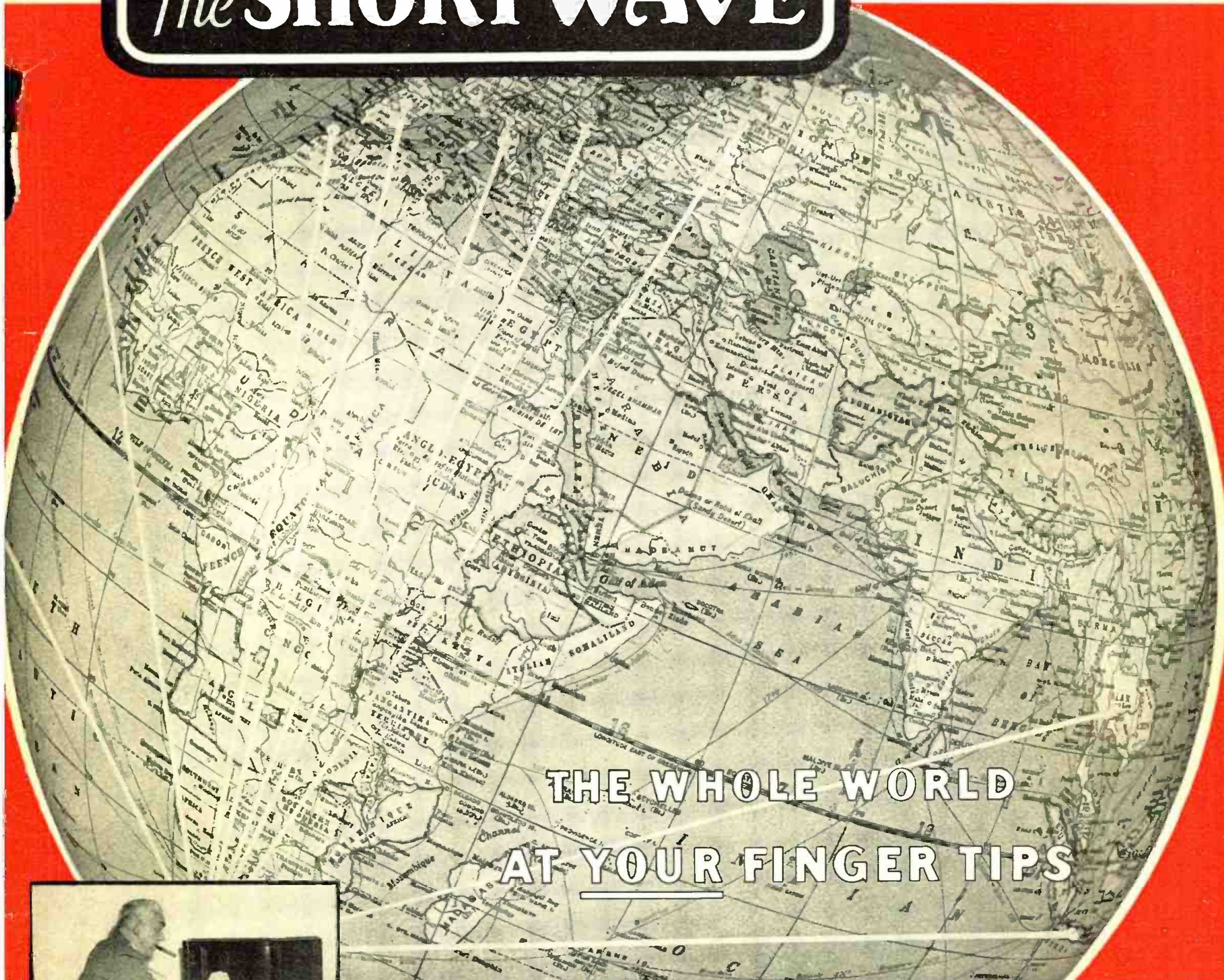
RADIO NEWS and The SHORT-WAVE

25¢

NRA MEMBER U.S. WE DO OUR PART

MAY



SET BUILDING PLANS

Devoted to Progress and Development in Radio

Service Work
Engineering
Applications
Experiments

Short Waves
Broadcasting
Electronics
Television

DX Reception
Set Building
Amateur Activity
Measurements

A FREQUENCY—STABILIZED BERNARD TEST OSCILLATOR

With Attenuator (ALL WAVES) $15

132 Kilocycle to 60 Megacycle Coverage! Line Is Blocked! Separate Neon Modulator Tube Used! Direct-Reading Scales for 132 to 3,000 KC., Higher Frequencies Accurately Computable by New, Simple Method!

Model 30-AB is Housed in a Black, Crinkle-Finish Shield Cabinet

BIG NEWS!

EVERY once in a while something of extraordinary value and importance is developed in radio. The latest such feat is our compact All-Wave Universal Test Oscillator for use on 90-120 volts a.c., d.c. or batteries (same device works on all three power sources), and that is free from all trouble. No feeding through the line, hence an attenuator becomes practical and is included. No stray ether radiation. No confusion in the use of harmonics.

Frequencies covered, directly or indirectly, guarantee you 1% accuracy on any frequency you will ever want.

Besides, the Model 30-AB is frequency-stabilized, which means that at any particular setting exactly the same frequency will be generated, time and time again, without end.

The Model 30-AB is just the thing for servicemen, for it works on a.c. of *any frequency*, as well as on d.c. or batteries. With line blocked, automatic-volume-control sets can be lined up. With separate neon audio oscillator, used when d.c. or batteries are the power, optional modulated-unmodulated service is enjoyed. High and uniform selectivity prevails on all uses, with no output wobble.

SHARP selectivity at all settings is one of the most important considerations in a Test Oscillator. Model 30-AB has it. *All-wave coverage* is an absolute essential to servicemen and experimenters, in view of the rapidly increasing sales of all-wave and short-wave sets. Model 30-AB has it. Intermediate, broadcast and lowest short-wave frequencies must be *direct-reading*. Model 30-AB has it. The scale must be adjusted to a reading *accuracy* of 1 per cent. or better. Model 30-AB has it. Instead of plug-in coils there must be *switching*. Model 30-AB has it. Frequency-stabilization spells *dependability*. Model 30-AB has it. *Model 30-AB has everything you want!*

Model 30-AB Universal Test Oscillator, complete in shield-cabinet, including one 30 tube as r.f. oscillator and one neon tube as modulator; ready to operate (shipping weight, 5 lbs.) **$15.00**

Kit for above, less tubes (Model 30-ABK) **$10.00**

Remit with Order. Sold on Ten-Day Money Back Guarantee

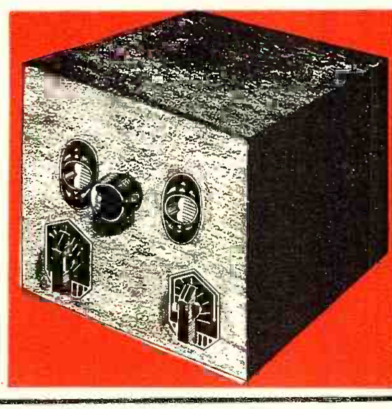
SIGNAL GENERATOR

A TEST Oscillator of our exclusive design, rendering the same frequency service as the 30-AB, but having these differences: (1) battery operation only; (2) all coupling, a.f. and r.f., is of electron type; (3) output attenuation is calibrated in decibels, 0-20 DB down, in steps of 2 DB; (4) modulation is adjustable and calibrated, 20 to 100 per cent; (5) 34 tube is r.f. oscillator and 30 tube is modulator; (6) modulated-unmodulated service always; (7) frequency stability is one part in 250,000; (8) scale readable to an accuracy of ½ per cent. Hence, the Portable Signal Generator is direct-reading in frequencies, 132 to 3,000 kc., indirectly from 3,000 to 60,000 kc., is direct-reading in DB output attenuation and is direct-reading in percentage modulation.

Model 3430 Portable Signal Generator (for advanced radio work), complete with A and B batteries, one 34 tube and one 30 tube; ready to operate (shipping weight, 11 lbs.) **$25.00**

Kit for above, less tubes, less batteries (Model 3430-K) **$18.00**

Remit with Order. Sold on Ten-Day Money Back Guarantee

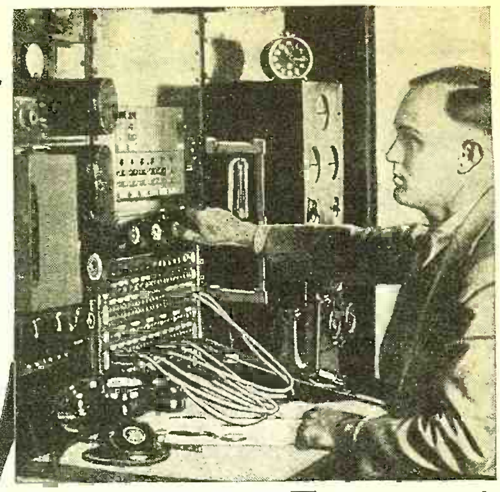


He man Berna d

**145 West 45th Street
New York, N. Y.**

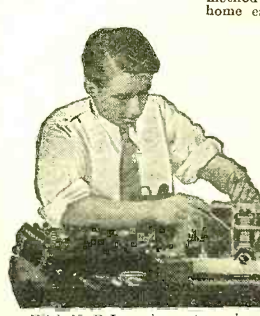
Long Distance Telephone, Medallion 3-0884

I will train you at home to fill a GOOD PAY Radio Job!



SPECIAL Radio Equipment for Broad Practical Experience *Given Without Extra Charge*

My Course is not all theory. I'll show you how to use my special Radio equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R. C. A., Victor, Majestic and others. You work out with your own hands many of the things you read in our lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, and how to make them work when they are out of order. Training like this shows up in your pay envelope—when you graduate you have had training and experience—you're not simply looking for a job where you can get experience.



With N. R. I. equipment you learn to build and thoroughly understand set testing equipment—you can use N. R. I. equipment in your spare time service work for extra money.

If your are dissatisfied with your present job, if you are struggling along in a rut with little or no prospect of anything better than a skinny pay envelope—clip the coupon NOW. Get my big FREE book on the opportunities in Radio. Read how quickly you can learn at home in your spare time to be a Radio Expert—what good jobs my graduates have been getting—real jobs with real futures!

Free Book Tells How Mail Coupon!

Many Radio Experts Make $40, $60, $75 a Week

In less than 15 years the Radio Industry has grown from a few million to hundreds of millions of dollars in business a year. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you through the N. R. I. method—have stepped into Radio at two and three times their former salaries.

Get Ready Now For Jobs Like These

Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, servicemen, buyers, for jobs paying up to $7,500 a year. Radio operators on ships enjoy life, see the world, with board and lodging free and get good pay besides. Dealers and jobbers employ servicemen, salesmen, buyers, managers, and pay up to $100 a week. My book tells you about these and many other interesting Radio jobs.

Many Make $5, $10, $15 a Week Extra in Spare Time Almost at Once

The day you enroll with me, I send you instructions, which you should master quickly, for doing 28 Radio jobs common in most every neighborhood, for spare time money. Throughout your training I send you information on servicing popular makes of sets. I give you the plans and ideas that have made $200 to $1,000 a year for N. R. I. men in their spare time. My Course is famous as the Course that pays for itself.

Television, Short Wave, Loud Speaker Systems Included

There's opportunity for you in Radio. Its future is certain. Television, short wave, loud speaker systems, police Radio, automobile Radio, aircraft Radio—in every branch, developments and improvements are taking place. Here is a real future for thousands and thousands of men who really know Radio—men with N. R. I. training. Get the training that opens the road to good pay and success.

You Get a Money Back Agreement

I am so sure that N. R. I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction Service upon completion.

FREE 64-page Book of Facts

Get your copy today. It's free to any ambitious fellow over 15 years of age. It tells you about the opportunities in Radio; about my Course; what others who have taken it are doing and making. Find out what Radio offers you without the slightest obligation. ACT NOW! Mail coupon in an envelope, or paste it on a 1¢ post card.

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

$50 to $75 a Week

"The National Radio Institute put me in a position to make more money than I ever made in good times. I am in the Radio service business for myself, where it is possible for me to make from $50 to $75 a week. Service work has increased because people, who in normal times would buy a new Radio, now are contented to have the old one 'pepped up'."

BERNARD COSTA,
150 Franklin St.,
Brooklyn, N. Y.

Runs Successful Radio Business

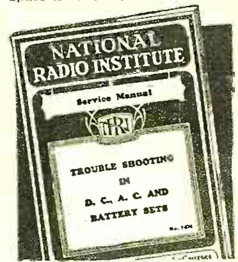
"I am a member of the firm of South Grand Radio & Appliance Co., which runs a very successful business. The greater part of my success I owe to N. R. I. Without your training, I could never have been successful in Radio."

J. A. VAUGHN,
Grand Radio & App. Co.
3107 S. Grand Blvd.
St. Louis, Mo.

Does Radio Work In Spare Time

"I am operating a 120 acre farm. Three nights a week I teach a Radio class. On the other nights I make service calls. Words cannot express my gratitude to N. R. I. Your training prepared me to earn nice sums of cash in spare time."

HOYT MOORE,
R. R. No. 3, Box 919,
Indianapolis, Ind.



FREE Radio Servicing Tips

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

I have doubled and tripled the salaries of many. Find out about this tested way to BIGGER PAY

Get a Job with a Future

FILL OUT AND MAIL THIS COUPON TODAY

Our Own Home

Pioneer and World's Largest Home-Study Radio training organization devoted entirely to training men and young men for good jobs in the Radio industry. Our growth has paralleled Radio's growth. We occupy three hundred times as much floor space now as we did when organized in 1914.

The Famous Course That Pays For Itself

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

Dear Mr. Smith: I want to take advantage of your Special Offer. Send me your two books, "Trouble Shooting in D.C., A.C., and Battery Sets" and "Rich Rewards in Radio." I understand this request does not obligate me. (Please print plainly.)

Name.............................Age.........

Address...

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

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Vol. XV
No. 11

RADIO NEWS

May, 1934

THIS MONTH—

P. A. Systems

New Tubes

Servicing

Short Waves

Television

NEXT MONTH—

Boat Owners: Watch for the June issue. It will provide valuable data on installation of radio on boats, large and small. Don't miss this number.

For Students: Don't miss the articles on the fundamentals of electricity in radio. There are also E. B. Kirk's and Alfred A. Ghirardi's well-known serials.

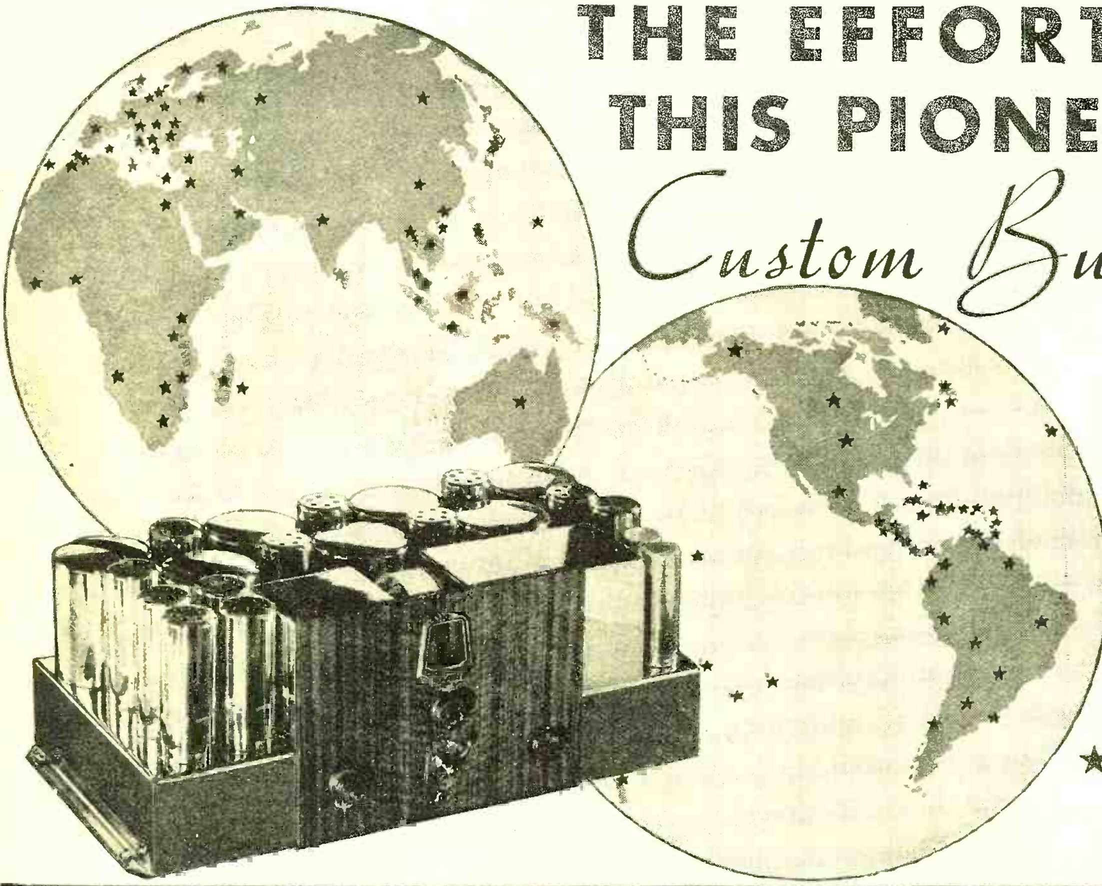
For Short-Wave and DX Fans: The DX Corners, New American Station List and the World Short-Wave Time Table.

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

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

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

ALL THE WORLD★ APPRECIATES THE EFFORTS OF THIS PIONEER IN *Custom Building*



E. H. SCOTT
President,
E. H. SCOTT RADIO LABORATORIES, Inc.

★ SCOTT Receivers are now giving satisfactory service to owners in 106 foreign lands, as well as in every state in the U.S.A.

In California and in Ceylon, in New York and in New Zealand . . . wherever people appreciate the finer things and demand the superlative in radio performance, you will find SCOTT Receivers.

What's behind this international acceptance of the SCOTT ALL-WAVE FIFTEEN as "The World's Finest Radio Receiver?" Obviously, there are many that will pick up entertainment from distant places.

The answer is in the fact that SCOTT Receivers are built with greater care, from pioneering experience. There is nothing new or experimental about all-wave reception on a SCOTT Receiver . . . for 10 years they have been making world's records for distant reception just as they continue to do now. London — Paris — Berlin — Rome — Madrid — Sydney — Melbourne — South American cities — all are heard — direct — almost as easily as local broadcasting stations on the SCOTT ALL-WAVE FIFTEEN.

Advanced engineering practice made it possible—plus true custom-building by specially trained technicians who, under the personal supervision of this pioneer—perform every operation in the construction of a SCOTT ALL-WAVE FIFTEEN as painstakingly as though they were building that particular receiver for their own laboratory use.

The result is a superlatively fine instrument that, from the very start of its building, has been subjected to the most rigid scientific tests known in radio engineering. It is so completely competent that we unhesitatingly guarantee it to outperform any other radio receiver in side-by-side test, during a thirty-day trial period in the purchaser's own home. Further, we warrant its every part (excepting only tubes) against breakdown or failure in service for five years.

Recent developments by SCOTT engineers have brought to the SCOTT ALL-WAVE FIFTEEN a new ability in distance reception, and in the perfected reproduction of speech and music, that is amazing. The complete story of these new developments—marking the beginning of a new era in radio reception—is now available. Send for it at once.

Custom-built
SCOTT ALL-WAVE FIFTEEN

E. H. SCOTT RADIO LABORATORIES, INC.
4450 RAVENSWOOD AVE., DEPT. N-54, CHICAGO, ILL.

GET ALL DETAILS

E. H. SCOTT RADIO LABORATORIES, INC.
4450 Ravenswood Ave., Dept. N-54, Chicago, Ill.

Send me at once, without obligation, information about the SCOTT ALL-WAVE FIFTEEN, including technical data regarding new engineering developments and PROOF of performance ability.

*Name*________________

*Address*________________

*Town*____________ *State*____________

MAIL THE COUPON

DOTS . . . . . and - - DASHES

Short but Interesting Items from the Month's Radio News

Radio Industry's Best Year Since 1930

NEW YORK—According to Dun and Bradstreet, the radio industry's start in 1934 is the most favorable it has been able to achieve since 1930. It is now, so the report states, on a more suitable basis than at any time in its history and fully capable of keeping pace with other industries in the recovery movement. So far it has not been unusual for the volume of sales to exceed by 60 percent. that of the same period in 1933.

MARCONI VISITS VATICAN

Here is the Marchese Marconi inspecting the short wave transmitter he built for Vatican transmissions

Television in Japan

TOKIO, JAPAN—The Department of Electrical Communication in Tokio, in collaboration with several scientific institutes, has decided to form a company for the promotion of television. This action has been taken in order to help the popularizing of television in Japan.

Radio Directs Rescue of Ice-Bound Sufferers

MOSCOW—Radio messages from a camp on shifting ice floes guided intrepid Soviet airmen to ice-bound castaways last month. The castaways were members of a party, bound for home from Wrangel Island, whose ship was crushed and sunk by the ice. They managed to save a radio set, which was installed in the camp and communicated with the government, who sent the relief planes.

Killing Germs with Radio Waves

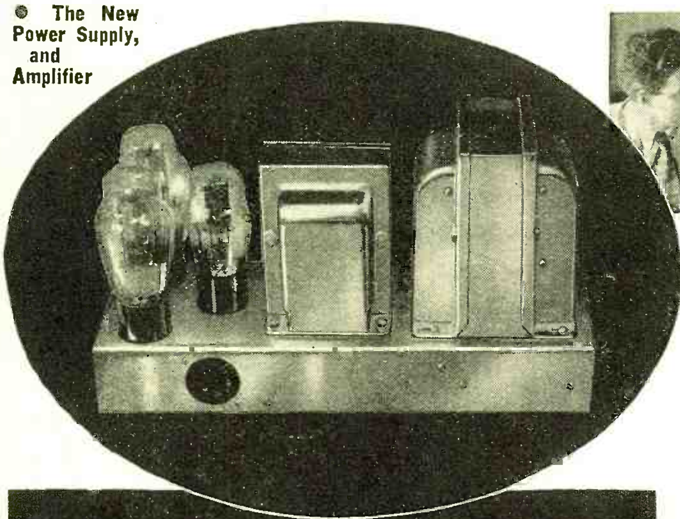
WASHINGTON—Using high-frequency radio waves to kill the germs of tooth decay is a recent announcement by the American Association for the Advancement of Science. The results were reported by Drs. J. S. Oartel and E. A. Wolf of the University of Pittsburgh. The waves used in

NEW POWER TUBES

GIVE 17 WATTS UNDISTORTED OUTPUT TO

MASTERPIECE, II

● The New Power Supply, and Amplifier



Admiral Byrd's choice now gains even more distinction thru addition of sensational new audio system.

• •

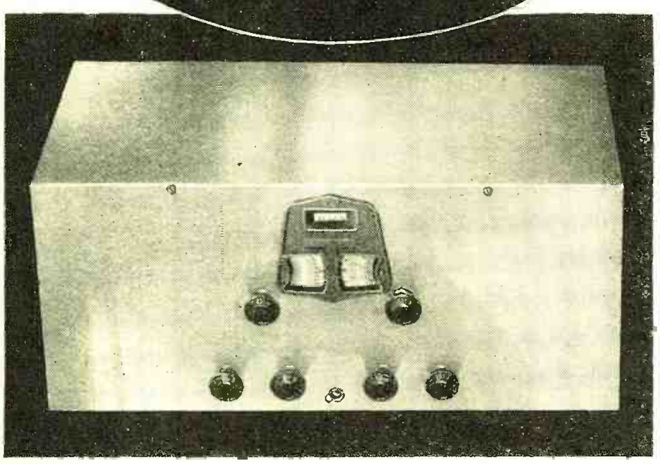
Masterpiece II is now equipped with two of the new 2B6 power tubes in three stages of Class "A" dual push-pull. This feature, plus a totally new system of tone control even further improves Masterpiece II's already excellent signal to noise ratio . . . and actually yields tonal possibilities utterly unattainable with any other receiver.

GREATLY HELPS 10,000 MILE RECEPTION

Masterpiece II has, since its inception, been noted for extreme clarity on short-wave transoceanic reception . . . the power resulting from absolute precision in every part and circuit, eliminating all necessity for forcing tubes on even the weakest signals. But now . . . with the 2B6 power tubes, and the new tone control, Masterpiece II has placed an entirely new meaning upon brilliance and satisfaction in long range reception. Results are unbelievable, until you hear them yourself.

ACTUAL 10 DAY TRIAL

Masterpiece II, with its new 2B6 tubes is ready to give you the thrill of a lifetime and to show you, at no risk to you, precisely why Admiral Byrd chose it for 10 to 570 work in the Antarctic. You can order Masterpiece II with the unconditional understanding that it is yours to try for 10 full days . . . you to be the sole judge . . . your money back instantly if you want it. My new book tells all about this offer and gives full technical details of the new, improved Masterpiece II.—Send coupon.



BRIEF SPECIFICATIONS

Wave length Range 10 to 570 meters or 520 to 30,000 kc. Four position wave change switch. (External unit extends range from 700 to 2000 meters.)

Tuned R. F. stage on both Broadcast and entire Short Wave range yet single dial tunes the receiver. Greatly improves signal-noise ratio on 12,000 mile reception.

Band-spread tuning on short waves. Makes short wave tuning actually easier than broadcast tuning.

3 air-tuned intermediate stages. Most accurate intermediate amplification ever developed.

Sensitivity better than ¼ micro-volt absolute average. Inter-station noise suppressor adjustable to exact location requirement.

Automatic volume control holds all stations 20 microvolts and up at constant volume to the ear.

Selectivity absolute 9 Kc. for Europe, better than U. S. needs (21 Kc. wide 10,000 times down).

Fidelity perfect over 30 to 4,000 cycle audio range. Undistorted power output, 17 watts. Automatic and manual tone controls.

Special impregnation for tropical climates.

Built-in beat oscillator for easy finding of S. W. and weak broadcast stations.

Chromium plated steel shielding case eliminates need for cabinet.

McMurdo Silver, Inc.

1733 Belmont Avenue, Chicago, Illinois

McMurdo Silver, Inc., 1733 Belmont Ave.,
Chicago, U.S.A.
Send me full technical information on Masterpiece II.

Name..

Street..

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

the experiment had a wavelength of 3.2 meters. The teeth were exposed for periods of from five minutes to an hour.

Ultra-Short Waves on Horse Back

JAPAN—During recent Japanese Army manoeuvers an ultra-short-wave transmitter and receiver were used by radio station JOCK (the Nagoya Central Broadcasting Station) to transmit a description of troop movements and activities to the listening public. An official announcer may be seen in the photograph (on the first horse) with the microphone which is connected by cable to the second horse, where an engineer carries the ultra-short-wave transmitter on his back. The third rider has charge of the receiving apparatus for listening to

the main broadcasting station to which the ultra-short-wave transmitter is relaying the program. The transmitter itself is somewhat similar to our American "transceivers" and works on a wavelength of 7 meters with an output of 4 watts. The transmitter weighs (complete with batteries) about 41 kgs.

A Doctor's Telephone Service

NEW YORK—It is rumored that an agency to be known as the Doctors' Telephone Service, Inc., of this city is soon to go on the air with short-wave broadcasts to members of the medical profession traveling around in automobiles.

New Amplifiers for House of Lords

LONDON—Deep down in the cellars extending below the Chamber of the House of Lords is a room which now houses a most complete public-address amplifying equipment. The new p.a. system was installed on account of the very imperfect acoustics of the Chamber, particularly in the Strangers' and Press gallery. Four microphones are used. The amplifier uses five amplifying stages and has five output circuits with independent volume controls. The amplifying equipment is connected to 65 earphones instead of the usual loudspeakers. The place where the amplifier is located in the cellar is on the exact spot where Guy Fawkes, hundreds of years ago, placed his explosives in an attempt to blow up the Houses of Parliament.

Stabs and Beats Father for Shutting Down Radio

OIL CITY, PA.—A seventeen-year-old radio fan of this city was recently arrested and charged with fatally beating his father over the head and stabbing him five times with a butcher knife for switching off a radio set to which the lad was listening. The radio annoyed the father, who was dozing in a chair, and he angrily turned it off, whereupon the boy attacked his parent and killed him.

LEARN RADIO FROM REAL RADIO ENGINEERS

HERE THEY ARE:
Dr. C. M. Blackburn, Chief Radio Engineer, Grigsby-Grunow Company (Majestic),
Kendall Clough, Chief Engineer Clough-Brengle Co. (Radio Engineers and Manufacturers)
Karl Hassel, Chief Engineer, Zenith Radio Corporation,
Homer Hogan, Gen. Manager, Radio Station KYW, Chicago,
R. MacGregor, Service Manager and Sales Engineer, Transformer Corporation of America (Clarion),
H. C. Tittle, Chief Radio Engr., Stewart-Warner Corporation,
F. D. Whitten, Service Manager, Chicago Plant, Philco Radio and Television Corporation,

NRA MEMBER U.S. WE DO OUR PART

LET THESE ENGINEERS RIGHT FROM THE HEART OF THE BIG RADIO INDUSTRY *Train You at Home for*

GOOD PAY RADIO WORK

MANY R-T-I TRAINED MEN MAKE $35 TO $75 A WEEK

If you're dissatisfied with small pay — work that's getting you nowhere—lay-offs and uncertain income — 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 YOURS." This book tells how you can learn at home 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.

"RADIO IS GROWING BY LEAPS AND BOUNDS"

says *Radio Craft Magazine*. It has forged ahead even in depression years. Where only a few hundred men were employed a short time ago, thousands are employed today. Where a few years ago a hundred jobs paid $35 to $75 a week — there are thousands of such jobs today. And more new jobs 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.

R-T-I TRAINING IS "SHOP TRAINING" FOR THE HOME

It comes to you right from the Radio Industry — right out of the factories where Radio sets and other vacuum-tube devices are made. It was planned and prepared for you by big radio engineers IN these factories, most of whom are the Chief Engineers of these great Radio plants. And NOW these same engineers are actually supervising R-T-I Training. Which 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.

4 BIG WORKING OUTFITS INCLUDED

These are probably the biggest and most expensive Working Outfits ever included with a home-training Course. You use them to build up testing equipment — to experiment with — to do actual Radio work. It's Shop Training for the home

SOUND PICTURES, P. A. SYSTEMS, PHOTO CELLS, TELEVISION, ETC. ALL INCLUDED

Radio service work is just the starting point in R-T-I Training. From there we take you up through the very latest developments in Radio, and then on into the new and larger field of Electronics—Sound Pictures, Public Address Systems, Photo Cells, and Television. This feature alone makes R-T-I the outstanding home training in Radio.

YOU GET "QUICK RESULTS"

C. E. Head, 431 Third St., Alexandria, La., says: "Made my first money 11 days after starting your training — cleared $14.25."

Frank E. Klemann, Lisle, Ill., writes: "Doubled my pay in less than six months."

Harry L. Stark, Ft. Wayne, Ind., writes: "Now making three times as much money as I was when I started your training."

AGE OR LACK OF EDUCATION NO HANDICAP

You don't have to be a high school graduate. It isn't necessary that you should have finished the grades. My Training in Radio is so simple, so easy, and so practical, that it offers every man, regardless of age, education, or previous experience, the chance to get out of a small-pay, no-future job, into good pay, big future work in Radio.

YOUR MONEY BACK IF YOU ARE NOT SATISFIED

That's my way of doing business. And I'll give you that agreement in writing — an agreement to refund every penny of your tuition if, on completion of my Training, you are not entirely satisfied.

INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results". Send today for my big book "Radio's Future and Yours". The book is free.

RAY D. SMITH, *President*
Radio & Television Institute, Chicago

"We OK Radio and Television Institute home training"

say these 30 LEADING RADIO MANUFACTURERS

and they are talking to YOU

AMERICAN TELEVISION APPARATUS DESIGN CO.
ARCTURUS TUBES
BALKEIT • BRUNSWICK
CAPEHART
CLOUGH-BRENGLE CO.
CROSLEY • DeFOREST • FADA
ERIE RESISTOR CORPORATION
HAMMARLUND • HICKOK
HOWARD
INTERNATIONAL RESISTANCE CO.
KEN-RAD • KOLSTER • LYRIC
MAJESTIC • MUTER CO.
NATIONAL UNION RADIO CORP.
PHILCO
RADIO PRODUCTS CO.
SANGAMO ELECTRIC
SENTINEL • STEWART-WARNER
SILVER-MARSHALL MFG. CO.
STANDARD TRANSFORMER CORPORATION
STROMBERG-CARLSON
UNIVERSAL MICROPHONE
ZENITH

MAIL COUPON FOR MY FREE BOOK

Get your copy of "Radio's Future and Yours" today. It tells you about Radio's amazing opportunities. It describes my Course. It tells what R. T. I. students are doing and making. It's FREE. Clip, sign and mail coupon RIGHT NOW!

Ray D. Smith, President,
RADIO and TELEVISION INSTITUTE, (R-T-I)
2130 Lawrence Ave., Dept. 45, Chicago, Ill.

Without obligation of any kind please send me a copy of "Radio's Future and Yours." I am interested in your home training and the opportunities you say exist in the great field of Radio for the R. T. I. Trained man.

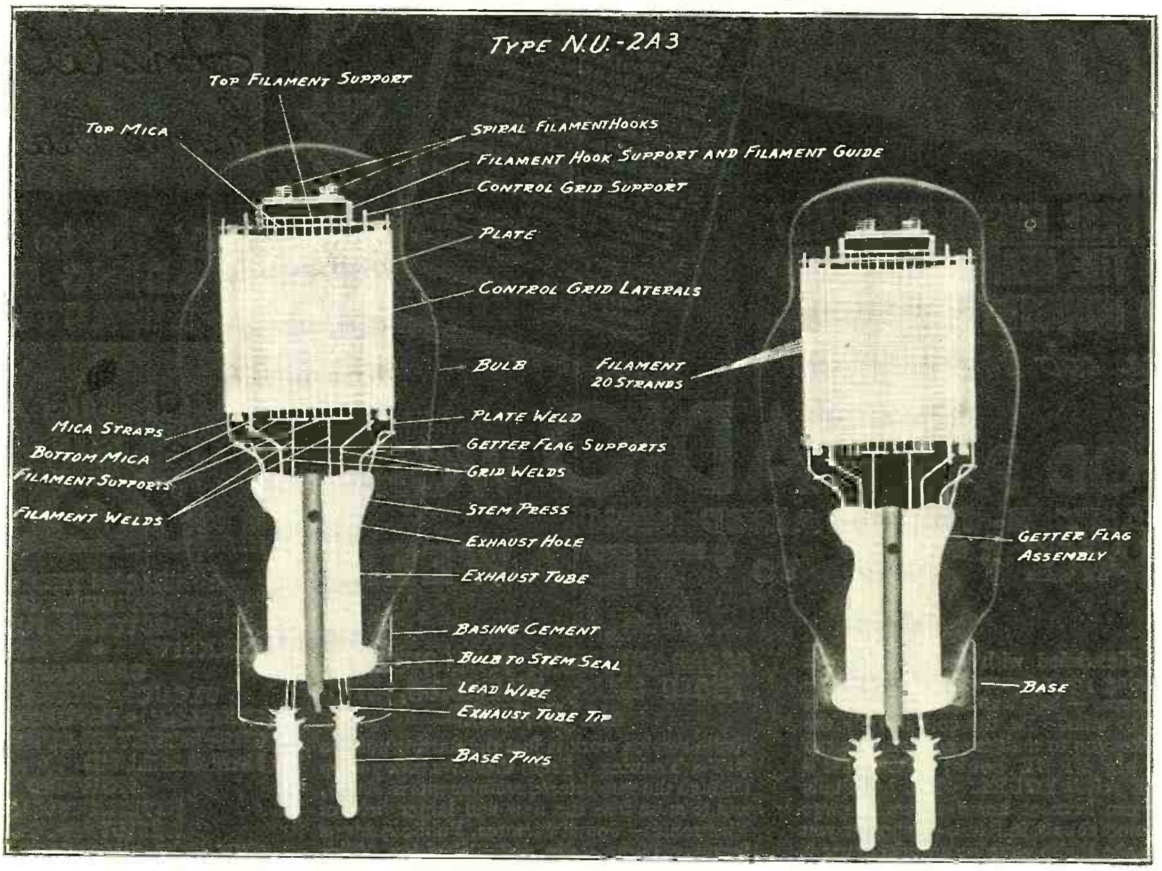
Name ____________________

Address ____________________

City ____________ State ________

X-RAY REVEALS NATIONAL UNION RADIO TUBE ACCURACY—QUALITY!

Servicemen Everywhere Acclaim Fine Tubes—Free Equipment



The above illustration is an actual reproduction from an x-ray photograph of a National Union tube Type 2A3. The consistent accuracy of detail in National Union tubes is one of the reasons they are sold by more service men than any other make.

Service Men Can't Afford to Ignore National Union Program

Many thousands of service experts throughout the United States are finding it profitable to be tied-up with the National Union program. They have proven to their own complete satisfaction that National Union means more than—Radio Tubes, National Union stands as a symbol of more service business and better service business at a profit. No service man who appreciates the full significance of what National Union can mean to his success can possibly afford not to tie-up with the National Union program. Consider a few of the points briefly outlined on this page and resolve now to tie-up with National Union in your own best interest.

PROFIT

The 10 cent higher list prices of National Union tubes were made to enable the service man to make the highest margin of profit on his tube sales. National Union servicemen have enthusiastically supported this full profit program with resultant benefits which are self evident.

SERVICE AIDS

For more than three years National Union has specialized in service aids. Charts, data and information which would be of most practical value to experts in the service business. A few of the many items are: Peak Frequency Charts, Tube Base Connection Finders and Voltage Divider Charts. These valuable aids, available to National Union authorized dealers at no cost cannot be duplicated from any other single source. Every National Union service outlet can testify to what this has meant to him in better service work and more profit.

National Union jobber stocks are complete.

X-RAY PRINT of NU 6F7 AVAILABLE

In the belief that the service men will be keenly interested in an x-ray photo of one of the newer type tubes, prints of the NU 6F7, suitable for framing have been prepared.

To obtain an NU 6F7 x-ray print, send 10c in stamps to cover postage and handling to National Union Radio Corporation of N. Y., 400 Madison Avenue, New York City.

FREE SHOP EQUIPMENT

One of the principal objectives of National Union has been to supply the serviceman with modern shop equipment and data so that he would be in a position to do better service work and more of it at a profit. Testers, analyzers, service manuals and service tools are given with the purchase of National Union tubes. The wide awake dealer realizes the advantage of obtaining his equipment in this way as he has both the guarantee of the manufacturer and the backing of National Union.

National Union offers include:
Servicing Tool Kit
Supreme No. 333 Analyzer
Service Manuals—Auto Manual
Triplett Oscillator and Output Meter
Triplett Tube Tester
Hickok Diamond Point Jr. Tube Tester
Supreme Model 85 Tube Tester

All Offers, subject to withdrawal without notice. Small deposit. What do you need? Get details!

OTHERS SAY:

"We have been in the radio business for more than six years, but for the past three have been specializing exclusively in radio service work. This has developed into a very profitable business, due in no small part, to the cooperation and "deals" of the National Union Radio Corporation." J. D. Edwards, Edwards Radio Service, Washington, D. C.

FULL LIST PRICES AND GOOD WILL

National Union tubes are sold everywhere at full list price. This means that the serviceman has no need to fear the ill will of his customers who might otherwise see the tubes in "cut price" stores. National Union stands for full price, fair profit and good will!

National Union Radio Corporation of N. Y.
400 Madison Avenue,
New York City.

Gentlemen:

I am interested in: RN 5

....

Name...

Street...

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

Radio News
May, 1934

Getting A

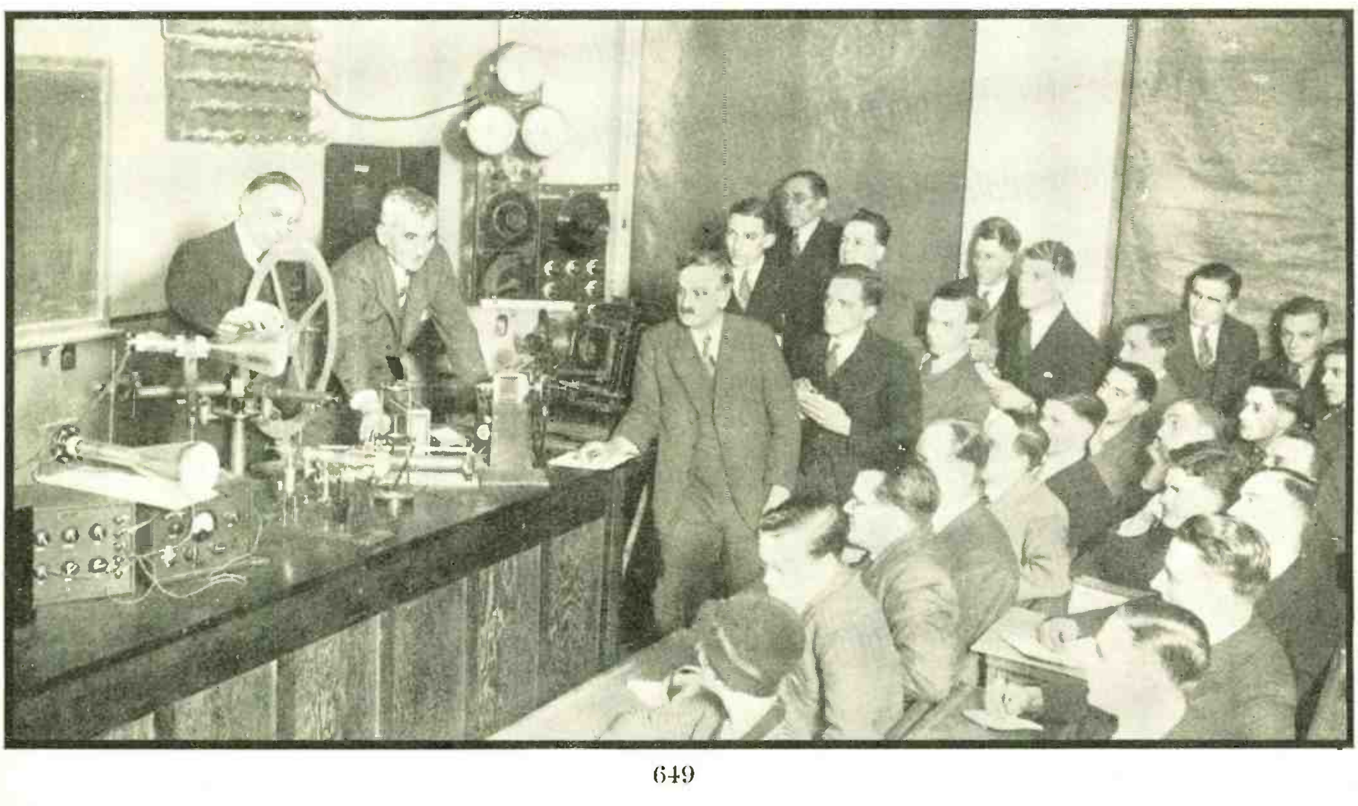
RADIO EDUCATION

The Editor—To You

Do you know all about radio? Do you feel the need for new knowledge? Read this short editorial and if it fits your case we will be glad to be of service. If you have a friend who is interested in radio, show him this page in RADIO NEWS and advise him to read it. It may be important for his future

ANY radio man—possessing real knowledge—has before him, during the next twenty years, a future that will be worthwhile and successful. But the radio technique is moving at such a rapid pace and knowledge is becoming so specialized that just a plain "tinkerer's" knowledge *is no longer enough!* In the old days when any experimenter could stumble across a new fundamental idea, the "will-to-experiment" with cut-and-try methods often produced a new star in the radio firmament. But nowadays, new discoveries and new developments *are made by men who really know radio theory and practice.* It is only recently that Dr. Jansky, president of the Institute of Radio Engineers, asked the question, "Just what is a radio engineer?" And it is a fact that there are many who call themselves radio engineers who understand very little about engineering practices and in some cases only a smattering of radio.

For the wide-awake young man who has decided to make radio his future field of endeavor, there must be serious consideration of the study of radio fundamentals, theory and practice with a continuing interest in learning new developments, new usages as they are discovered to put them in practice. There are, in the United States, as in no other country, numbers of radio schools that teach radio and its principles in many different ways. Some are highly technical training schools, some are semi-technical schools for the beginner, some are devoted to courses which explain in less detail the engineering features but feature the practical side of radio. And there are also universities and colleges dealing with the strictly theoretical engineering side of radio as part of an electrical course. (*Continued on page* 707)



A CENTRAL SCHOOL P. A. SYSTEM

Which contributes educational facilities and opens a new source of revenue for the wide-awake radio serviceman

Zeh Bouck

A STUDENT AT THE "MIKE"

A Schoharie high-school student, Miss Yowmans, at the microphone on the auditorium stage

THE inception and rapid expansion of the central school idea has developed a new educational technique and at the same time contributed a post-depression income to the technically qualified and ambitious serviceman. Central schools, serving relatively large rural areas by means of bus transportation, are supplanting the tiny district schools where the three R's were taught to the tune of the birch and ruler slap. The "little red schoolhouse on the hill" is giving way to commodious and modern structures, with study halls, auditoriums, gymnasiums, laboratories and multitudinous classrooms, where all the advantages of urban curricula can be assimilated if not enjoyed. The movement being fundamentally a progressive one, it is only natural that those behind it are *receptive to ideas embodying the latest in scientific developments.* And the fact that each centrol school is almost invariably a *new* building greatly facilitates the incorporation of modern educational equipment.

An excellent example of this grade and high school modernization is displayed in the Schoharie Central School, located in the county seat of Schoharie, New York State. The electrical installation in this school is of interest from three points of view: It illustrates the achievement of a local serviceman, provides excellent data on the technical requirements of such installations, and demonstrates conclusively the educational advantages of school public-address systems.

It is particularly significant that this installation was engineered by a local concern—Scribner Brothers—rather than by readily-available specialists from nearby cities. Schoharie is a strictly rural community of some 1500 folk, located well within an hour's drive of Albany and Schenectady. The work was personally directed by Eddie Scribner, who convinced the school board and the principal, Mr. Gordon L. Fox, that the installation could be effected at a cost well within a possible appropriation. No sales argument, aside from confining the expenditure within such limits, was necessary.

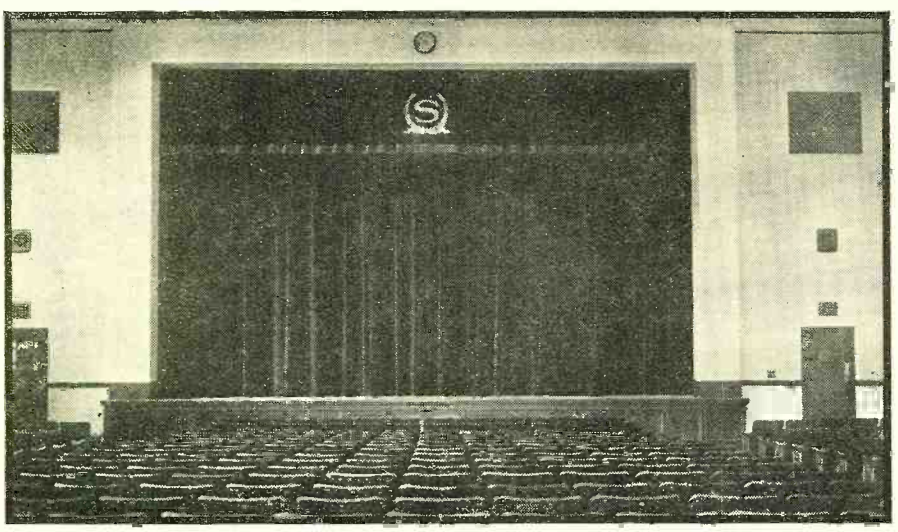
Dealing with their regular sources of supply, the usual credit accommodations were extended the service organization and a contract drawn up with the school board. When the school was constructed, ¾-inch conduit was laid for the p.a. system in accordance with the plan for distribution. The requirements were carefully studied and worked out with the co-operation of engineers of the Radio Receptor Company, who manufactured the equipment to meet specifications. The actual installation required, in all, one week's labor on the part of three men, and the estimate of cost to the school was made on a time basis—plus the list price of materials—the contractor realizing a reasonable profit on both considerations.

The heart of the system is a control desk located in the office of the principal, and comprises two radio receivers, a monitoring speaker, input and power amplifiers, a turntable and pick-up, a microphone, volume controls for both channels, a main power supply and an elaborate but mechanically simple switching arrangement.

The receivers are General Electric 8-tube superheterodynes, with automatic volume control, and operating on the broadcast bands. They may be operated simultaneously, providing two radio channels. The amplifier is of Class A

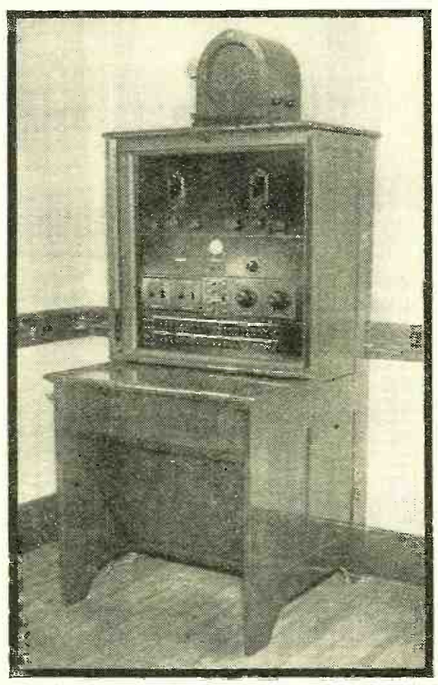
A VIEW OF THE STAGE

The auditorium with the two dynamic speakers mounted flush on the wall on each side of the stage



THE FRONT VIEW

The control desk with the switching arrangements and monitor speaker mounted on top of cabinet



throughout, consisting of a —24 input tube, a —45 and —50s in push-pull, the output of which is conservatively rated at 13 watts. The power supply employs two —81 type tubes.

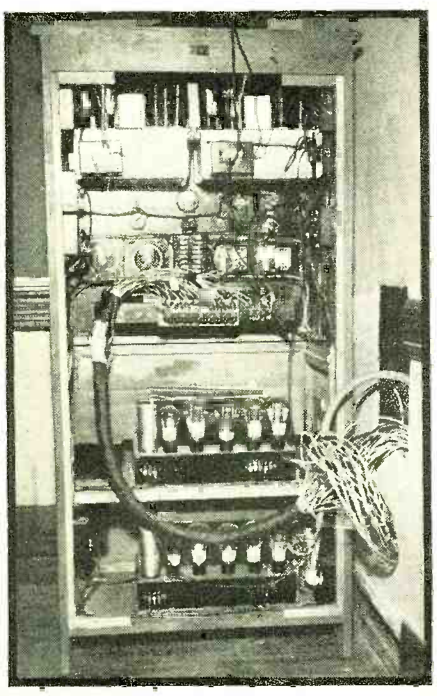
The switching arrangement provides for two complete channels. Any speaker in the system can be switched to either channel, and any two desired inputs—microphone, either receiver or turntable—can be used simultaneously on both channels, or both channels tied in on a single input. A master switch throws all speakers to microphone regardless of the settings of the other controls. Cross-talk is eliminated by adequate shielding. The desk microphone is of the close speaking type and can be used without feed-back to the monitor speaker.

Volume control on both channels is varied at the desk until the desired intensity is indicated by the monitoring speaker. All other speakers have individual integral volume controls, which can be adjusted only with a screwdriver. These are set for the volume desired in the individual classrooms when the volume (at the monitor) is normal. They require no further adjustment.

Two dynamic speakers are installed in the auditorium, seating an audience of 600 persons, and two similar speakers in the gym which has a seating capacity of approximately 400 persons. These speakers have individual field supplies, operated by automatic relays from the control desk. The relays are operated by a 12-volt circuit carried in the same conduits with the modulated current. Readily adjustable and separate volume control is provided behind the procenium for the auditorium speakers. This facilitates a desired degree of control when the studio type microphone is employed on the auditorium stage.

THE REAR VIEW

This shows the installation of the receivers, power supply and the control cables running to the switches



There are 27 magnetic type speakers in as many classrooms, seating, on the average, 35 students in each classroom. These are mounted flush with the walls, at the head of the classroom, providing effective sound distribution. The natural baffling contributes to the excellent quality which is scarcely inferior to the output of the dynamics.

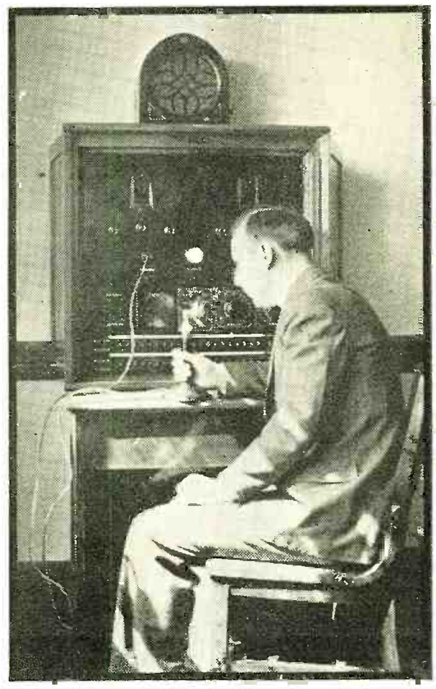
In engineering an installation of this order, particular care should be directed to the distribution of conduit, experience demonstrating the probability that the principal difficulty encountered will be cable crowding. In one instance it was necessary to run nine pairs through one ¾-inch conduit, which presents a rather difficult job of fishing.

The entire installation was engineered with an appreciation of the fact that even the best of equipment requires servicing from time to time, and the layout so arranged as to facilitate inspection and repair. Junction boxes are placed at convenient intervals along the conduit, greatly expediting the localization of trouble. The speakers are mounted in the walls with four screws and are readily removable for test or replacement. The desk, with the main control panel, can be pulled out from the wall, and the control system immediately exposed.

The installation is protected by a service guarantee for one year, during which time all defective parts, with the exception of tubes, are to be replaced free of charge. After this period the usual charges will be made for material and labor, including a stipulated inspection every six months.

Provision has also been made for expansion. Empty conduits were run to the basement in anticipation of additional speaker outlets. Conduit is also embedded in the rear wall of the school, sufficiently close to the surface to be exposed if additions are made to the building.

The cost to the school was based on an estimated requirement of 10,000 feet of wire. Actually 10,500 feet were required, and the entire installation cost the school approximately $1,700.



1000 STUDENTS LISTENING

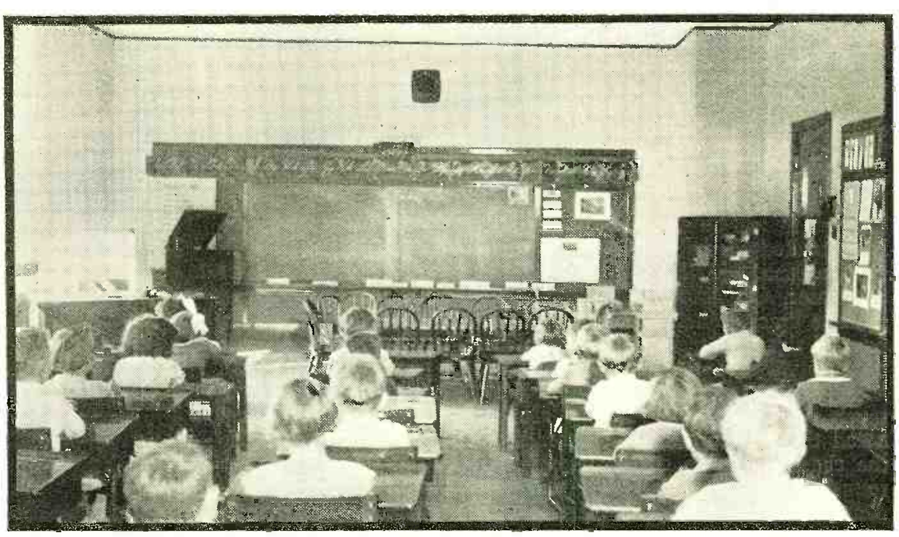
Principal Gordon Fox addressing the entire school from the special microphone plugged into the control desk

Though the perfect control of the various radio, voice and phonograph channels is electrically complicated, it is manually a simple operation, and the technique was readily acquired by the principal. The installation is employed most consistently for announcements to individual and grouped classes, with the saving of considerable time and the elimination of messenger service. Each notice is preceded by a musical signal of four Degan chimes followed by five seconds of silence for the suspension of work.

Various classes in the school have radio schedules with the American School of The Air and the Damrosch Musical Appreciation Hour. Special events of national and civic importance, such as Presidential addresses, also form an important part of the radio educational fare.

A RADIO CLASS AT WORK

The educational P.A. system in action. The speaker is mounted flush with the wall above the blackboard



HOW TO BUILD A 3-TUBE A. C.-D. C. COMPACT

The tiny receiver described out-performs many commercial compact receivers, yet is easy to build from these standard parts

Richard F. Shea

A REALLY "COMPACT" RECEIVER
Figure 1. Although home constructed, it rivals the best factory-made compacts in appearance

THE past two years have demonstrated beyond any doubt the wide popularity of the small-size universal type radio receivers, designed to operate on either a.c. or d.c. current. With this thought in mind, this "how to build" article should find great favor with radio constructors; or, for that matter, all types of radio enthusiasts, for the complete constructional details it supplies on a three-tube compact universal receiver which actually provides excellent 4-tube performance, due to the use of new 12A7 combination pentode-rectifier tube. Its compactness is indicated by the overall dimensions of the leatherette-covered case—7¾ inches high by 6¼ inches wide by 5¾ inches deep.

The receiver uses standard parts and the wiring is not at all complicated, as the constructor will notice by referring to the circuit diagram, Figure 4. The instructions are complete with dimensional drawings of the chassis, tube shield and speaker bracket. The illustrations are marked with symbols of the parts corresponding to those listed at the end of this article. The receiver employs a tuned radio-frequency circuit utilizing one -78, one -77 and the aforementioned 12A7 tube. This new 12A7 tube contains in one envelope a power pentode, having the same characteristics as the type -38 tube and a rectifier with characteristics similar to those of the 1V rectifier. Thus this tube plays the dual rôle of output tube and rectifier. The constructor wll find the prong layout for this new 12A7 in Figure 4.

By further reference to the circuit diagram, it will be seen that the antenna is connected to the primary winding of the antenna coil through a .002 mica condenser, C1, shown mounted on the speaker bracket in Figure 2. The purpose of this condenser is to prevent the possibility of receiving a shock if the antenna wire and an external ground are touch simultaneously. It will also be noted that all parts are insulated from the chassis, for the same reason. The returns of the r.f. coils and by-pass condensers are made to the variable condenser frame, and this condenser is insulated from the chassis by a thin sheet of varnished cambric. The screws fastening the condensers to the chassis are insulated by a small piece of cambric sleeving placed over the screws and bakelite washers on each side of the chassis. Control of volume is accomplished by varying the bias on the -78 tube. This volume control also carries the on-off switch.

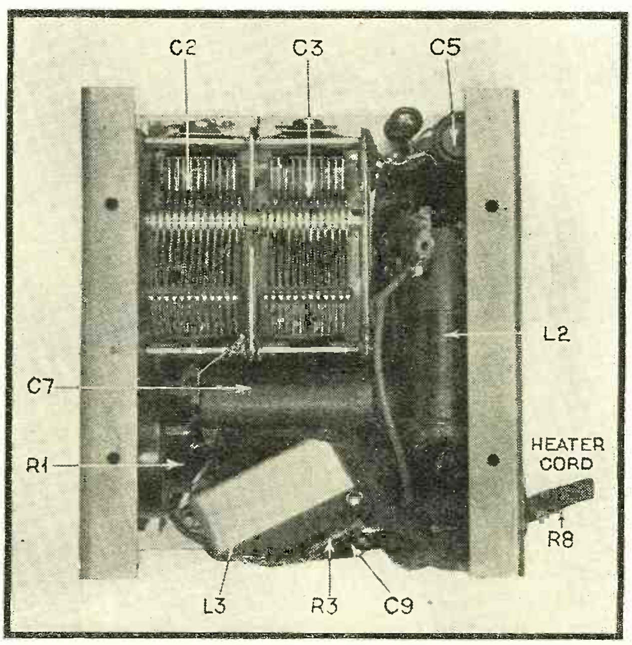
The antenna coil, L1, is located on top of the chassis, mounted on a bracket fastened to the back of the loudspeaker. The r.f. coil, L2, is mounted under the chassis, in back of the variable condenser. Particular care must be taken to have these two coils connected to their respective variable condenser sections as directly as possible. The detector circuit is conventional, employing a type -77 tube to provide high sensitivity. The screen voltage for this tube is obtained from the voltage divider resistors R6 and R7. The detector is resistance-coupled to the grid circuit of the 12A7 through resistors R3 and R4 and condenser C9. The magnetic speaker is connected directly in the plate circuit of the 12A7 as shown. The detector and output tubes are biased by resistors R2 and R5 respectively. C6 and C7 serve to by-pass these bias resistors, to obtain best quality. If the builder doesn't care too much for bass reproduction, these two condensers can be ¼ or ½ mfd. each, but for best reproduction it is suggested that 5 mfd. electrolytics be used. These 5 mfd. electrolytic condensers may be either single units or combined in one container. They are low-voltage units, rated at 25 volts, hence are very compact in size.

The filter choke, L3, is mounted under the chassis and can be readily seen in Figure 3. This choke is a very compact one wtih 500 ohms rated resistance. It is supplied with an upright mounting bracket so that it can easily be mounted on the chassis.

The filter condenser is also very compact, and is shown in Figure 2, at the front, right in back of the speaker.

The filament-reducing resistor, R8, of 250 ohms, is incorporated right in the line cord which is known as a "heater line cord." These cords are obtainable in various lengths and resistance values and it is suggested that the cord be as long as possible, at least 6 feet, and 10 feet if procurable. There is consider-

FIGURE 3. UNDERSIDE OF CHASSIS



able heat dissipated in this line cord, and the longer it is the cooler it will be in use.

Now for the actual construction. The first procedure is to make up the chassis. Figure 5 gives the chassis layout and all the necessary holes for mounting the various parts. Of course, if the builder has other parts that are just as good and will fit into the available space, there is no reason why they cannot be used. Lay out a piece of steel, .042 inch thick, 5 inches wide by 11 inches long, and mark on this the four bending lines shown in the dimensional drawing, Figure 5. Before bending the chassis, lay out and drill all the holes, working from the center lines. The large cut-out for the speaker can best be made by drilling around its outline with a small drill, then chiseling out the enclosed piece and filing the edges smooth. The holes marked F are for passing through the connecting wires and should use steel grommets if possible, but for the great majority of us who cannot use such things the next best thing is to just make very sure that the edges of these holes are smooth, so that they cannot cut the insulation of wires going through them.

After all the holes have been drilled in the chassis, and it has been bent up in its final shape it should be plated. Cadmium is suggested, although a dull chromium may also be used. However, some plating should be used, to avoid future rusting.

The drawing, Figure 6, shows the construction of the shield which is placed between the –77 and 12A7 tubes, as shown in Figure 2. Figure 6 also shows the speaker bracket dimensions. The spade bolts used on the shield are the same as used on variable condensers and coil shields by many manufacturers and can be obtained from any variable condenser manufacturer. These two shields should also be plated like the chassis.

When the chassis is completed and the parts are ready to assemble, the rest is comparatively easy. The variable condenser is first mounted under the chassis, taking the precautions mentioned before to insure its insulation from everything else. After it is in place it is suggested that its insulation be checked by means of a continuity meter. Next the loudspeaker is mounted in place. A word of caution is necessary here. Be sure that the assembly bench is scrupulously clean of all magnetic particles, otherwise these particles are liable to get into the speaker and ruin its performance. The volume control is next assembled on the chassis followed by the choke and the sockets. The filter condenser block is mounted on top of the chassis, the antenna coil and antenna condenser are mounted on the loudspeaker frame and the r.f. coil is fastened under the chassis in back of the variable condenser. Resistances are mounted on their own leads and as directly as posible, as also are the smaller by-pass condensers. The dual .5 mfd. condenser block, C6 and C7, is mounted directly on the back of the variable condenser.

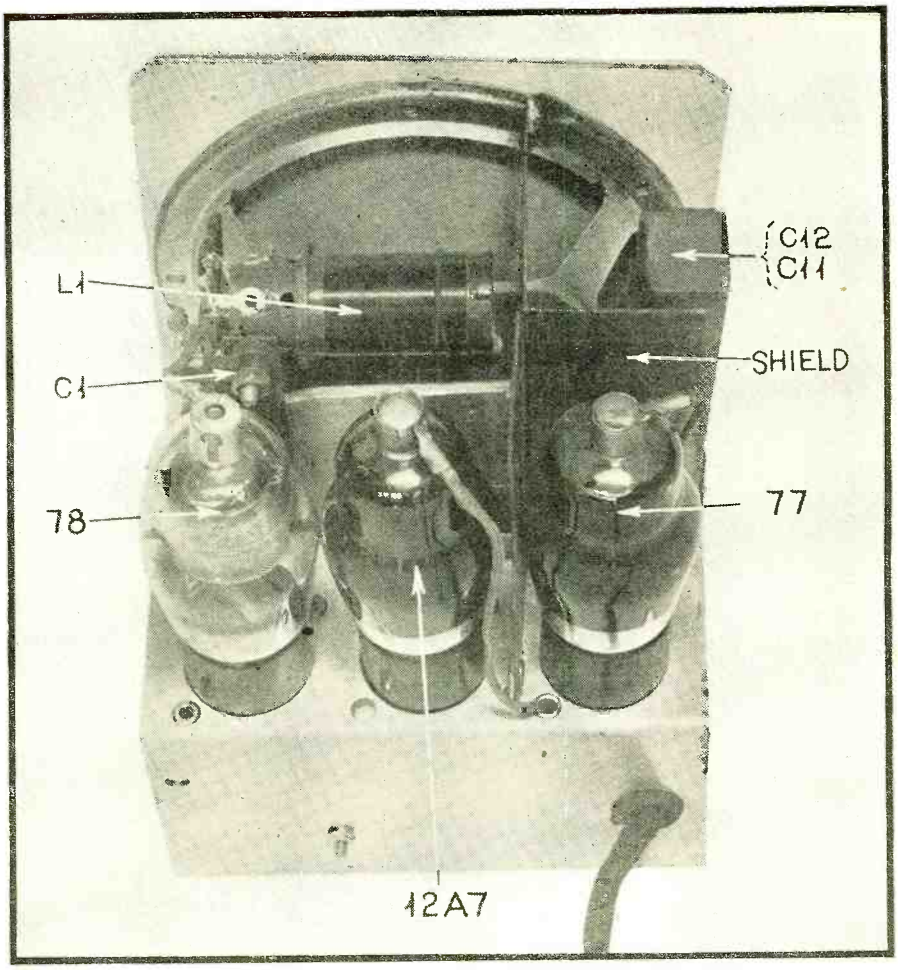


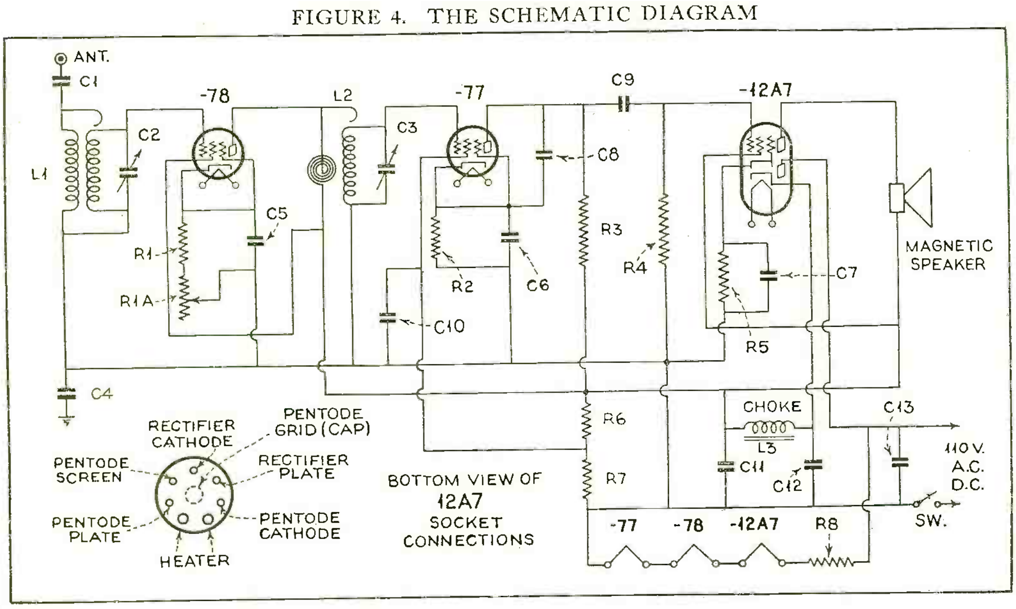
FIGURE 2. TOP VIEW OF COMPLETED CHASSIS

After the set is all wired up, check over all connections carefully, then plug it into the line. First check the voltages, to make sure all values are correct. There should be about 100 volts on the plate and screen of the –78 and 12A7, about 10 volts on the 12A7 cathode and about 4 volts on the –78 cathode on full volume.

Once the set is working, the alignment procedure is simple. Pick out some station near 1500 kc. and adjust both compensators on the variable condenser, with the volume control reduced, until the signal is loudest.

If in operation the receiver tends to be unstable at the high-frequency end, it can be materially remedied (*Cont'd on page* 700)

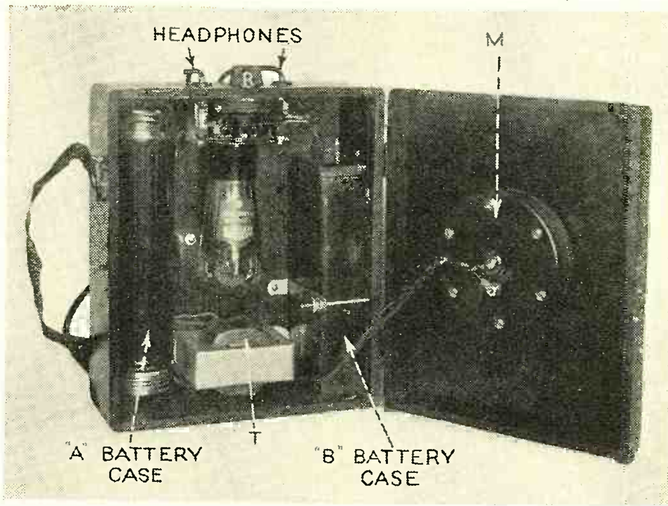
FIGURE 4. THE SCHEMATIC DIAGRAM



A Home-made HEARING AID

The device described here is a really effective vacuum-tube hearing aid which can be constructed at low cost by anyone with even a rudimentary knowledge of radio

H. Melchior Bishop



THE HEARING AID OPENED

Figure 1. The locations of all parts are shown. The symbols correspond to those shown in the list of parts and in the diagram, Figure 2

THE instrument shown in the accompanying photographs is the result of the author's efforts to design an instrument which would retain most of the advantages of the Radio News Ear Aid (described in the January, 1932, Radio News), yet be salable at a fraction of its price, on the theory that such a device would not fail to be an excellent sideline for radio men everywhere. It is efficient, professional-looking and can be built for from seven to fifteen dollars, depending upon whether one makes or buys the microphone and upon the quality of earphone used. *And*—both A and B batteries are standard flashlight cells that can be easily and cheaply obtained in any city, town or hamlet in the world.

The microphone, shown in Figure 5, is of the home-made variety, using a "button" taken from a small hand-type, home-recording microphone. If such is not available, one can experiment with buttons from an old telephone. Telephone replacement microphones, sometimes known as "corn plasters," may be purchased from telephone supply houses for less than one dollar. The construction of a microphone utilizing one of these buttons is simple and requires only a small lathe; or, lacking this, an equally good job can be done with a saw and file, as explained further on.

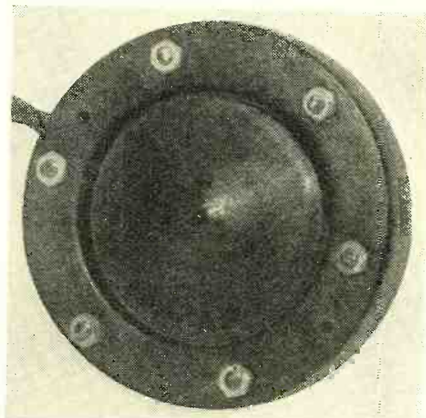
The microphone frame is of quarter-inch basswood. This is sold in small pieces by most lumber dealers, and costs very little. First turn out, on the lathe, a back plate 3 inches in diameter and 2 rings of the same size, as shown in Figure 3. If you do not have access to a lathe, follow the dotted outlines for the frame, sawing out the two-inch circles with a coping saw, keeping a bit inside the lines, and then finish the circular openings with a half-round file. This will give you a square frame, which will work just as well as a round one. Pile up the back plate and rings, and after clamping them, drill the twelve small holes. Last of all, drill the center hole in the back plate of a suitable size to accommodate the mounting screw or post on the back of your microphone button. The frame should now be given a coat or so of black lacquer.

Now turn your attention to the diaphragm and the microphone button. First unscrew the commercial button and remove about half of the carbon grains. Also make sure, before reassembling it, that there is but one thickness of mica over the front of the button. This operation will greatly increase the instrument's sensitivity, and is a safe procedure with the low voltage we shall use with it. The exact amount of carbon grains to be removed is a matter of experiment. If the instrument does not hiss to any noticeable extent, you have guessed right. If it does, return part of the grains you have removed and try again. Now mount the altered button on the back plate, and solder a thin flexible wire to the front contact and connect it to a terminal screw put through one of the vent holes in the back plate.

The diaphragm is made of lightweight bond letter paper, cut to the size shown in Figure 3 and cemented with Ambroid or celluloid cement along the narrow flap. After the cement is dry, punch a tiny hole in the apex of the cone with a small nail. It is now ready for mounting, which is done as follows:

Coat the top face of the bottom wooden ring (the ring next to the back plate) with Ambroid or other good cement, and stretch over it a single thickness of China silk or georgette crêpe. Hold this taut until the cement dries, and your ring now has a drumhead of silk. Centering your diaphragm on this silk drumhead and holding it down lightly, apply a coat of cement around its periphery. When this has dried thoroughly, cut out the circle of silk over the hollow of the conical diaphragm, leaving a very narrow rim of silk projecting inside the cone for the sake of strength. You now have a relatively free-floating, light, non-resonant diaphragm.

In the final assembly, adjust the button so that the screw on the front contact projects about one-thirty-second of an inch through the hole in the apex of the diaphragm, first removing any clamping nuts that are on the screw. Now place the top and final ring on the microphone, and clamp evenly and tightly with six machine screws around its circumference. Last of all, fasten the front contact to the diaphragm with a drop or two of cement. When this is dry, the microphone is finished. It will later be (*Continued on page* 701)



THE INEXPENSIVE MICROPHONE

Figure 5. This is what the microphone, made from directions given in the text, looks like when finished

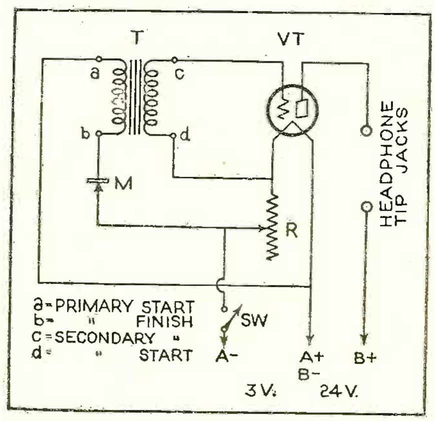
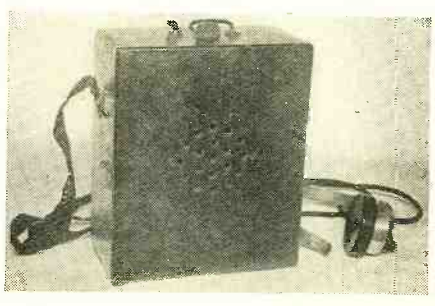


FIGURE 2. THE CIRCUIT



AMPLIFIED A. V. C.

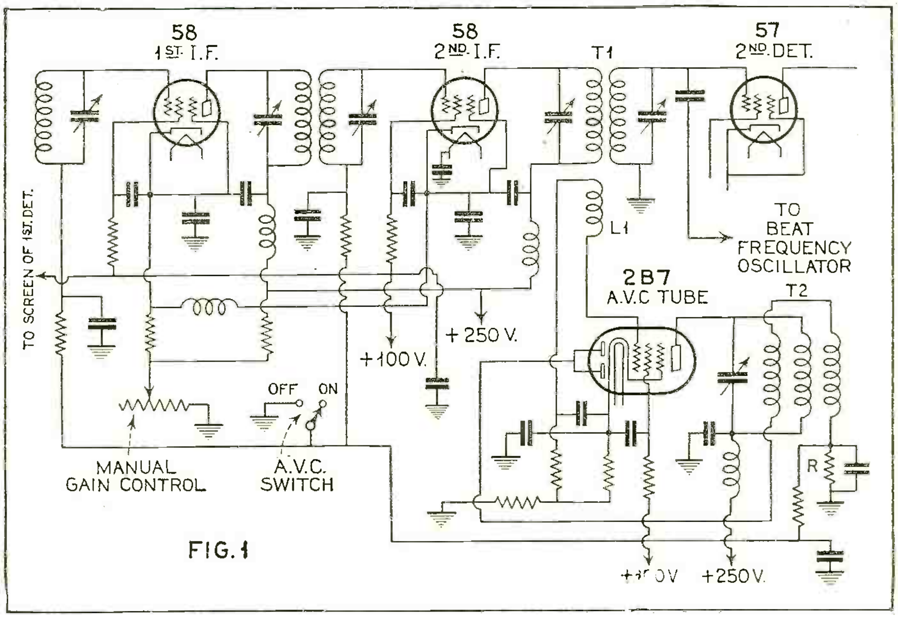


FIG. 1

IN his articles in the March and April issues Edgar Messing described the principles involved in automatic volume control design and provided excellent information on the applications and limitations of this type of control. In his closing paragraphs he referred briefly to the possibility of obtaining more complete and effective automatic control by employing an amplifier stage to produce a higher controlling voltage. It is the purpose of the present article to describe such a system and show just what is accomplished in one commercial application of "amplified a.v.c"

There are two means of accomplishing amplified a.v.c. Either the signal voltage taken off the i.f. amplifier can be amplified further before applying it to the a.v.c. rectifier tube, or the output of the a.v.c. rectifier can be applied to the grid of another tube and the amplified control voltage taken off across a resistor in the plate circuit of this latter tube. In the system recently developed by Hammarlund and incorporated in the A.V.C. "Pro" the former method is employed and it is this system that will be described in this article.

Figure 1 shows the schematic circuit of the 2B7 a.v.c. tube, the i.f. amplifier and the second detector. The pick-up coil L1 in the grid circuit of the pentode section of the 2B7 tube is coupled to T1 in the output of the last i.f. tube to provide the activating voltage for the a.v.c. amplifier. In effect the signal proper goes directly from the second i.f. tube to the grid of the second detector through the coupling provided by T1 and therefore the additional gain obtained in the pentode section of the 2B7, which really constitutes a third stage of i.f. amplification, adds nothing to the voltage applied to the second detector. It may seem wasteful to develop this additional gain and then not employ it in the signal line but to do so would provide no benefit inasmuch as the sensitivity of this receiver, with its two i.f. stages, is already as high as can be utilized effectively inasmuch as it is such as to go down to the noise level in even the best locations.

The amplified output of the pentode section of the 2B7 is applied through the transformer T2 to the paralleled plates of the diode section of this tube where it is rectified and the controlling voltage developed across the resistor R. This voltage is then applied to the i.f. grids through resistance-capacity filters. It will be noted that the biasing resistor in the cathode circuit of the 2B7 is divided into two parts and that only part of the bias developed across it is applied to the 2B7 grid. This is done to provide a relatively high bias for the diode section in order to procure "delayed" a.v.c action. Thus signals below a certain value do not activate the a.v.c. system, and for weak signals the full sensitivity of the receiver is therefore available. Obviously if every signal, no matter how weak, caused the a.v.c. system to function, the sensitivity of the receiver to weak signals would be reduced appreciably.

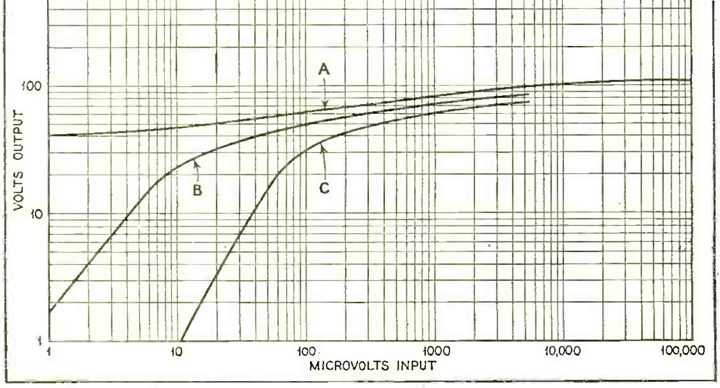
The a.v.c. switch shown in Figure 1 provides a means for shorting the automatic control voltage to ground in order that the receiver may be used without the a.v.c. feature when desired. When so used gain control is accomplished manually by means of a gain control on the front panel. This varies the cathode bias of the two i.f. tubes.

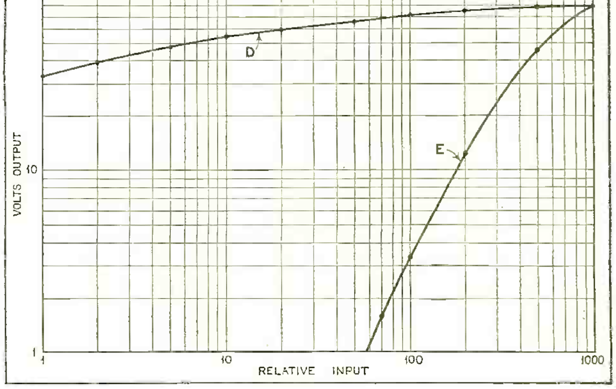
So much for the design features of the system and now for some information on the results procured with it. Figure 2 shows a series of curves prepared by one of the leading measurement laboratories in the country. These curves represent actual measurements made of a standard A.V.C. "Pro" receiver and show its output characteristics. All were made with the a.v.c. system in operation. Curve A is the important one inasmuch as it shows the characteristic obtained in normal operation; i.e., with the manual gain control fully advanced.

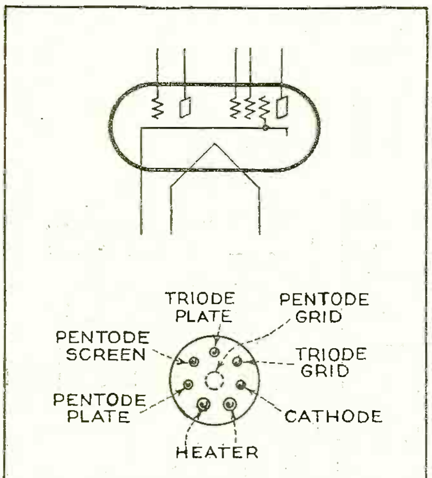
In some cases it may be desirable to limit the sensitivity of the receiver to a certain predetermined level; as, for instance, in locations where the background noise level is high. There would be no hope of bringing in signals so weak as to be below this noise level and and there would be the drawback that the "between station" noise would be uncomfortably (*Continued on page* 705)

CHECKING A.V.C. ACTION

Figure 2 (left) shows automatic control of the receiver under discussion, at full receiver sensitivity (curve A), and with gain limited by retardation of manual gain control (B and C). Figure 3 shows effect of a.v.c. (curve D) in holding output voltage relatively constant on a badly fading signal







BOTTOM VIEW OF BASE

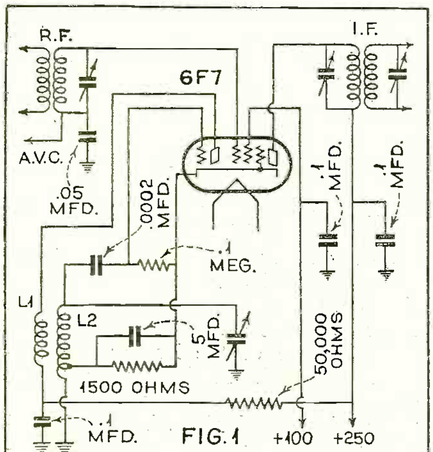


FIG. 1

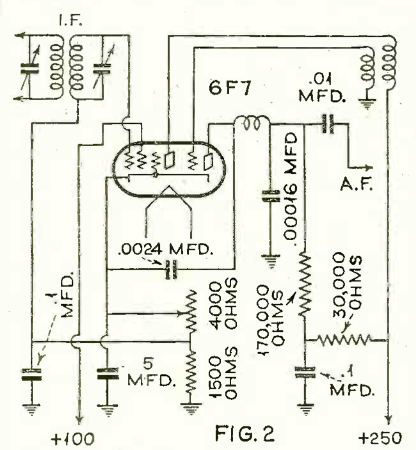


FIG. 2

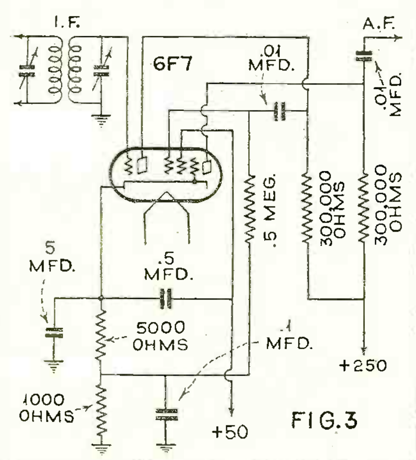


FIG. 3

TECHNICAL DATA ON THE 6F7

(Triode-Pentode)

J. van Lienden

THE new 6F7 multiple tube consists of a triode and variable-mu pentode mounted in a single glass envelope. The two units are mounted vertically above each other (the triode below) and they utilize a common cathode somewhat larger than usual. Due to the mechanical construction there is very little coupling between the two units. This tube is primarily designed for use as a detector-oscillator (in a superheterodyne), but it is also suitable for other purposes where a pentode and triode, with common cathode, are suitable. Some of these are: i.f. amplifier and detector (either bias detector, grid-leak or diode); a.f. amplifier and detector, detector, automatic volume control and noise suppressor, etc.

As the name implies, the 6F7 is a 6.3-volt tube, consuming .3 ampere, and can therefore be employed in series with other tubes of similar filament rating in a.c.-d.c. receivers. Table I shows the characteristics of each unit as well as the conditions for converter service. A family of Ep-Ip characteristics (for the triode) is given in Figure 4, and (for the pentode) in Figure 5. The influence of the screen voltage on rp, Gm, Ip and Isg is illustrated in Figure 6, while Figure 7 illustrates the relation between these same quantities and the control-grid voltage.

Figure 1 shows a typical circuit employing the tube as an oscillator-mixer. Coupling between the two units is accomplished by the lower part of coil L2, which is in the cathode circuit. Another possible method is to have a third coil in the cathode circuit (the grid coil does not have to be tapped in that case). Since the pentode has variable-mu characteristics, it can be connected to the automatic volume-control circuit. Employing the circuit of Figure 1, an oscillator voltage peak of 7 volts, L2 tapped ¼ from bottom end and L1 containing the same number of turns as L2 and wound over it, the conversion conductance is 300 micromhos with 10 volts bias; 200 micromhos with 13 volts bias, 100 micromhos with 15.5 volts bias, 40 micromhos with 18 volts bias and 14 micromhos with 20 volts bias.

Both units can be employed as a detector, but for maximum gain the triode should be the detector. When it is used in such a combination, the common cathode presents a problem in obtaining separate bias for the two units. This is best solved by a tapped bias resistor, as shown in Figures 2 and 3. The circuit of Figure 2 illustrates a 6F7 type tube employed as an i.f. amplifier and a biased detector. Minimum grid bias (*Continued on page* 698)

TABLE I

E_F = 6.3 V. I_F = .3 AMPERE LENGTH = 4 9/32" – 4 17/32" DIAMETER (MAX) = 1 9/16" BASE - SMALL 7-PIN	INTERELECTRODE CAPACITANCE TRIODE: G-P = 2.0 MMFD. G-C = 2.5 MMFD. P-C = 3.0 MMFD. PENTODE: G-P (WITH SHIELD CAN) = .008 MAX. MMFD. INPUT = 3.2 MMFD. OUTPUT = 12.5 MMFD.

AMPLIFIER SERVICE (CLASS A)

	Triode Unit		Pentode Unit		
E_P	100	250 MAX*	100	250	VOLTS
E_{SG}	—	—	100 MAX	100 MAX	VOLTS
E_G	-3	37.5**	-3 MIN.	-3 MIN.	VOLTS
μ	8	—	300	900	—
r_P	17,800	—	300,000	850,000	OHMS
G_m	450	—	1050	1100	MICROMHOS
G_m AT 35 V. BIAS	—	—	10	10	MICROMHOS
I_P	3.5	**	6.4	6.4	M.A.
I_{SG}	—	—	1.6	1.5	M.A.

* FOR BIASED DETECTOR ONLY.
** ADJUST BIAS FOR I_P = .2 MA. WITH NO SIGNAL

CONVERTER SERVICE	TRIODE UNIT	PENTODE UNIT	
E_P	100 MAX.	250 MAX.	VOLTS
E_{SG}	—	100 MAX.	VOLTS
E_G	1)	-3 MIN 2)	—
OSC. PLATE CURRENT (AV.)	4 MAX.	—	M.A.
CONVERSION CONDUCTANCE	—	300 2)	μ MHOS

1) - OBTAINED BY GRID LEAK
2) - AT LEAST 3 VOLTS GREATER THAN PEAK OSC. VOLTS. WITH OSC. VOLTS = 7 AND E_G = 10 V., CONVERSION CONDUCTANCE = 300 μ MHOS

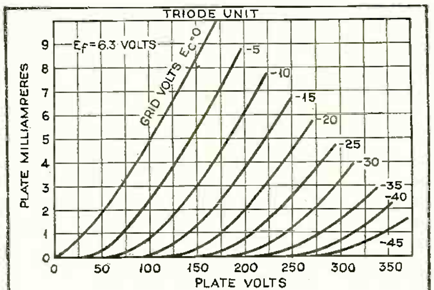


FIG. 4

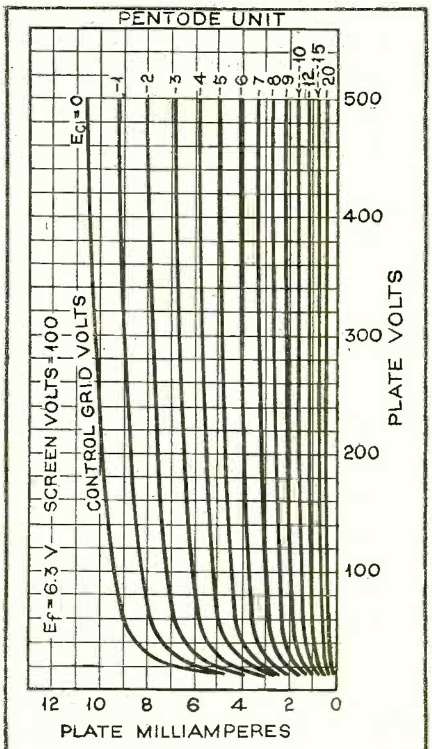


FIG. 5

PHENOMENA UNDERLYING RADIO

(Piezo-Electric Effects)

E. B. Kirk

Part Eight

THE strains in a crystal are approximately proportional to the applied potential difference and if the potential is reversed the direction of the strains is reversed also. It follows, therefore, that if the potential is alternated in direction the plate will be set in vibration at the same frequency. The dimensions of the plate cause it to have various natural periods of vibration and if the frequency of the applied voltage is made to approach one of these natural frequencies (different along the different axes) the response of the crystal increases until, if the two coincide, resonance occurs and the amplitude of vibration may increase several hundredfold. If the applied voltage is too great, the crystal can be broken by the violence of its own motion. When a crystal is made to vibrate in this way, thereby calling into play the converse effect, the direct effect is also involved, for the motion of the plate with the charges on the faces gives rise to electrical reactions on the circuit which is being used to supply the alternating potential difference. The frequency at which the reaction takes place is in most part dependent on the dimensions and the elastic constants of the material. By accurate grinding the natural periods of vibration along the various axes can be made any desired value and thus gives a simple means for obtaining frequency standards. A device of this sort is called a piezo-electric resonator.

One crystal can furnish a number of frequencies any one of which can be called into action by the proper adjustment of the driving circuit, for in addition to the natural periods along the three axes the overtones of harmonics can be used. These are 2, 3, 4 (and so on) times the fundamental frequencies.

We have considered a crystal plate working in a circuit which was driven by an alternating electric potential. A most important advance was made when it was discovered that a crystal could be used, in a vacuum-tube circuit, for maintaining oscillations of constant frequency. A number of circuits were worked with before the present ones were evolved, and although it is still not ordinarily possible to obtain much more than a watt or so of power directly from a crystal circuit, it is always possible to amplify to any desired power level.

The uses to which the direct and the converse piezo-electric effects can be turned are rather impressive. We have mentioned before the use by the Curies for the measurement of movements of 1/10,000,000 of a centimeter. It is interesting to note that interferometry allows measurements to slightly less than 1/10,000,000 cm., and although it has at present many more chances for application, the crystal methods are superior for some purposes. Crystals can also be used for the measurements of high pressures, as in the explosion chambers of large guns. High-voltage measurements have been previously mentioned; it has been used for the detection of currents as small as 1/1,000,000,000,000 of an ampere. (The vacuum tube is still ahead, being able to detect as little as 1/10,000,000,000,000,000 ampere.) Piezo-electric oscillographs have been constructed by Wood; the supersonic waves (in water) of Langevin are used for deep-sea sounding, submarine (*Continued on page* 698)

MULTI-RESONANCE IN CRYSTALS

A crystal plate cut without particular reference to the orientation of the three axes will in general respond to a large number of frequencies. Plotting the response amplitude against the frequency gives results similar to those shown in the above figure, which has been called the frequency spectrum of the crystal plate. Usually there are one or more frequencies in the spectrum of a plate giving responses sufficient to drive a vacuum tube in the usual crystal oscillator circuit. Relations between major response frequencies and the dimensions of a plate cut by the Curie or perpendicular method are as follows: For this type of plate there are two major response frequencies, one high and one low. The high frequency which is a function of c, the thickness of the plate, can be determined approximately from the relation $f = K/c$, *where c is the thickness of the plate in millimeters and* $K = 2.860 \times 10^6$ *(giving a constant of approximately 105 meters per mm. of thickness). The low frequency is a function of b, the dimension along the electric axis, and is obtained by substituting the value of b in millimeters for c in the above relation. With the parallel or 30° cut there is a major high and low frequency, but in some cases the high frequency occurs as two response frequencies a kilocycle or so apart (termed a doublet). For thin plates of relatively large area the high frequency is given approximately by the relation* $f = K/d$, *where d is the thickness in millimeters and* $K = 1.96 \times 10^6$. *The low frequency, a function of the width, e, of the plate, is obtained by substituting the value of e in millimeters in the place of d*

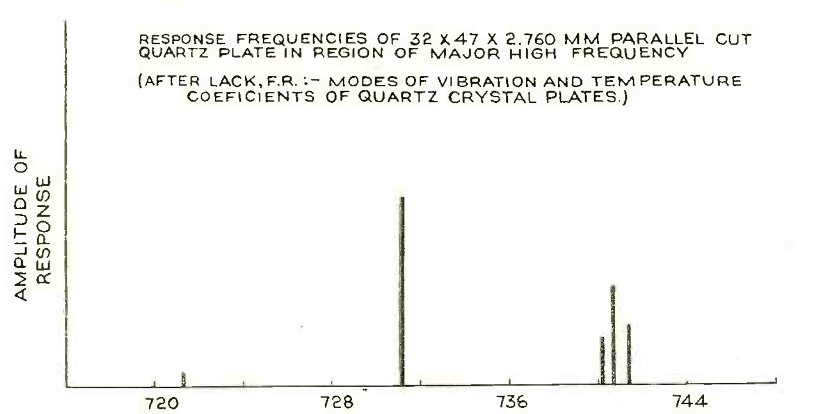
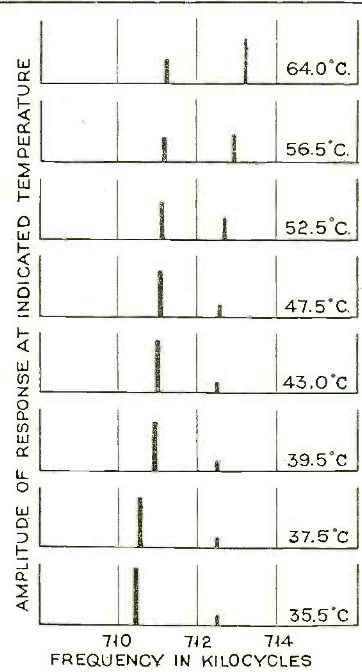


FIG. 1



RESPONSE-FREQUENCY SPECTRA OF A PARALLEL CUT CRYSTAL PLATE AT DIFFERENT TEMPERATURES ILLUSTRATING THE INTERCHANGE OF ACTIVITY BETWEEN THE TWO FREQUENCIES AS THE FREQUENCIES OF THE TWO MODES OF VIBRATION PASS THROUGH A COINCIDENT VALUE.

LENGTH OF PLATE ALONG OPTIC AXIS = 47 MM.
WIDTH ALONG ELECTRIC AXIS = 19.35 MM.
THICKNESS ALONG THIRD AXIS = 2.75 MM.

(AFTER LACK:- MODE OF VIBRATION AND TEMPERATURE COEFICIENTS OF QUARTZ CRYSTAL PLATES. BELL TELEPHONE LABORATORIES, REPRINT. B403.)

FIG. 2

"DIAL" P. A. SYSTEM

Samuel Kaufman

ONE of the most elaborate public-address systems in the world is now used in the National Broadcasting Company's ten-story headquarters in Radio City, New York. Audition, observation and engineering rooms, in addition to offices, are equipped with loudspeakers that convey selected programs. A novel phase of the network's P.A. layout is the use of an automatic dialing system, not unlike the telephone dialing method, to permit the choice of a wide variety of programs, auditions or rehearsals over each loudspeaker. The P.A. system was designed by NBC engineers for the peculiar needs of the Radio City broadcasting headquarters. The apparatus, according to Mr. O. B. Hanson, the network's manager of technical operations and engineering, is not commercially available to other consumers, but may be at a later date.

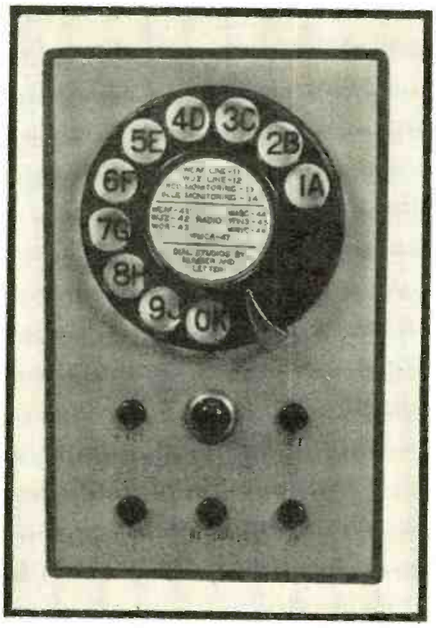
There are 120 positions on the automatic switching control board, providing for the same number of outlets throughout the building. At this writing there are only 80 outlets in use, the remaining number being reserved for future loudspeaker installations in parts of the building not yet covered. And, of course, an unlimited number of switchboard positions can be added to provide for still more outlets. The P.A. outlets are installed in the offices of all department heads and in such other rooms where it its essential that employes listen in from time to time. Thus, the programs are available to workers in the artists service, sales, program and press departments.

PROGRAMS GALORE

Operator tuning in one of the reception panels to WJZ. The dial system may select any one of the nine programs. Each panel receives one local station. The dial system may be connected to an program at will

TESTING THE "GADGET"

R. C. Patterson, Jr., vice-president of the N. B. C., testing out the new dial system at Radio City Headquarters as O. B. Hanson, technical expert, explains its operation. Left, the dial "gadget" with its control buttons



Loudspeakers are mounted in pairs, at each outlet. The two speakers, in most instances, are set in tall console cabinets of attractive design. Where floor space is at a premium, or where the decorative scheme so requires, the speakers are encased right in the wall, with a hanging tapestry hiding them from view. The speakers are set at a V-tilt to distribute the high-frequency sound evenly throughout the room.

According to Mr. Hanson, an entirely new principle in loudspeaker design is embodied in the P.A. units. The loudspeakers, built by the RCA-Victor company to NBC specifications, are known as double-coil dynamics. The word "double" in this instance has no connection with the fact that two speakers are used at each outlet point. Rather, the designation applies to the fact that each individual speaker includes two coils—one responding to low frequencies, the other to high—in order to provide a wide range. A flexible connection is used between the two coils. Mr. Hanson stated that the speakers have a guaranteed range of 8000 cycles. He added, however, that the operating range of each unit actually exceeds 12,000 cycles.

Each loudspeaker outlet is provided with a desk control box on which is mounted the telephone-type dial, five control buttons and a bulb. The dial, like the rest of the automatic switching equipment, is of Strowger manufacture.

The five control buttons serve to put the system "on and off," increase the decrease volume, and redial programs.

To operate the system, the listener first presses the "on" button and then dials a combination of two digits to obtain the desired program. To increase or decrease the volume he presses the respective *plus* or *minus* buttons to the point where they yield the desired effect. To change programs, the "re-dial" button must be pressed before dialing a new number. The *plus* and *minus* volume buttons serve to operate tiny individual motors behind each loudspeaker.

Through the use of two-digit program directory numbers, there are 99 possible combinations. Just about half that many combinations are provided in the P. A. system at this writing. Consideration was also given for future expansion of the automatic dialing P.A. method even to (*Continued on page* 695)

HOW TO INTERPRET STANDARD RATINGS FOR

METER ACCURACY

How many readers know the meaning of manufacturers' accuracy ratings, as applied to measuring instruments?

Harold L. Olesen

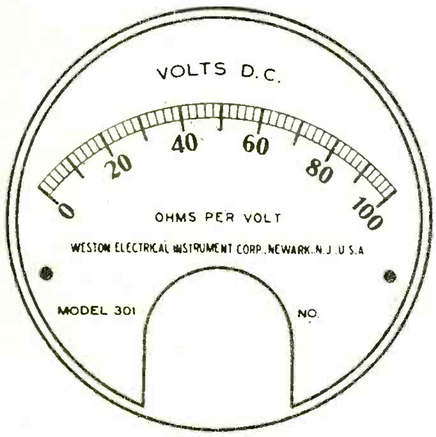


FIGURE 1

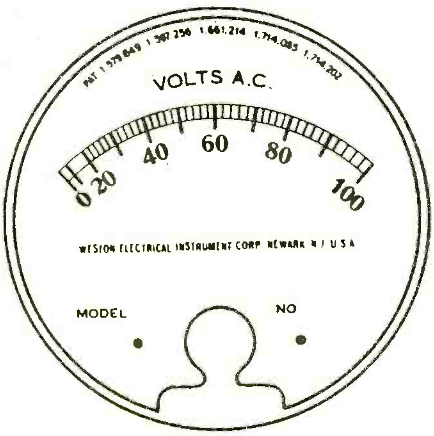


FIGURE 2

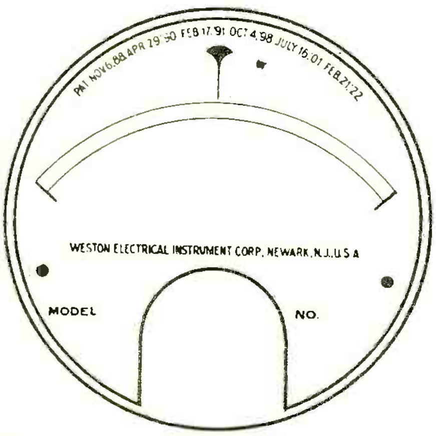


FIGURE 3

THE accuracy of electrical indicating instruments and certain other devices as used in the radio service field, seems to be a subject that is generally misunderstood. Even though these units are rated by their manufacturers as being correct within a specified accuracy most users do not know how to apply this information advantageously.

The instruments used in radio servicing are practically all of the "indicating" class, as distinguished from instruments of the other classes, "integrating," "recording," etc. As a class, "indicating" instruments are treated as one group; the underlying principle regarding accuracy is the same for all.

The length of the meter scale is the distance from the zero position to its other or full scale end, as measured along the arc traced by the tip of the pointer. This assumes that the zero position is at one end of the scale, which is generally the case. When the zero point is located at some mid-position on the scale, the pointer can move either to the right or left of it; the scale is then considered as having two end scale positions and the full scale length then becomes the sum of the distances from the zero point to each end scale position.

The recognized standard for electrical measuring instruments in this country is that issued by the American Institute of Electrical Engineers. In this group of standards, Standard No. 33-33 covers the accuracy of indicating instruments. This standard reads as follows:

"ACCURACY OF INDICATING INSTRUMENTS.—In specifying the accuracy of an indicating instrument, the limits of error at any point on the scale shall be expressed as a percentage of the full scale reading."

Instruments whose scales are uniform, or reasonably so, and whose scale markings increase from zero at the point of zero indication to a maximum value at the other end of the scale fall in this group and are covered by the standard directly. This group includes all standard voltmeters, ammeters, and wattmeters for both a.c. and d.c. Figures 1 and 2 show typical scales of this group.

In Figure 1 the scale is marked off into 50 uniform divisions which bear the identifying numerals 0-100. An accuracy rating of 2% on an instrument using this scale would mean that the pointer should indicate with an error not to exceed ±2 volts (2% of 100) at any point on the scale. Should the reading be made at the 100 mark, the maximum allowable error, ±2 volts would be 2% of the indicated value. However, if the reading should be made at 10 on the scale, the maximum allowable error, ±2 volts, would become 20% of the indicated value. For this reason greatest accuracy is obtained by properly choosing the ranges on indicating instruments of this sort so that large deflections of the pointer may be obtained.

In Figure 2 the scale is marked off in units, so that the instrument to which this scale is attached may read directly in a.c. volts. Instrument practice considers this scale as having 50 divisions because each of the ten cardinal divisions contains 5 smaller divisions. The application of an accuracy rating to this instrument is made in exactly the same manner as in the case of Figure 1, except that the rating does not apply for the first 1/5th of the scale. The usable part of a scale of this nature is considered to be the upper 4/5ths and no attempt is made either to use the first 1/5th at the left-hand end of the scale, or to (*Continued on page* 704)

FIGURE 4

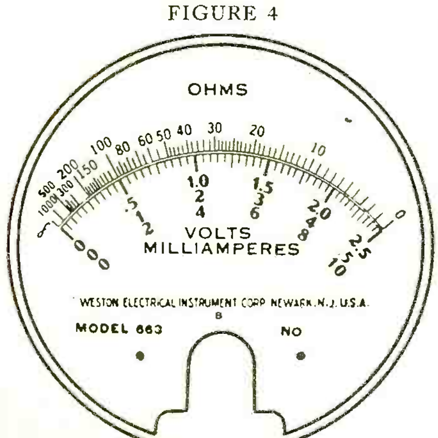


FIGURE 5

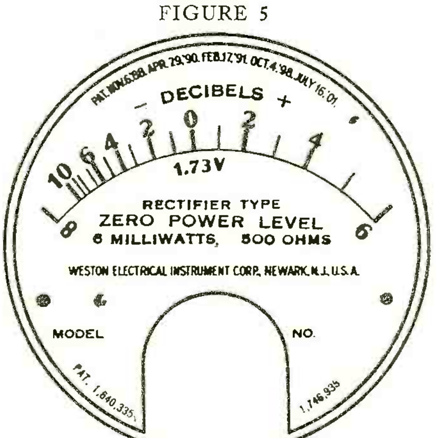
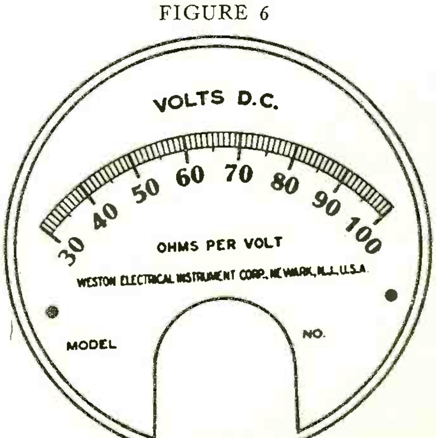


FIGURE 6



PROFITS SERVICEMEN OVERLOOK

J. R. Jackson

A SUCCESSFUL radio serviceman in an Eastern city was recently asked the secret of his success in maintaining a large service business. Without hesitating, his reply was that *he went after the business and did not wait for it to come to him!* Every man engaged in radio service work is (or should be) a business man. In order to stay in business and make a profit, it is necessary to have sales. Many servicemen may question this statement and ask what they have to sell. In the case of radio service, the serviceman is selling his technical knowledge and his ability to service radio sets. In this sense, he is also a professional man, just as much as a doctor or a lawyer is a professional man.

Most servicemen consider themselves technicians, and since they are primarily concerned with the repair and adjustment of a radio set, they are sometimes not particularly interested in sales promotion—the kind of work which gets more service business. Those serviceman, however, who realize the necessity for going after more service jobs and for taking advantage of every opportunity to promote business *are the men who are making the most money.* The man who has a shop and who spends all of his spare time in the shop waiting for work to come his way never prospers.

Some lucky servicemen have built up a large clientele of customers, so that there is always as much work coming into the shop as can be handled conveniently. Such men, if they are not going after *more* service work, are losing a grand opportunity to make some real money. It is always possible to obtain assistance in radio work, and still make a profit on the work after the assistant has been paid. The larger radio service organizations must depend on quantity as well as quality for their existence. These organizations, that are making plenty of money in service, employ men who are particularly fitted for inside repair work to take care of the jobs which come into the shop. Men who are better fitted for outside contact work are employed to call upon customers.

There are big profits available in radio service to those men who will take enough time from their world of technical thought to consider in their daily work a few of the elementary principles of business. The principles outlined below are basic, and if followed carefully, will, *without fail,* bring greater prosperity to the serviceman.

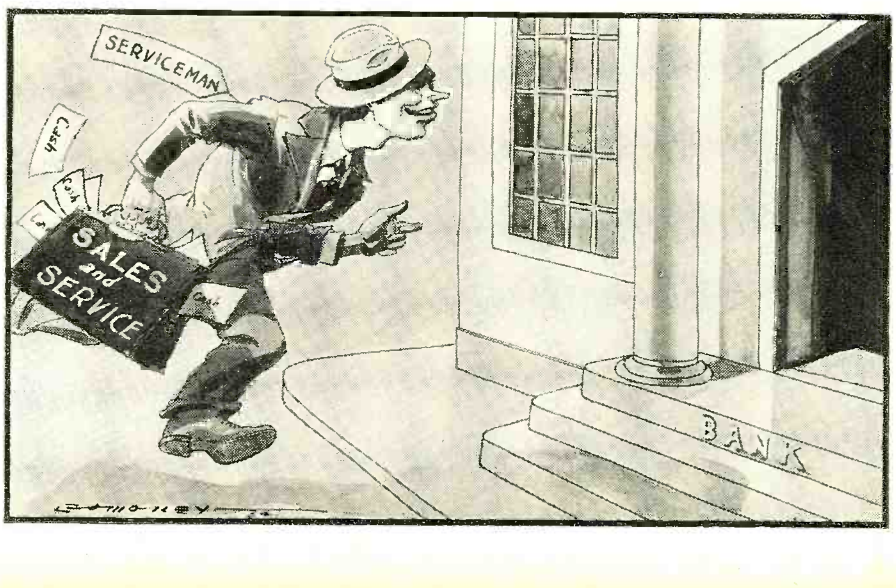
1. *QUALITY WORK.* The quality of a serviceman's work is like the quality of a manufacturer's radio set—*it must be good to survive.* Unless the quality of his work is entirely satisfactory, the serviceman will be unable to succeed over a period of time. He may obtain occasional new customers, but sooner or later they will become dissatisfied and will go elsewhere. A good serviceman can repair a radio set in such a way that the set will be just as good as it was when it left the factory. The serviceman must be certain that every job done in a customer's home is done in the same manner that the serviceman would do it for himself on his own radio set. He knows then that the job will be absolutely right.

2. *FAIR BUSINESS PRACTICES.* As in any other business, it is necessary, in service, to be fair in dealings with customers. The serviceman may be tempted at times to make statements which cannot possibly be fulfilled. As an example, it is *never* good policy to tell a customer that he can obtain just as good performance on a small indoor aerial as he can on a large outdoor aerial. Another angle of fair business practices is the fact that a customer should *never* be overcharged for any job.

3. *SELL THE CUSTOMER ON YOURSELF.* Before the customer is entirely satisfied with the work which the serviceman has done, it is necessary that he be sold on the man's ability as a serviceman and as an honest business man. Perhaps the serviceman may feel that the quality of a completed repair job will speak for itself. This is entirely true with old customers who know you and know that you are being entirely fair with them. With new customers, however, you should explain, briefly but adequately, the nature of the work to be done, and try to show the customer just how you have succeeded in making his radio set perform far better than it did before you went on the job. Show him that you *know* what you are talking about, and that you are charging him *only a fair price* for the work. He will have greater confidence in you and will not hesitate to call upon you the next time nor to recommend you to his friends.

4. *GET THE SERVICE BUSINESS OF NEW CUSTOMERS.* After you are well established with one service customer, you can, with comparative ease, obtain additional business from this customer's friends and acquaintances. Give the customer some of your business cards and ask him to hand them to his friends who have radio sets. Ask him for the names and addresses of such people, so that you can personally contact them and solicit additional work. Take every possible advantage of new contacts for service work by *letting as many people as possible know that you are in the service business and that you have a real quality product to offer at a reasonable price.*

5. *SELL RADIO MERCHANDISE.* Every serviceman has the opportunity of selling radio merchandise to his customers, and if the man is thoughtful in such sales work, it is possible for him to add considerably to his regular income. Tubes can be purchased from a local radio distributor at dealer prices, and the serviceman is entitled to charge list prices to his customers. The installation of transposed antenna systems for greater efficiency of reception and for noise reduction is becoming a very important factor in radio service work. Every owner of a radio set is a possible prospect for such an installation. The serviceman can purchase the equipment at dealer prices and can make a legitimate profit on the sale of the equipment as well as on the installation. Many people are interested in having additional loudspeakers or microphones to operate in conjunction with their radio sets. Here, again, is an opportunity for the serviceman to sell radio merchandise at a profit and to make an additional profit on the installation. Then, again, there is the matter of sidelines that can be sold and serviced—household electrical goods, etc., to add to the strictly radio profits. (*Continued on page* 707)



A BIRD'S-EYE VIEW OF THE WORLD'S RADIO MARKET

South American and European needs for radio apparatus. Australia's similarity to the American market. The increased demand for American radio merchandise built up by our methods of mass production and engineering skill. These are discussed in this article by—

W. A. Coogan

MASS production, symbolizing the climax in American industrial progress, and skilled handicraft, representing the acme of conservative industrial and merchandising policies of most overseas countries, are meeting today in the radio markets of the world in hard-fought combat for a place in scattered households. What with a most thorough research and engineering activity made economically possible by the large returns from mass production, together with the savings which mass production can pass on to buyers, the American radio industry is gaining ground not only in those countries that must import the bulk of their radio requirements, but even in those that boast of a large domestic radio production. A journey abroad never fails to impress one with American radio achievement, although at the same time fully appreciating the splendid efforts of our overseas confreres. It is simply an interesting study in the ways of the Old and the New Worlds.

My thoughts regarding European radio preference are not long-distance guesses or hunches. Rather they are based on first hand experiences and observations gained during an extended tour of the Continent two months ago. During that tour, which was the regular annual call on our customers abroad, I visited Ireland, England, France, Belgium, Norway, Sweden, Denmark, Switzerland, Czechoslovakia, Italy and Spain, including a hurried passage through parts of Germany, as well as Tangiers and Morocco in northern Africa.

If I must present a bird's-eye view of European radio activities, my first point is to impress you with the quite-at-home feeling one gets when surrounded by European radio manufacturers and merchandisers, their products and methods. After all, there is not such a vast difference in the general picture. It is only when we get down to details that the points of departure loom into view.

Thus the European radio manufacturer makes a line of radio sets not much different from current American practice. For the moment the trend is decidedly towards so-called midget sets, with console models limited to the more costly offerings. The most popular circuit over there is the superheterodyne. There is also the tendency to employ some multiple function tubes. The dynamic type loud-speaker is almost universally employed. The general appearance is quite like our current American midget sets, especially the latest modernistic cabinets. As for prices, the European sets are usually higher than corresponding American offerings, due to limited production and greater labor cost. In France, for example, the superheterodyne midgets sell for around $60 to $75.

A closer examination of European sets discloses the points of divergence. Most obvious, under the magnifying lens of close scrutiny, is the matter of wave-length or frequency range. Not only must those European receivers cover the 200 to 550 meter band of American broadcasting, but must extend all the way up to 2000 meters. This enormous frequency range is usually accomplished without changing inductance coils or elaborate switching means. An examination of the tuning dial of a typical European receiver on which the important stations are printed alongside the wave-length scale, indicates such stations as Budapest, Beziers, Fecamp, Bordeaux and Nuremberg, down near the 200 meter reading, and Radio Paris, Zeesen, Daventry, Huizen and Kovno near the 2000 meter upper limit. The tuning dial covers the main European centers from Portugal and Spain on the west, to Moscow, Warsaw and Istanbul on the east, and again from Oslo on the north to Milan and even Algiers (in northern Africa) on the south. Imagine that array of international programs! American broadcasting thrills seem quite tame when contrasted with those of the average European set owner who tunes in the programs of dozens of countries. Especially true these days, when leading European nations are engaged in a propaganda battle whose main artillery comprises powerful radio stations. And as literal, quite as well as figurative, artillery, these contending stations frequently lay down barrages in the form of conflicting carrier waves whose heterodyning reduces verbal assaults into a shambles of meaningless whistles, grunts and groans!

To the wide array of international programs enjoyed by the European set owner at the mere flip of his tuning dial, must be added American broadcast stations. I was surprised to learn how readily American broadcast programs, on usual broadcast wavelengths, can be tuned in by ordinary broadcast receivers in European homes. This is especially so in Ireland and England, and to a somewhat lesser degree in Continental countries. Our more powerful broadcast stations have a considerable European following, quite aside from the popularity of rebroadcasting of programs on the short waves.

The peculiar requirements of European radio in the matter of wide wave-length or frequency range have been met by several American manufacturers, small as well as large. Indeed, certain small radio manufacturers have concentrated on the overseas markets and by diligent application have evolved highly attractive offerings for the European market, giving them a logical place in the picture. I have seen many American sets in European homes and many more in dealers' shops. Our sets are popular, for in engineering and performance they equal anything Europe can produce even at higher prices. Despite import duties our sets can still meet European competition on its own soil, because of economies of mass production.

In the matter of radio tubes Europe has largely accepted American practice, shelving some of its original ideas. Just so long as radio tubes were produced in limited quantities, utilizing much manual labor and stationary exhaust positions, Europe had its own ideas about tube design and production. But with the introduction of present high-speed equipment units found in our largest tube plants, the Europeans have accepted our designs and, in some instances, our methods of production in order to approach our quality and prices.

Norway, Belgium, France and Italy are using more and more American tubes. This is particularly true of A.C. tubes. There is an exceptionally heavy demand for American tubes in southern Europe, especially in the absence of large local tube manufacturers. In France and Italy domestic radio sets have been redesigned for American type tubes. Originally those countries and others on the Continent had their own style of tube base, barring standard American tubes from their radio sets. But today American tube bases are accepted as standard and European sets designed around American tubes can take those tubes without any changes whatsoever. In fact, despite heavy duties which must be paid and special government permits or licenses which must be secured in order to bring in American tubes in some countries, notably France, European radio buyers are not discouraged from insisting on our products. Orders are steadily increasing in the face of all obstacles which supreme nationalism may place in the way.

All in all, the merchandising situation is not much different from our own. Radio sets and (*Continued on page* 693)

MODERN RADIO PRACTICE IN USING GRAPHS *and* CHARTS

Calculations in radio design work usually can be reduced to formulas represented as charts which permit the solution of mathematical problems without mental effort. This series of articles presents a number of useful charts and explains how others can be made

John M. Borst

Part Nine

ANY problem involving proportion can be solved graphically without much difficulty. Such problems occur often in a serviceman's and experimenter's life; therefore, the chart, presented this month should prove applicable in many cases.

For instance, one can use any milliammeter as an ohmmeter but then it takes a little arithmetic to find the resistance after readings are taken. This arithmetic will be eliminated when using the chart in Figure 5. The chart can also be applied to the slide-wire bridge, a construction is given for an ohmmeter scale employing a milliammeter in the two popular circuits.

In the February 1932 issue of RADIO NEWS, the formulas for the different kinds of charts were derived and here the N-chart was introduced. It consists of three linear scales in the form of an N or a Z and is useful in several kinds of proportion-problems and some forms of multiplication. As seen in Figure 1, the chart has the draw-back that it is hard to utilize the extreme end of the diagonal scale since the line, 1, does not intersect scale *c* within the limits of the paper. In some cases, it will be found that nearly one fifth of the scale *b* on each end cannot be used. Therefore, instead of using the N chart, a logarithmic arrangement was used in Figure 5, even though this meant the calculation of a special scale. It solves the same formula as the N-chart.

Now let us proceed with the problem. The ordinary ohmmeter is usually something like the circuit in Figure 2. The 0-1-ma. meter is the most popular, and therefore it is used here in the examples, but any milliammeter can be used. In fact, for low-resistance measurements, an 0-50 m. meter is very useful. R is usually made so that the meter shows full-scale reading when the test prods are short-circuited. This, too, is not essential, but it is desirable since it gives a longer scale and it simplifies computation. Suppose that we have such an ohmmeter, in which the meter shows full-scale deflection when the prods are short-circuited, and that it shows a lower reading, *m*, when the resistance *x* is inserted. Then,

$$X = \frac{R\,(1\text{-}m)}{m}\ \text{ohms}$$

Here the numeral 1, represents the full-scale reading (1 ma.) If a different kind of meter is used with a full scale reading of *n* ma., then,

$$X = \frac{R\,(n\text{-}m)}{m}\ \text{ohms}$$

Referring to the chart of Figure 5, connect the meter reading on scale M (A) with the value of R on scale R and the intersection on scale X shows the value of the unknown resistance. For instance, if, as in our case, R is 4500 ohms and the meter went down to .2 ma. with the resistance X inserted, then the sample line shows that the resistance of X is 18000 ohms.

All you have to know is the value of R. This is the resistance which will let just enough current flow to make the meter show full-scale reading. It can be figured out with Ohm's law. With a 1-ma. meter and a 4.5-volt battery, R is 4500 ohms. With a 10-ma. meter and a 4.5-volt battery it would be 450 ohms and with a 1-ma (*Continued on page 703*)

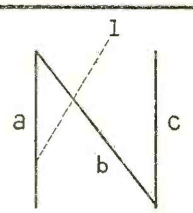


FIG.1

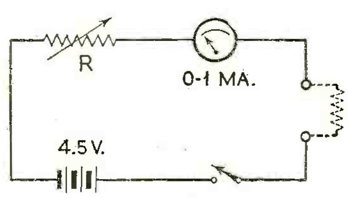
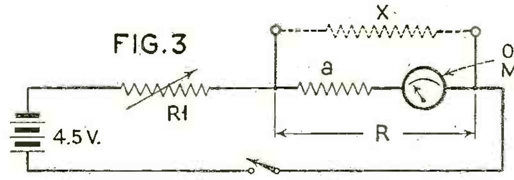
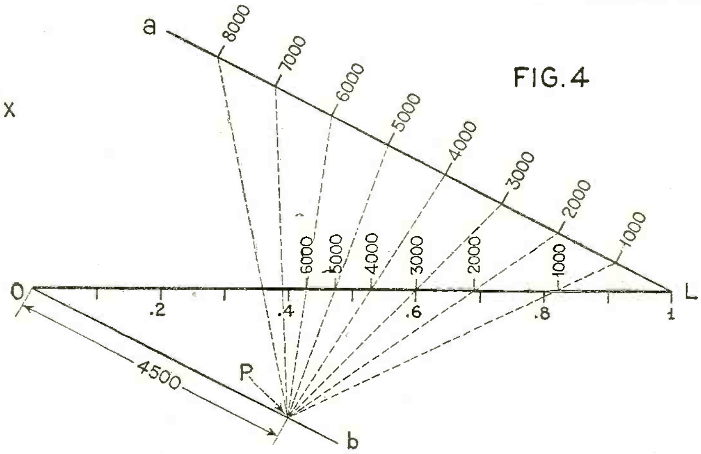
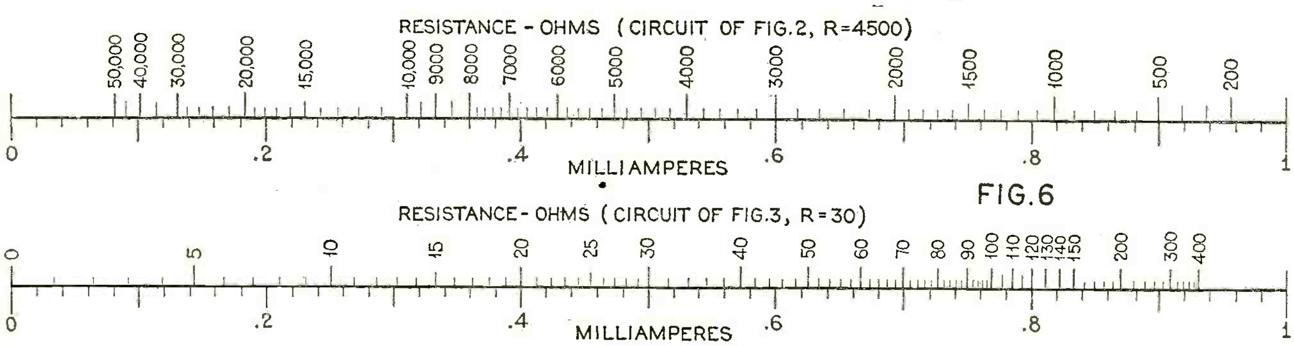


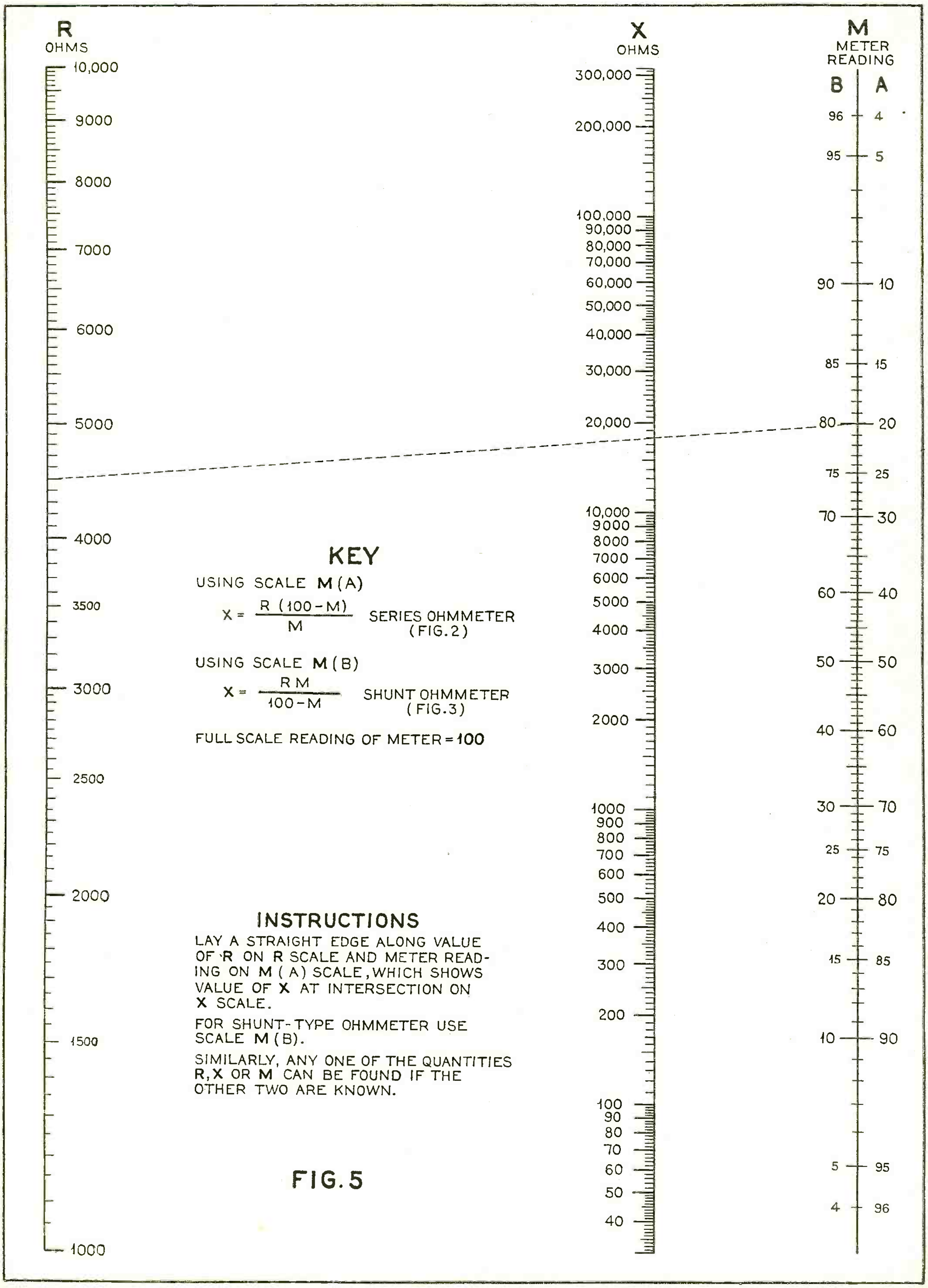
FIG.2







A MILLIAMMETER AS AN OHMMETER



KEY

USING SCALE M(A)

$$X = \frac{R\,(100-M)}{M}$$ SERIES OHMMETER (FIG. 2)

USING SCALE M(B)

$$X = \frac{RM}{100-M}$$ SHUNT OHMMETER (FIG. 3)

FULL SCALE READING OF METER = 100

INSTRUCTIONS

LAY A STRAIGHT EDGE ALONG VALUE OF R ON R SCALE AND METER READING ON M (A) SCALE, WHICH SHOWS VALUE OF X AT INTERSECTION ON X SCALE.

FOR SHUNT-TYPE OHMMETER USE SCALE M (B).

SIMILARLY, ANY ONE OF THE QUANTITIES R, X OR M CAN BE FOUND IF THE OTHER TWO ARE KNOWN.

FIG. 5

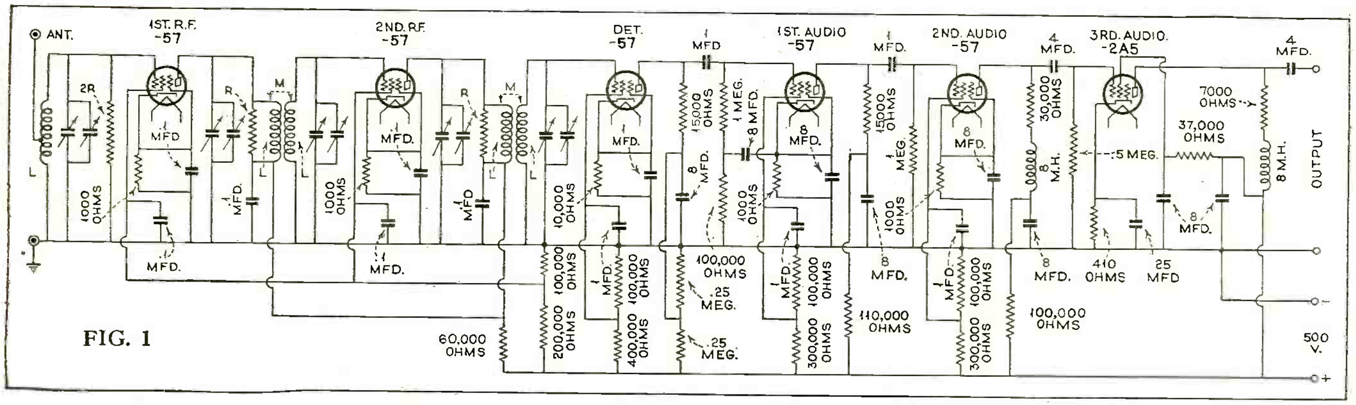


FIG. 1

TELEVISION

(Receiver Design)

In concluding the series on the use of cathode-ray tubes, the authors add an article on the design of the radio television receiver proper

J. M. Hollywood, M. P. Wilder

SINCE many are not familiar with the radio receiver proper as used in television either for cathode-ray tube reception or mechanical scanning methods, it was thought desirable to add an article on that subject to this series, even though not directly connected with the subject of cathode-ray tubes.

An ordinary broadcast receiver has three main functions. One is to convert modulated radio-frequency current into direct current varying in accordance with the sound picked up by the microphone at the transmitting station; this is the process of detection. The second is to provide enough amplification so that the small amount of energy picked up by the aerial can operate a loudspeaker. The third is to provide radio-frequency selectivity such that the desired signal can be separated from others. The loudspeaker then serves a fourth function of converting electrical energy into a reproduction of the original sound.

This is not much different from the process in television reception. There the loudspeaker is replaced by apparatus which converts electrical variations into light variations, together with scanning apparatus which makes a point of light trace out a whole picture. For cathode-ray tube reception, this apparatus was described in previous articles of the series.

The television receiver proper has the same functions as a broadcast receiver; namely, detection, amplification, and frequency selection. The difference between the two classes of receivers lies in the fact that a broadcast receiver must cover a range of modulation frequencies from 20 to 5000 cycles, and separate stations 10 kc. apart in frequency; but a television receiver must cover a range of modulation frequencies from a fraction of a cycle to 100,000 cycles or so, and separate stations over 200 kc. apart in frequency, for good 60-line pictures.

This means that in television receivers the radio-frequency tuning must be much broader, the "audio" frequency amplifier must have a much flatter frequency response curve, and the detector must have much better output for high modulation frequencies than in the case of a broadcast receiver.

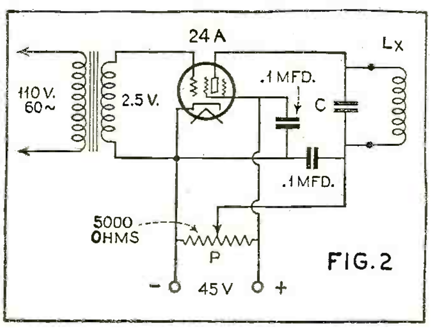
The circuit diagram of Figure 1 shows a receiver that fulfills these conditions. This circuit does not differ at first glance from that of a tuned r.f. broadcast receiver using a resistance-coupled audio amplifier. The difference lies in the choice of values for the circuit elements. In the audio amplifier, for example, the coupling resistances are much smaller than usual, to reduce the relative effect of the stray capacities by-passing the coupling resistors. This makes the frequency response flat to very high modulation frequencies, at the cost of reduced gain per tube. The audio amplifier shown is designed somewhat like the high-gain amplifier described in the March issue. It uses two type -57 tubes for voltage amplification and a 2A5 power tube.

The 2A5 power tube is used, not because of the power delivered, but because the small load resistance required reduces the by-passing effect of the stray capacity of the lead to the cathode-ray tube grid, which may therefore be moderately long. This lead should not run through a cable, but as much in the open as possible, and should not be over five feet long. If the cathode-ray tube is to be used far from the receiver, it would be better to use a 2A3 instead of a 2A5, and use a load resistance in its plate circuit of 2500 ohms instead of 7000 ohms.

With three audio stages and a plate detector, an increase in radio-frequency input will cause the ungrounded output terminal to become more positive. If this terminal is used to apply voltage to the modulating grid of a cathode-ray tube, a positive picture will result for most television signals. The transmitting station generally increases its output on the bright parts of the picture, but if it does the opposite, the phase of the cathode-ray tube grid voltage at the receiver must be reversed or a negative picture will result. This reversal is best accomplished by adding an extra resistance-coupled audio stage with little or no amplification; for instance, a -56 or

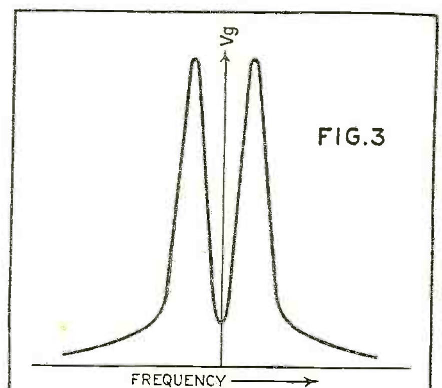
DYNATRON TEST OSCILLATOR

Figure 2. This oscillator circuit is employed, as described in the text, to measure the inductance and mutual inductance values of the coils required, simplifying the cut and try method of determining proper values



EFFECT OF INSUFFICIENT DAMPING

Figure 3. This is the double hump characteristic obtained in normal, closely coupled r.f. tuned circuits



a -57 tube with a 1000-ohm coupling resistor.

Any type of detector can be used, but resistors across which audio-frequency voltage is to be developed must not be by-passed seriously by any capacitance, or if they are, the resistance must be reduced accordingly. The product of resistance in ohms and capacitance in mfds. should be kept under one-half. For grid leak and condenser detection, the grid leak must be so small that this method is not very practical. Plate detection may be used, with plate-circuit resistance values similar to those used in the audio amplifier. Diode or duo-diode detection is also good, if the condenser by-passing the diode load resistor is under 20 mmfd. and the resistor about 25,000 ohms. Incidentally, if grid leak or duo-diode-triode, etc., detection is used instead of plate detection, the phase of the "audio" voltage is reversed. Plate detection was chosen for the diagram given, because it is simple and reliable. No radio-frequency filters are used in the detector output, because they by-pass the higher modulation frequencies too badly.

The most striking difference between a television receiver and a sound receiver lies in the radio-frequency amplifier. Modulation frequencies of about 100,000 cycles must be passed, requiring a radio-frequency band width of almost 200 kc. for good 60-line pictures. In the diagram shown, this band width is provided by means of tuned, coupled circuits which act much like band-pass filters. When two tuned circuits without resistance are coupled together as the coupling agent between tubes, the voltage delivered by the combination is not a maximum at resonance, but instead the resonance curve shows (two) large peaks of voltage occurring at frequencies on each side of the resonance frequency, separated from it by a frequency proportional to the degree of coupling and to the resonant frequency.

R.F. COUPLING CHARACTERISTICS

Figure 4. These curves show how different degrees of coupling effect the resonance characteristic of a tuned r.f. stage

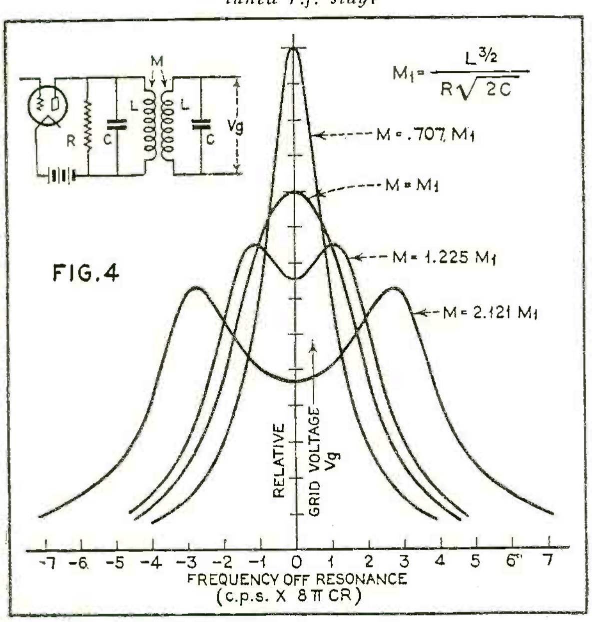
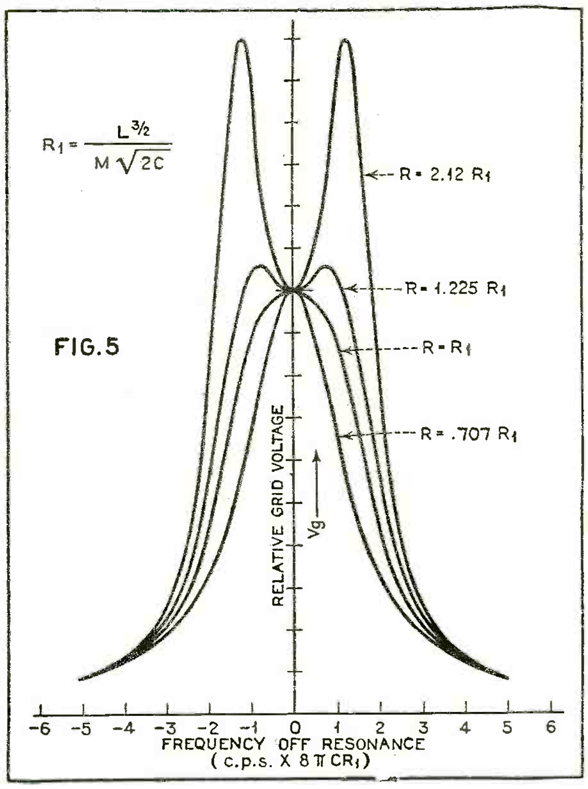


Figure 3 illustrates such a case. That is to say, the ratio of frequency separation between the two peaks to the average frequency is proportional to the coupling coefficient. The separation will in a way determine the band width obtained; the ratio above is small for a broadcast receiver and the coupling is loose, but it is larger for television work and rather tight coupling is used.

It is clear, of course, that such a sharp, double-peaked resonance curve would be totally unsuited for band-pass action, which in the ideal case would give constant output over a 400 kc. range and zero at all other frequencies. (A 400 kc. band width is to be used in this receiver, which should give good pictures of more than 60 lines.) However, when resistance is added to the circuit—for example, by the shunt resistors R in the diagram—the resonance curve is changed. The peaks are greatly reduced in size, but the response at the resonant frequency is not much reduced, so that the resonance curve can be made such as to give an almost constant output over the desired frequency range. The value of shunt resistance that will accomplish this becomes smaller as the desired frequency range and the coupling are made larger. It also becomes smaller as the tuning capacity is made larger. Since the amplification will depend largely on the size of this resistance, much more amplification can be obtained if the tuning capacity is kept small and the shunt resistor made correspondingly large. It can be seen that the gain per stage must be reduced as the modulation-frequency range is made greater, which was also the case for the audio amplifier. Figure 5 shows the effect of varying the shunt resistance on the shape of the resonance curve; Figure 4 shows the effect of changing the coupling.

The tuned radio-frequency receiver shown was selected for this article because it is simple and yet illustrates the essential points in good television receiver design. It suffers from one notable defect; that is, if the tuned coupled circuits are designed for band-pass operation at

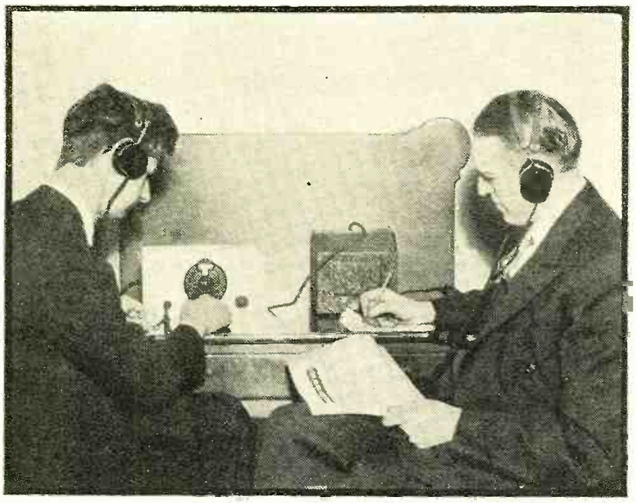


SHAPING THE RESPONSE CURVE

Figure 5. By selecting the proper shunt resistors, as indicated at R (Figure 1), the double hump effect is eliminated and a broadly peaked characteristic suitable for television tuner circuits is obtained

one carrier frequency, the resonance curve will not be very good when a different carrier frequency is to be tuned in. It would therefore be advisable to use a superheterodyne instead of a t.r.f. receiver, because the band-pass action could then be confined chiefly to the intermediate-frequency amplifier, which could be adjusted carefully for best results and left alone. The superheterodyne also has the advantage that with a coil-switching arrangement it could be made suitable for either the 1500 to 3000 kc. television signals or the experimental transmissions sent on something like 60,000 kc. However, those readers who are sufficiently familiar with receiver construction to make a successful superheterodyne will probably be able to apply the principles involved in the t.r.f. receiver to the superheterodyne. No new problem is involved, except that the oscillator and first detector should be suitable for use where the carrier frequency and oscillator frequency are widely separated. A pentagrid converter (2A7, for example) would be quite satisfactory. A good choice of intermediate frequency would be 6000 kc. For the signals between 1500 and 3000 kc., the oscillator frequency could be 7500 to 9000 kc., and for the signals around 60,000 kc. the oscillator frequency can be about 54,000 kc.

Suitable values of the circuit constants for a carrier frequency of 2800 kc., with the t.r.f. receiver shown in Figure 1, are as follows: All tuning condensers are to be of 100 mmfd. capacity, ganged, with small trimmers. The inductances (*Cont'd on page 702*)



GETTING ACQUAINTED *with* SHORT WAVES

(What Makes the Wheels Go Round)

This is the fifth article of a series for the beginner. This installment discusses the operation of the home-built set described in last month's issue

James Millen

FOR the intelligent operation of the beginner's short-wave receiver, it would be well to understand just how it works. Constructing the set last month has familiarized you with its various parts. We shall now consider their functions. This can best be accomplished by reference to Figure 1.

We shall assume that the receiver is connected to antenna, ground, the power supply and the phones are plugged-in.

The operation of the receiver pivots around three different circuits, formed by these three coils, L1, L2 and L3. These windings are called, respectively, the antenna coil, secondary coil and tickler coil. They are all wound on the single form and are automatically connected when the coil is plugged into the socket. These coils are so wound as to be close together—or, as the engineers say, in inductive relation to each other. They are so close together that they have an interacting effect on each other, and energy is transferred between them.

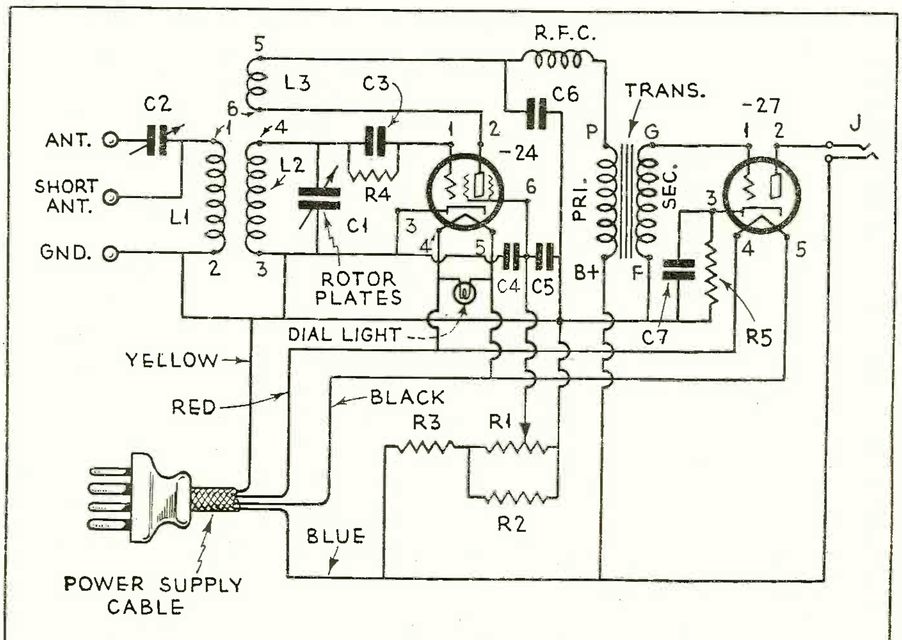
A signal picked up by the aerial energizes the antenna circuit, of which L1 is a part. The antenna coil is constantly energized, because it is tuned outside the range to be covered, and there is always a jumble of signals, covering practically all wave-bands, coursing through it. By virtue of the inductive relationship between coils L1 and L2, some of these signals are induced into the secondary circuit. This circuit is tuned sharply by the condenser C1, and only signals very close to the resonant (or tuned) frequency, build up sufficient voltage to affect the grid of the tube and to be heard in the telephone headset.

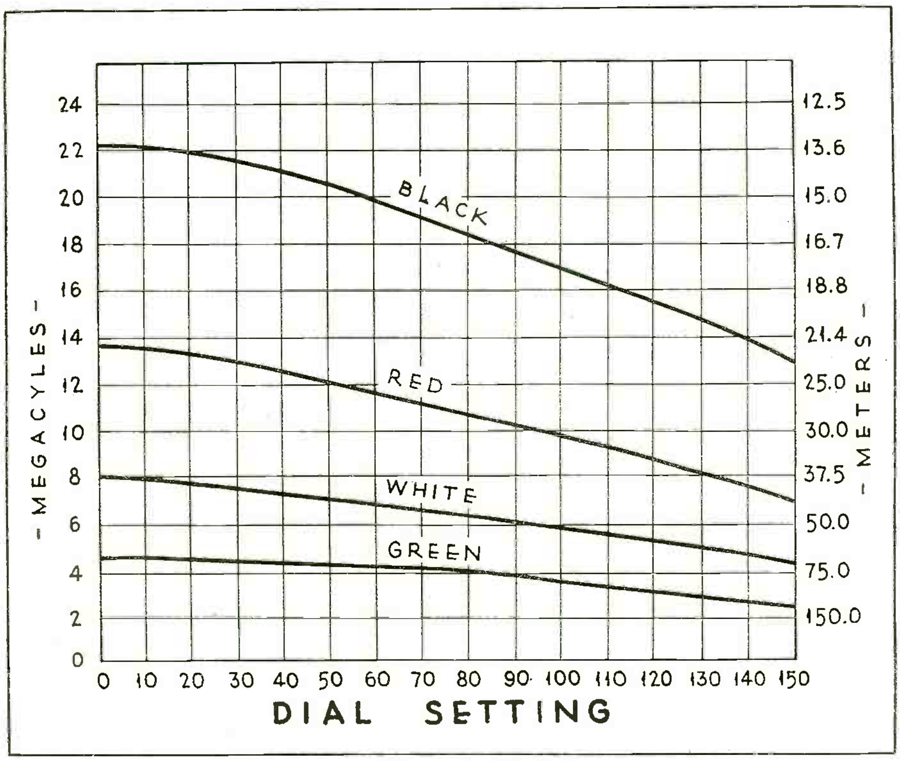
The function of the –34 detecting tube is a double one—it amplifies the signal, and at the same time passes it on, as an audible response, for further amplification through the transformer marked "trans." and the –30 tube. It does this by means of a "trigger" action—the minute voltage applied to the grid releasing a greater amount of energy supplied by the local "B" battery. The grid condenser C3 and the grid-leak R4 assist in this action and contribute to the detecting efficiency.

It will be observed that coil L3 (the tickler) is in the plate circuit of the tube. That is, the current which flows from the filament to the plate, and back through the power supply, must pass through this coil. Similarly, the signal energy, released by the action of the grid, *also* flows through this coil. As a matter of fact the signal energy in the plate circuit is apparent as variations in the plate current. As L3 is coupled closely to the secondary coil, L2, this results in the signal energy being fed back to the grid circuit—a phenomenon known as regeneration, and which, naturally enough, greatly increases the strength of the signal. The amount of feed-back is governed by the efficiency of the tube, which is controlled by the variable resistor R1. The higher the efficiency (the amplifying ability of the tube), the louder the signal. As might be imagined, R1 makes a very effective volume control.

As the efficiency of the tube is increased by turning up the volume control, a point will be reached where so much energy is fed back into the grid circuit that it begins generating radio-frequency power *of its own accord!* It is said to be *"oscillating."* This action can be readily pictured. The grid impulse can be likened to the motion of a pendulum, and the plate impulse to a force that might tend to keep the pendulum swinging. If the latter force is powerful enough (if there is sufficient amplification), and it always hits the pendulum *just at the right time* and *in the right direction,* the pendulum will be *maintained in a state of oscillation!*

When the tube is oscillating, the circuit is particularly sensitive and millions of minute variations in voltages—within and without the tube—will be evident as a hiss in the telephone receivers. Every time a carrier wave is tuned in, with the tube oscillating, *a whistle will be heard.* Unmodulated code stations will also be *audible* as a series of short and long whistles—dots and dashes. This is known as "beat note" reception, and follows a well-known law of physics which explains that whenever two sets of oscillations (such as the oscillations of the received station and the oscillations of the tube) exist simultaneously and in the same place, two additional sets of oscillations will be set up, with frequencies equal to the sum and the difference between the frequencies of the original oscillations. When the short-wave receiver is oscillating, and tuned very close to a carrier,





THE TUNING CURVES

Figure 2. This chart shows the tuning range of each of the four plug-in coils and the dial setting for any frequency (or wavelength)

the difference in frequency may be only a few hundred cycles per second, which is heard as a whistle. Of course when the receiver is tuned exactly on the carrier wave, there can be no difference in frequency, and no whistle is heard. This is called a "zero beat." The beat-frequency principle is applied to the superheterodyne, the intermediate frequency being the difference between the frequency of a local oscillator and the frequency of the received station.

Obviously, satisfactory reception of a telephone station cannot be had while the receiver is oscillating (except at zero beat, which is a very delicate adjustment, and only used for the reception of the weakest station). Most volume will be had when the regeneration control is turned to the point *just below oscillation.*

When a short-wave receiver of this type oscillates, some of the generated energy finds its way into the antenna circuit by transfer from L2 to L1. This is radiated, and the receiver actually becomes a low-powered transmitter. Such radiations may be picked-up by a neighboring short-wave receiver, causing a very annoying interference. It is desirable, therefore, to permit the receiver to oscillate only when absolutely necessary, for station spotting. In a future article of this series, directions will be given for the addition of a radio-frequency amplifying and blocking tube, which will increase the efficiency of the receiver, and at the same time prevent oscillations from riding through to the antenna.

Condenser C6 and the choke coil, RFC, comprise a filter system which keeps the radio-frequency current out of the telephone receiver circuit, where its presence would result in difficult tuning, due to the capacity effect between the body and the head-set. The condenser offers a direct radio-frequency circuit from L3 to ground, while RFC blocks the r.f. from passing through the primary of the transformer.

The output of the detector tube, which could be heard as a signal if telephone receivers were substituted for the primary of the transformer, is transferred to the second tube circuit by virtue of the inductive relationship between the primary and secondary—just as the original radio-frequency energy passed from L1 to L2. It is further amplified—made louder—by the additional trigger action of the type —30 tube, and finally heard in the headset plugged into the plate circuit.

The condenser C5 is also a bypass condenser, while C4 is effective in reducing the hum occasioned by the a.c. heater.

The functions of the various parts in the d.c. receiver are identical with those of the a.c. model just discussed.

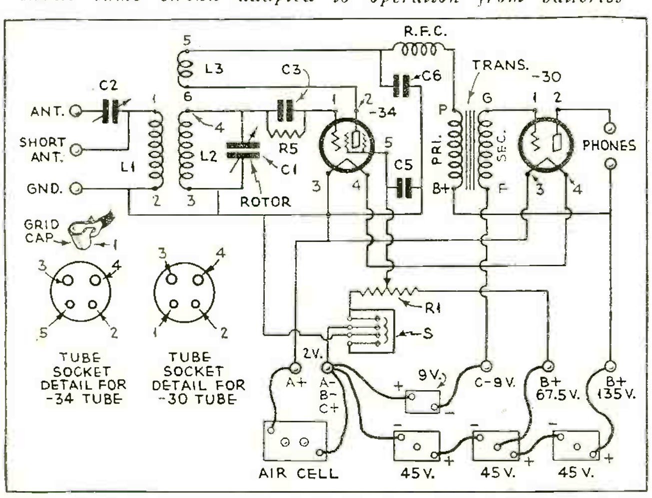
The actual operation of the beginner's short-wave receiver is similar to that of a broadcast set. Antenna and ground are connected to their respective posts. The usual broadcast antenna and ground will be satisfactory—but make sure that all connections are clean. If your aerial is a long one, connect it to "Long Ant." posts. Condenser C2 will now be in the circuit permitting adjustment of the antenna circuit for best reception by means of a screw driver. When a short aerial is employed this condenser is usually neither necessary nor desirable, and the lead-in is connected directly to the remaining antenna post. Plug the cable into the power supply, and the power unit into the usual 110-volt receptacle. A type −24 tube and a −27 will be used in the receiver as indicated in Figure 2, and a −80 in the power unit. If the receiver is of the battery type, it should be connected in accordance with Figure 3, a −34 and a −30 tube being inserted in the correct sockets. In either case a coil covering the short-wave band desired is plugged into the left hand socket (the receiver facing the operator). The detector tube −24 or −34, plug into the right-hand socket.

The correct coil can be determined from the table given last month under the list of parts, or from the tuning curves, herewith, in Figure 2. In addition to indicating the correct coil, Figure 2 will show you the dial location of any particular station, providing you know the wavelength or frequency. For instance, if you want to receive GSB at Daventry, England, broadcasting on 31.5 meters, inspection of the tuning curves will show you that the correct coil will have the red stripe and that GSB will tune in near 100 on the dial.

Familiarize yourself with the stable and oscillating conditions by turning the volume control up and down. You will readily recognize the hiss which means that circuit has "spilled over" and is oscillating. Now try tuning in a station. At first it will be best to tune with the circuit just oscillating. After a little practice, however, *only the very weakest stations* should be fished for in this way to avoid disturbing other listeners in the neighborhood. The station will be identified as a continuous whistle, with voice and music on top if the carrier is a powerful one. Now turn back the (*Continued on page* 691)

THE SCHEMATIC CIRCUIT DIAGRAM

Figure 1 (left). The circuit employed when operating voltages are obtained from the a.c. lines. Figure 3 (below) shows same circuit adapted to operation from batteries



Operating Tests On
ALL-WAVE SUPER
(Philco Model 16-X)

IN undertaking operating tests with the Philco Model 16-X console receiver, a description of which was published in the April issue, it was decided to make the tests sufficiently thorough to show just what can be expected from a modern all-wave receiver of the better grade. Tests were therefore conducted in two locations, in addition to the preliminary tests conducted in the laboratory. The first of these tests was carried on in an apartment house in New York City; typical of the average large city location. Then the receiver, console and all, was transported to the RADIO NEWS Short-wave Listening Post in Westchester County, N. Y., and again put through its paces.

Before going into detail concerning these tests it might be well to make it clear that the receiver used was a regular production model picked at random from the stock of the Philco distributor in New York. It was neither hand-picked nor in any way "hopped up" for these tests. The results it produced can therefore be logically taken as typical of what may be expected by anyone purchasing one of these receivers.

The tests in the city apartment house were quite non-technical in nature. In fact the receiver was used there just as it would be in the average home, operated by all members of the family as the spirit moved them. This continued for two weeks, early in February. The antennas employed were (1) a 25-foot wire around the picture moulding and (2) a 75-foot outdoor wire.

The indoor antenna proved entirely satisfactory for the reception of all local and many semi-distant broadcast-band stations. DX stations were also brought in galore on it but in the case of distant stations where the automatic volume control action permits the receiver to operate at high sensitivity the indoor antenna had the disadvantage that it picked up considerable electrical interference originating within the apartment house. Telephone dials, light switches and electrical appliances operated in neighboring apartments all contributed to a noise condition which was found undesirable. In the case of short-wave reception this interference was greatly intensified and in addition strong interference was caused by the ignition systems of automobiles running along an important traffic artery in front of the house, and another about 100 feet distant from the antenna.

With the outdoor antenna the signal strength was considerably greater on both short-wave and broadcast-band stations and the interference level was relatively lower. The first obvious conclusion was, therefore, that if one is to obtain the best results with this receiver (as with any other sensitive receiver) an outdoor antenna should be employed. With such an antenna broadcast-band stations throughout the country were brought in with good loudspeaker volume. Denver, Minneapolis, Texas, and New Orleans stations were brought in with good regularity. Minneapolis particularly could be depended upon for really good reception beginning at or before dinner time practically every evening. KFI of Los Angeles was heard quite regularly in the later evening and other west-coast stations were heard frequently. In this location the California stations have not been good this year—not nearly as good as last year. The regular test receiver located here has not been able this year to bring in KFI in a really satisfactory manner until 10 p. m. or later as a rule—and sometimes not satisfactorily then.

THE purpose of occasionally publishing reports such as this one on the results obtained with various all-wave receivers in actual operating tests is two-fold. First of all, there are always newcomers in the radio game who have never had experience with short-wave reception and do not appreciate its possibilities. For them these articles are a revelation and there seems to be considerable evidence that this type of article running over the past several years in RADIO NEWS has contributed a great deal to the present-day popularity of short-wave reception. Second, fans who are interested in short-wave (or all-wave) reception like to keep posted on improvements in design, and to know to what extent these developments actually improve reception results.

As time goes on more people become acquainted with the short-waves and there is less need for this missionary type of article. But for those who are short-wave fans and who want to know about new equipment and its accomplishments in this field RADIO NEWS will continue to publish an occasional operating report.

—The Editors.

Stations closer to New York than those mentioned above were heard in almost unlimited numbers beginning in the late afternoon and early evening.

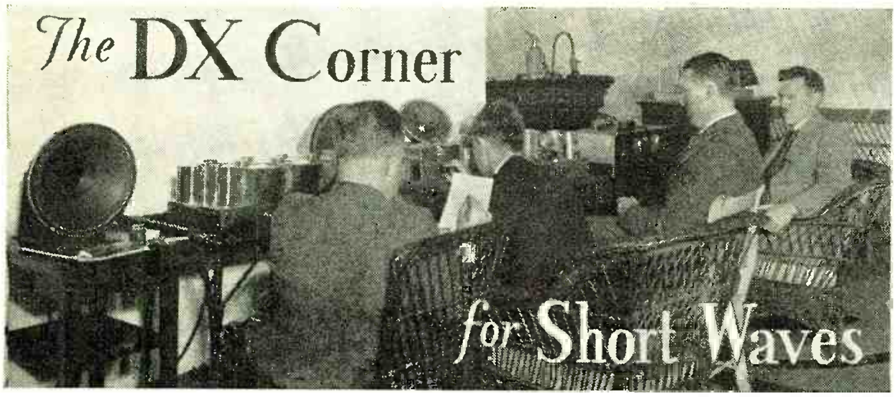
Short-wave reception was found to be highly satisfactory, considering the location. Reception from the British, German and Canadian stations was many times excellent in every sense of the word, the pick-up being adequate to overcome local noise. Sometimes, of course, fading would be encountered and at these times the local noise level would come up as the station signals faded. Short-wave selectivity was found to be exceptional, showing a slight tendency to cut side bands. While this, to a trained ear caused tone quality to suffer somewhat, it had the compensating advantage of eliminating a good deal of the rushing sound that frequently accompanies short-wave reception.

The conclusion of the city tests, with an understanding of the limitations of that location as gained from numerous tests conducted there with other receivers, brought the conviction that this receiver is deserving of an unusually good rating.

The receiver was moved to the Westchester Listening Post and set up in readiness. There were two antennas available; a 175-foot horizontal wire with a 20-foot lead, and a 90-foot sloping wire (including lead-in). The tests here were conducted on Saturday, February 24. Inasmuch as they were limited to daylight they concerned themselves almost entirely with the short waves. Following is a list of the stations logged in about 3 hours of actual listening, between noon and 5:30 p. m.:

Call	*Location*	*Kc.*	*Wl.*
W3XAL	Bound Brook, N. J.	17780	16.8+
GSG	Daventry, England	17790	16.8+
FYA	Pontoise, France	15243	19.6
DJB	Zeesen, Germany	15200	19.7
FYA	Pontoise, France	11900	25.2
GSE	Daventry, England	11865	25.3
W2XE	New York, New York	11830	25.3+
I2RO	Rome, Italy	11810	25.4
GSD	Daventry, England	11750	25.5
DJD	Zeesen, Germany	11760	25.5
EAQ	Madrid, Spain	9860	30.4
XETE	Mexico City, Mex.	9600	31.2+
HBL	Geneva, Switzerland	9580	31.3
GSC	Daventry, England	9585	31.3
W1XAZ	Springfield, Mass.	9570	31.3+
W2XAF	Schenectady, N. Y.	9530	31.4+
GSB	Daventry, England	9510	31.5
PSK	Rio de Janeiro, Brazil	8185	36.6+
HBP	Geneva, Switzerland	7790	38.4+
HJ1ABB	Barranquilla, Colombia	6450	46.5
HI1A	San Domingo, D. R.	6272	47.8
YV3BC	Caracas, Venezuela	6162	48.7
W8XK	Pittsburgh, Pa.	6140	48.8+
W2XE	New York, New York	6120	49.0
VE9HX	Halifax, N. S.	6110	49.0+
YV1BC	Caracas, Venezuela	6112	49.1+
W9XF	Chicago, Ill.	6100	49.1+
VE9GW	Bowmanville, Canada	6095	49.2
W9XAA	Chicago, Ill.	6080	49.3
W8XAL	Cincinnati, O.	6060	49.4+
GSA	Daventry, England	6050	49.5
W1XAL	Boston, Mass.	6040	49.6+
DJC	Zeesen, Germany	6020	49.8
COC	Havana, Cuba	6000	49.9+

There is no record-breaking reception indicated in this list; that is, there are no unusual catches. Its outstanding feature is found rather in its variety and consistency. For instance every one of the six stations employed by the British Broadcasting Company was logged, as well as the (*Continued on page* 706)



S. W. TIME SCHEDULE

Laurence M. Cockaday

In this fourteenth installment of the new DX Corner we find a leading feature entitled "World Short-Wave Time Table," in which are listed the month's short-wave best bets. This time table contains a list of short-wave stations logged during the past month in the Radio News' Westchester Listening Post.

Reception Conditions This Month

Although the past month has given us some excellent receptions on the short waves, it also has brought a few days of the *worst* for a long time. Reception is again, however, picking up—the 19, 25- and 31-meter bands are coming into their own. Static is increasing somewhat on the 49-meter band. However, we look forward to wonderful and clear results on the 19- and 25-meter bands in the near future.

Outstanding Short-Wave Reception Features

One of the outstanding features this past month has been the international news broadcast from Rome at 1:15 to 3 p.m., in English. Another very excellent weekly news-feature broadcast, in English, is that from GSF and GSE, from 9 to 9:15 every morning. France also has a fine news and entertainment program, in English, from 7 to 7:15 p.m. daily. The Byrd broadcasts are also excellent features for anyone looking for a thrill. Things are "popping" on the world's short waves!

British Empire Transmissions

An official communication from the British Broadcasting Company states that the Empire transmissions will be as shown in this month's Short-Wave Time Table with the following alternatives: GSD may be substituted for GSE and GSA or GSC may be substituted for GSB or vice versa.

The German Transmissions

An official communication from the "D" stations in Germany states that they will be on the air substantially as shown in the Short-Wave Time Schedule, except in the case of some unlisted special transmissions.

YV1BC Transmissions

An official communication from station YV1BC at Caracas states that their programs continue the same as mentioned in the Short-Wave Time Schedule.

UOR2 Transmissions

An official communication from the Administration of the Austrian station at Vienna states that their station is temporarily closed, but will be reopened within the next few weeks. We note that the call letters have been changed to OER2 and the correct frequency is 6072 kilocycles.

HCJB Transmissions

An official communication from radio station HCJB at Quito, Ecuador, states that they are on the air from 12:30 to 2 p.m. and from 7:30 to 10 p.m. daily except Monday, Ecuador time. Their power was increased to 500 watts on the first of April. They transmit on 73 meters, 4107 kilocycles.

Radio Coloniale Transmissions

An official communication from station Radio Coloniale (we note that they do not use any call letters) states that they will be on the air as shown in the World Short-Wave Time Table for this month.

HJ4ABE Transmissions

An official communication from station HJ4ABE at Medellin, Colombia, states that they will be on the air on a wavelength of 50.6 meters Monday from 7 to 11 p.m., Tuesday, Thursday and Saturday from 6:30 to 8 p.m., Wednesday and Friday from 7:30 to 11 p.m.

Where Is VE9JR?

A number of our Listening Posts note the absence from the air of VE9JR. Is this really so or is there something peculiar about the transmission of VE9JR, recently, that makes them skip wide areas?

A Report from Texas

Mr. J. N. Naff of Camden, Texas, states that reception has been somewhat erratic except on the 40-meter band during the past month. He gives the following Best Bets for his location: W2XE, W8XK, GSF, GSD, EAQ, XETE, VK2ME, GSC, W3XAU, W1XAZ, GSB, HJ1ABB, YV3BC, W3XAL, W9XF, VE9GW, W9XAA, W8XAL, GSA, W4XB, DJC.

An Oklahoma Report

First Sgt. R. F. Hinck of the First Balloon Squadron, Fort Sill, Oklahoma, reports the following Best Bets for his location. VK2ME, GSC, EAQ, YV3BC, GSA, DJA, XETE, W8XK, W8XAL, W2XAF, W3XAU, W2XE, W9XF, G6RX. He uses a home-made receiver with a –36 detector, a –38 first audio and an –89 output tube.

Report from Denver

Mr. William J. Vette sends in a very fine report of reception in his location on a Philco model 44B all-wave receiver. He

(*Continued on page* 672)

PIONEERS

Official Radio News Listening Post Observers

Listed below by States and Countries are the Official Radio News Short-Wave Listening Post Observers who are serving conscientiously all over the World in logging stations for the DX Corner.

In the United States of America:

Alabama, J. E. Brooks; **California,** E. G. DeHaven, C. H. Canning, E. S. Allen, A. E. Berger; **Colorado,** Wm. J. Vette; **Florida,** E. M. Law, James F. Dechert; **Georgia,** James L. Davis, C. H. Armstrong; **Illinois,** Philip Simmons, E. Bergeman, Robert L. Weber; **Indiana,** Freeman C. Balph, J. R. Flannigan; **Iowa,** J. Harold Lindblom; **Kentucky,** Wm. A. McAlister, George Krebs; **Maine,** R. I. Keeler; **Maryland,** Howard Adams, Jr., James W. Smith; **Massachusetts,** Armand A. Boussy, J. Walter Bunnell, Harold K. Miller, Donald Smith, Elmer F. Orne, Arthur Hamilton, Roy Sanders; **Minnesota,** Dr. G. W. Twomey; **Mississippi,** Dr. J. P. Watson; **Missouri,** C. H. Long; **Nebraska,** P. H. Clute, G. W. Renish, Jr., Harold Hansen; **New Hampshire,** P. C. Atwood, A. J. Mannix; **New Jersey,** William Dixon, R. H. Schiller, William F. Buhl; **New York,** R. Wright, I. H. Kattell, Donald E. Bame; **Nevada,** Don H. Townsend, Jr.; **North Carolina,** H. O. Murdoch, Jr., W. C. Couch; **Ohio,** Oker Radio & Electric Shop, R. W. Evans, C. H. Skatzes; **Oklahoma,** H. L. Pribble; **Pennsylvania,** Edward C. Lips, K. A. Staats, C. T. Sheaks, George Lilley, John A. Leininger, F. L. Stitzinger; **Tennessee,** Chas. D. Moss, Adrian Smith; **Texas** Heinie Johnson; **Utah,** Harold D. Nordeen; **Virginia,** Gordon L. Rich, G. Hampton Allison, D. W. Parsons; **Washington,** A. D. Golden, Glenn E. Dubbe, Chas. G. Payne; **West Virginia,** Kenneth Boord, R. E. Sumner; **Wisconsin,** Willard M. Hardell, Walter A. Jasiorkowski.

Australia, C. N. H. Richardson.

Brazil, W. W. Enete.

British Guiana, E. S. Christiani, Jr.

British West Indies, E. G. Derrick.

Canada, Douglas Wood, Jack Bews, A. G. Taggart, W. H. Fraser.

Cuba, Frank H. Kydd.

England, Kenneth Judd, C. L. Wright, John J. Maling, Alan Barber, Donald Burns.

France, J. C. Meillon, Jr.

India, D. R. D. Wadia.

New Zealand, Dr. G. Campbell.

South Africa, C. McCormick, Mike Kruger.

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

Venezuela, Francisco Fossa Anderson.

WORLD SHORT WAVE TIME-TABLE

The schedule of short-wave broadcasting stations listed below includes only those that are received best in RADIO NEWS LISTENING POSTS. This new schedule is from 9 G.M.T. up to 06 G.M.T. Both wavelength and frequency are noted for each station. Station locations are found on the next page.

THE WORLD SHORT

Short-Wave "Best Bets"

Wavelengths in Meters	Call Letters	Frequency in k.c.
9 G. M. T.	**4 A. M. E. S. T.**	
25.5	GSD	11750
31.5 Wed., Sat.	VK3ME	9510
31.5	GSB	9510
49.9+ Ex.Tu.Th.Sat.	RV59	6000
70.2 Except Sun.	RV15	4273
10 G. M. T.	**5 A. M. E. S. T.**	
19.8+	HVJ	15123
30.5	JIAA	9870
31.2+ Sun.	VK2ME	9590
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
11 G. M. T.	**6 A. M. E. S. T.**	
25.1+	RV50	11924
30.5	JIAA	9870
31.2+ Sun.	VK2ME	9590
31.5 Wed., Sat.	VK3ME	9510
42.9+	LCL	6984
49.4+ Irregular	W8XAL	6060
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
12 G. M. T.	**7 A. M. E. S. T.**	
13.9+	W8XK	21540
16.8+	GSG	17790
19.6+	FYA	15243
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
25.5+ Ex.Tues.,Wed.	PHI	11730
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.8	PLV	9415
42.9+	LCL	6984
49.2 Fri., Sat.	VE9GW	6095
49.4+ irregular	W8XAL	6060
52.9+	XQAJ	5660
70.2 Except Sun.	RV15	4273
13 G. M. T.	**8 A. M. E. S. T.**	
13.9+	W8XK	21540
16.8+	W3XAL	17780
16.8+	GSG	17790
19.6+	FYA	15243
17.2	JIAA	17380
19.7	DJB	15200
19.8	GSF	15140
23.3+ Sun.	CNR	12830
25.1+ Sun.	RV50	11924
25.5+ Ex.Tues.,Wed	PHI	11730
31.2+ Sun.	VK2ME	9590
49.0+ Sun.	YV1BC	6112
49.0+	VE9HX	6110
49.2 Fri., Sat.	VE9GW	6095
49.4+ Irregular	W8XAL	6060
49.6	W1XAL	6040
16 G. M. T.	**11 A. M. E. S. T.**	
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
23.3	HJ1ABB	12800
25.2	FYA	11900
25.3	GSE	11865
25.4	I2RO	11810
25.6 Except Sun.	VE9JR	11720
26.8 Sun.	CT3AQ	11180
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
47.8 Tues., Fri.	HI1A	6272
49.0+ Sun.	YV1BC	6112
49.0+	VE9HX	6110
49.2 Fri., Sat.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.6 Sun.	W1XAL	6040
17 G. M. T.	**12 Noon E. S. T.**	
13.9+	W8XK	21540
16.8+	W3XAL	17780
17.3+ Fri.	W3XL	17300
19.6+	W2XE	15270
19.7	W8XK	15210
23.3	HJ1ABB	12800
25.2	FYA	11900
25.3	GSE	11865
25.4	I2RO	11810
25.5	DJD	11760
25.6 Sat.	VE9JR	11720
25.6 Irregular	FYA	11720
30.6+	GCW	9790
31.2+	W3XAU	9590
31.2+ Sun.	VK2ME	9590
31.3+	W1XAZ	9570
31.5+	GSB	9510
40.5 Except Sun.	HJ3ABD	7402
42.9+	LCL	6984
45.3+	RV72	6611
47.5 Sun.	HIZ	6315
47.8 Tues., Fri.	HI1A	6272
49.0+ Ex. Sat., Sun.	VE9HX	6110
49.2 Fri., Sat., Sun.	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.4+ Irregular	W8XAL	6060
49.6 Irregular	W1XAL	6040
49.5+	GSA	6050
49.8+ Irregular	COC	6010
50.0	RV59	6000
21 G. M. T.	**4 P. M. E. S. T.**	
17.3+ Fri.	W3XL	17300
19.7	W8XK	15210
25.2	FYA	11900
25.2	W8XK	11870
25.3+	W2XE	11830
25.4	I2RO	11810
25.5	DJD	11760
30.6+	GCW	9790
31.2+	W3XAU	9590
31.5	GSB	9510
37.3 Sun.	CNR	8035
42.9+	LCL	6984
47.5	HIZ	6315
47.8 Sun.	HI1A	6272
48.8+	W8XK	6140
49.0+ Sun.	YV1BC	6112
49.0+	VE9HX	6110
49.1 Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+ Irregular	W9XAA	6080
49.3+ Temporary	YV5BMO	6070
49.4+ Irregular	W8XAL	6060
49.5 Temporary	OXY	6060
49.5+	GSA	6050
49.8+	DJC	6020
49.8+	COC	6010
49.9+	HIX	6000
50.0	RV59	6000
22 G. M. T.	**5 P. M. E. S. T.**	
25.2	FYA	11900
25.2	W8XK	11870
25.4	I2RO	11810
26.8	CT3AQ	11180
30.4	EAQ	9860
31.2+ Tues., Fri.	CT1AA	9590
31.2+	W3XAU	9590
31.3 Sat.	HBL	9580
31.3+	W1XAZ	9570
31.3+	DJA	9560
31.5	GSB	9510
38.4+ Sat.	HBP	7790
42.9+	LCL	6984
45.0+ Sun.	HC2RL	6668
46.5 Sun.	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5	HIZ	6315
47.8	HI1A	6272
48.7	YV3BC	6162
48.8+	W8XK	6140
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
50.4 Irregular	HJ2ABA	5880
50.6 Ex. Wed., Sun.	HJ4ABE	5860
69.4 Irregular	G6RXJ	4320
01 G. M. T.	**8 P. M. E. S. T.**	
25.2	W8XK	11870
25.5	DJD	11760
25.6	FYA	11720
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8	CP5	9120
37.5	HC2JSB	8000
40.5+ Except Sun.	HJ3ABD	7402
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.8	HI1A	6272
48.5+	TGW	6180
48.7	YV3BC	6162
48.8+	W8XK	6140
49.0	W2XE	6120
49.0+	YV1BC	6112
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2	VE9GW	6095
49.3+ Sun.	W9XAA	6080
49.3+ Temporary	YV5BMO	6070
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6 Sun.	W1XAL	6040
49.6	W4XB	6040
49.8	DJC	6020
49.8+	COC	6010
49.9+	HIX	6000
50.4 Irregular	HJ2ABA	5880
50.6 Mon.,Wed.,Fri.	HJ4ABE	5860
69.4 Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107
02 G. M. T.	**9 P. M. E. S. T.**	
25.2	W8XK	11870
25.5	DJD	11760
25.6 Except Sun.	VE9JR	11720
31.2+	XETE	9600
31.3+	W1XAZ	9570
31.4+	W2XAF	9530
32.8	CP5	9120
40.5+ Except Sun.	HJ3ABD	7402
45.0+ Tues.	HC2RL	6668
45.3 Thurs.	PRADO	6618
46.1	HJ5ABD	6504
46.5	HJ1ABB	6450
46.6+ Fri.	W3XL	6425
47.5 Sat.	HIZ	6315
47.8	HI1A	6272
48.5+	TGW	6180

WAVE TIME TABLE

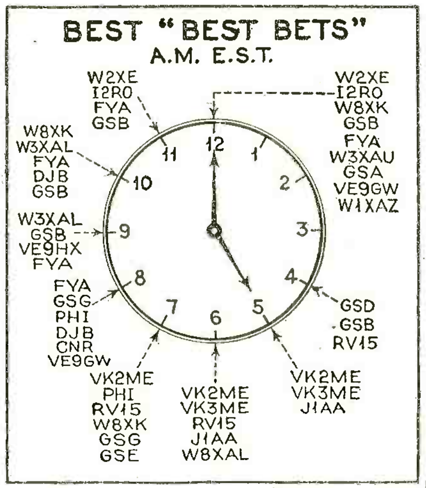
31.3+		W1XAZ	9570
31.3+		DJA	9560
31.8		PLV	9415
42.9+		LCL	6984
49.2	Fri., Sat.	VE9GW	6095
49.4+	Irregular	W8XAL	6060
49.5	Sun.	OXY	6060
52.9+		XQAJ	5660
70.2		RV15	4273

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

13.9+		W8XK	21540
16.8+		W3XAL	17780
19.6+		FYA	15243
19.7		DJB	15200
19.8		GSF	15140
25.3		GSE	11865
25.5+	Ex. Tues., Wed.	PHI	11730
25.6	Except Sun.	VE9JR	11720
31.2+	Sun.	VK2ME	9590
31.3+		W1XAZ	9570
31.3+		DJA	9560
31.8		PLV	9415
42.9+		LCL	6984
49.1+	Sun.	YV1BC	6112
49.0		VE9HX	6110
49.2	Fri., Sat.	VE9GW	6095
49.4+	Irregular	W8XAL	6060
49.6		W1XAL	6040
70.2		RV15	4273

15 G. M. T. 10 A. M. E. S. T.

13.9+		W8XK	21540
16.8+		W3XAL	17780
19.6+		FYA	15243
19.7		W8XK	15210
19.7		DJB	15200
19.8		GSF	15140
19.8		VE9DN	15130
19.8+	Irregular	HVJ	15123
25.3		GSE	11865
25.4	Sun.	I2RO	11810
25.5+	Ex. Tues., Wed.	PHI	11730
26.8	Sun	CT3AQ	11180
31.2+	Sun.	VK2ME	9590
31.3+		W1XAZ	9570
31.3+		DJA	9560
31.5+		GSB	9510
42.9+		LCL	6984



49.8+		DJC	6020

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

13.9+		W8XK	21540
16.8+		W3XAL	17780
17.3+	Fri.	W3XL	17300
19.7		W8XK	15210
25.2		FYA	11900
25.4		I2RO	11810
25.5		DJD	11760
25.5		GSD	11750
25.6	Sat.	VE9JR	11720
30.4	Sat.	EAQ	9860
30.6+		GCW	9790
31.2+		W3XAU	9590
31.3+		W1XAZ	9570
31.5		GSB	9510
42.9+		LCL	6984
47.5	Sun.	HIZ	6315
47.8	Sun	HI1A	6272
49.0+		VE9HX	6110
49.2	Fri., Sat., Sun.	VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.4+	Irregular	W8XAL	6060
49.5	Temporary	OXY	6060
49.6	Irregular	W1XAL	6040
49.8+		DJC	6020
73.0+	Ex. Mon.	HCJB	4107

19 G. M. T. 2 P. M. E. S. T.

17.3+	Fri.	W3XL	17300
19.5	Ex. Tu. Th. Sat.	W2XAD	15330
19.7		W8XK	15210
25.2		FYA	11900
25.4		I2RO	11810
25.5		DJD	11760
25.5		GSD	11750
25.6	Ex. Sat., Sun.	VE9JR	11720
30.4	Sat.	EAQ	9860
30.6+		GCW	9790
31.2+		W3XAU	9590
31.3+		W1XAZ	9570
31.5		GSB	9510
37.3+	Sun.	CNR	8035
41.0	Sun.	HAT2?	7300
42.9+		LCL	6984
47.5	Sun	HIZ	6315
47.8		HI1A	6272
49.0+	Sun.	YV1BC	6112
49.0+		VE9HX	6110
49.2	Except Thurs.	VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.4+	Irregular	W8XAL	6060
49.5	Temporary	OXY	6060
49.5+		GSA	6050
49.8+		DJC	6020
50.2+		HVJ	5969
73.0+	Ex. Mon.	HCJB	4107

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

17.3+	Fri.	W3XL	17300
19.5+	Ex. Tu. Th. Sat	W2XAD	15330
19.7		W8XK	15210
25.2		FYA	11900
24.3+		W2XE	11830
25.4		I2RO	11810
25.6	Ex. Sat., Sun.	VE9JR	11720
30.4	Sat.	EAQ	9860
30.6+		GCW	9790
31.2+		W3XAU	9590
31.3+		W1XAZ	9570
31.5		GSB	9510
37.3	Sun.	CNR	8035
41.0?		HAT2?	7300
42.9+		LCL	6984
47.8	Sun.	HI1A	6272
49.0+	Sun.	YV1BC	6112
49.0+		VE9HX	6110
49.2		VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.4+	Irregular	W8XAL	6060
49.5	Temporary	OXY	6060

49.2		VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.3+	Temporary	YV5BMO	6070
49.4+		W8XAL	6060
49.5	Temporary	OXY	6060
49.5+		GSA	6050
49.6		W4XB	6040
49.6+	Irregular	W1XAL	6040
49.8+		COC	6010
49.9+		HIX	6000
50.0		RV59	6000
50.4		HJ2ABA	5880
50.6	Irregular	HJ4ABE	5860

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

25.2		W8XK	11870
25.6		FYA	11720
26.8	Tues., Thurs.	CT3AQ	11180
30.4		EAQ	9860
31.2+	Tues., Fri.	CT1AA	9590
31.3		GSC	9585
31.3	Sat.	HBL	9580
31.3+		W1XAZ	9570
31.3+		DJA	9560
38.4+	Sat.	HBP	7790
45.0+	Sun.	HC2RL	6668
46.1		HJ5ABD	6504
46.5	Sun.	HJ1ABB	6450
46.6+	Fri.	W3XL	6425
48.7		YV3BC	6162
48.8+		W8XK	6140
49.0		W2XE	6120
49.0+		YV1BC	6112
49.0+		VE9HX	6110
49.1+	Sat.	W3XAL	6100
49.1+	Except Sat.	W9XF	6100
49.2		VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.3+	Temporary	YV5BMO	6070
49.4+		W8XAL	6060
49.4+		W3XAU	6060
49.5	Temporary	OXY	6060
49.5+		GSA	6050
49.6		W4XB	6040
49.6	Irregular	W1XAL	6040
49.8+	Irregular	COC	6010
50.6	Tues., Th., Sat.	HJ4ABE	5860
69.4	Irregular	G6RX	4320

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

25.2		W8XK	11870
25.6		FYA	11720
25.6	Except Sun.	VE9JR	11720
30.4		EAQ	9860
31.3		GSC	9585
31.3+		W1XAZ	9570
31.3+		DJA	9560
31.4+		W2XAF	9530
32.8		CP5	9120
36.6+		PSK	8185
40.5		HJ3ABD	7402
45.0+	Sun.	HC2RL	6668
46.1		HJ5ABD	6504
46.5		HJ1ABB	6450
46.6+	Fri.	W3XL	6425
47.8		HI1A	6272
48.5		TGW	6180
48.7		YV3BC	6162
48.8+		W8XK	6140
49.0		W2XE	6120
49.0+		YV1BC	6112
49.0+		VE9HX	6110
49.1+	Sat.	W3XAL	6100
49.2		VE9GW	6095
49.3+	Irregular	W9XAA	6080
49.3+	Temporary	YV5BMO	6070
49.4+		W8XAL	6060
49.4+		W3XAU	6060
49.5+		GSA	6050
49.6		W4XB	6040
49.6	Irregular	W1XAL	6040
49.5+	Irregular	COC	6010

48.7		YV3BC	6162
48.8+		W8XK	6140
49.0		W2XE	6120
49.0+		YV1BC	6112
49.0+		VE9HX	6110
49.1+	Sat.	W3XAL	6100
49.1+	Except Sat.	W9XF	6100
49.2	Except Sun.	VE9GW	6095
49.3+	Sun.	W9XAA	6080
49.3	Temporary	YV5BMO	6070
49.4+		W8XAL	6060
49.4+		W3XAU	6060
49.6		W4XB	6040
49.8	Irregular	DJC	6020
49.8+		COC	6010
49.9+		HIX	6000
50.4	Irregular	HJ2ABA	5880
50.6	Mon., Wed., Fri.	HJ4ABE	5860
69.4+		G6RX	4320
73.0+	Except Mon.	HCJB	4107

03 G. M. T. 10 P. M. E. S. T.

25.1+		RV50	11924
25.5	Irregular	DJD	11760
25.6		FYA	11720
25.6	Sat.	VE9JR	11720
31.3+		W1XAZ	9570
31.4+		W2XAF	9530
40.5+	Except Sun.	HJ3ABD	7402
45.0+	Tues.	HC2RL	6668
45.3	Thurs.	PRADO	6618
46.5		HJ1ABB	6450
46.6+	Fri.	W3XL	6425
47.5	Sat.	HIZ	6315
47.8		HI1A	6272
48.5		TGW	6180
48.8+		W8XK	6140
49.0		W2XE	6120
49.0+		YV1BC	6112
49.0+		VE9HX	6110
49.1+	Sat.	W3XAL	6100
49.1+	Except Sat.	W9XF	6100
49.2	Except Sun.	VE9GW	6095
49.4+		W8XAL	6060
49.4+		W3XAU	6060
49.6		W4XB	6040
49.8	Irregular	DJC	6020

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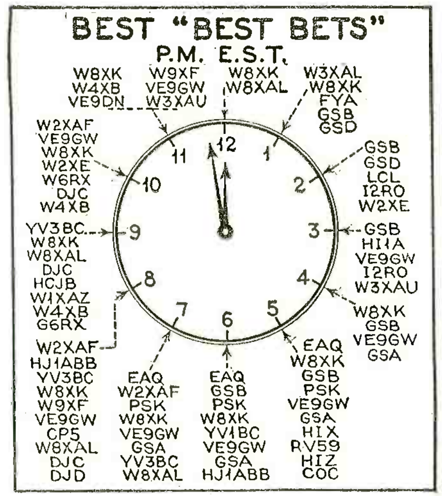


49.9+ Sat.	HIX	6000
50.6 Mon., Wed., Fri.	HJ4ABE	5860
69.4+ Irregular	G6RX	4320
73.0+ Except Mon.	HCJB	4107

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

25.6	FYA	11720
25.6 Sat.	VE9JR	11720
31.3+	W1XAZ	9570
45.0 Fri.	TGW	6180
45.0+ Tues.	HC2RL	6668
46.6+ Fri.	W3XL	6425
48.8 Sat.	VE9CL	6150
48.8+	W8XK	6140
49.0+	VE9HX	6110
49.1+ Sat.	W3XAL	6100
49.1+ Except Sat.	W9XF	6100
49.2 Thurs., Fri., Sat.	VE9GW	6095
49.4+	W8XAL	6060
49.4+	W3XAU	6060
49.6	W4XB	6040
49.9+	VE9DN	6005
49.9+ Sat.	HIX	6000
73.0+ Ex. Mon.	HCJB	4107

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

31.3+	W1XAZ	9570
48.8+	W8XK	6140
49.1+ Except Sat.	W9XF	6100
49.4+	W3XAU	6060
49.4+	W8XAL	6060

Station Locations

WL.	*Call*	*KC.*	*Location*
13.9+	W8XK	21540	Pittsburgh, Pa.
16.8+	W3XAL	17780	Bound Brook, N. J.
16.8+	GSG	17790	Daventry, England
17.2+	J1AA	17380	Kemikawa-Cho. Japan
17.3+	W3XL	17300	Bound Brook, N. J.
19.5	W2XAD	15330	Schenectady, N. Y.
19.6	FYA	15243	Pontoise, France
19.6+	W2XE	15270	New York, N. Y.
19.7	W8XK	15210	Pittsburgh, Pa.
19.7	DJB	15200	Zeesen, Germany
19.8	GSF	15140	Daventry, England
19.8	HVJ	15123	Vatican City
23.3	CNR	12830	Rabat, Morocco
23.3	HJ1ABB	12800	Bogota, Colombia
25.1+	RV50	11924	Moscow, U. S. S. R.
25.2	FYA	11900	Pontoise, France
25.2	W8XK	11870	Pittsburgh, Pa.
25.3	GSE	11865	Daventry, England
25.3+	W2XE	11830	New York, N. Y.
25.4	I2RO	11810	Rome, Italy
25.5	GSD	11750	Daventry, England
25.5	DJD	11760	Zeesen, Germany
25.5+	PHI	11730	Huizen, Holland
25.6	FYA	11720	Pontoise, France
25.6	VE9JR	11720	Winnipeg, Canada
26.8	CT3AQ	11180	Funchal, Madeira
30.4	EAQ	9860	Madrid, Spain
30.5	J1AA	9870	Kemikawa-Cho, Japan
30.6+	GCW	9790	Rugby, England
31.2+	XETE	9600	Mexico City, Mex.
31.2+	W3XAU	9590	Philadelphia, Pa.
31.2+	VK2ME	9590	Sydney, Australia
31.2+	CT1AA	9590	Lisbon, Portugal
31.3	HBL	9580	Geneva, Switzerl'd
31.3	GSC	9585	Daventry, England
31.3+	W1XAZ	9570	Springfield, Mass.
31.3+	DJA	9560	Zeesen, Germany
31.4+	W2XAF	9530	Schenectady, N. Y.
31.5	VK3ME	9510	Melbourne, Aust.
31.5	GSB	9510	Daventry, England
31.8	PLV	9415	Bandoeng, Java
32.8+	CP5	9120	La Paz, Bolivia
36.6+	PSK	8185	Rio de Janeiro, Brazil
37.3	CNR	8035	Rabat, Morocco
37.5	HC2JSB	8000	Guayaquil, Ecuad.
38.4+	HBP	7790	Geneva, Switzerl'd
40.5+	HJ3ABD	7402	Bogota. Colombia
41.0?	HAT2?	7300	Budapest, Hungary
42.9+	LCL	6984	Jeloy, Norway
45.0+	HC2RL	6668	Guayaquil, Ecuad.
45.3	PRADO	6618	Riobamba, Ecuador
45.3+	RV72	6611	Moscow, U. S. S. R
46.1	HJ5ABD	6504	Cali, Colombia
46.5	HJ1ABB	6450	Barranquilla, Co.
46.6	W3XL	6425	Bound Brook, N. J.
47.5	HIZ	6315	San Domingo, D.R.
47.8	HI1A	6272	San Domingo. D.R.
48.5	TGW	6180	Guatemala City
48.7	YV3BC	6162	Caracas. Venez.
48.8	VE9CL	6150	Winnipeg, Man.
48.8+	W8XK	6140	Pittsburgh, Pa.
49.0	W2XE	6120	New York, N. Y.
49.1+	YV1BC	6112	Caracas, Venez.
49.0+	VE9HX	6110	Halifax, N. S.
49.1+	W3XAL	6100	Bound Brook, N. J.
49.1+	W9XF	6100	Chicago, Ill.
49.2	VE9GW	6095	Bowmanville, Can.
49.3+	W9XAA	6080	Chicago. Ill.
49.3+	YV5BMO	6070	Maracaibo, Venezuela
49.4+	W8XAL	6060	Cincinnati, Ohio
49.4+	W3ZAU	6060	Philadelphia, Pa.
49.5	OXY	6060	Skamlebaek, Den.
49.5	GSA	6050	Daventry, England
49.6+	W4XB	6040	Miami, Fla.
49.6+	W1XAL	6040	Boston, Mass.
49.8	DJC	6020	Zeesen, Germany
49.8+	COC	6010	Havana, Cuba
49.9+	VE9DN	6005	Montreal, Que.
49.9+	HIX	6000	San Domingo, D. R.
50.0	RV59	6000	Moscow, U. S. S. R.
50.2+	HVJ	5969	Vatican City
50.4	HJ4ABA	5880	Tunja. Colombia
50.6+	HJ4ABE	5860	Medellin. Colombia.
52.7	XQAJ	5660	Shanghai. China
69.4	G6RX	4320	Rugby. England
70.2	RV15	4273	Khabarovsk, Siberia
73.0	HCJB	4107	Quito, Ecuador

Short-Wave Reports

(*Continued from page 669*)

mentions that Denver is supposed to be a "dead spot," but from his report we do not seem to agree with this. He does note, however, that Germany is almost impossible to be heard, but VK2ME is ten times as dependable as W2XAF and W1XAZ. EAQ comes in like a local and sometimes the neighbors complain.

A Report from New Jersey

Official RADIO NEWS Short-Wave Listening Post Observer William Dixon reports that PSK is the Radio Club of Brazil, but that they use their long-wave call letters, PRA3, in their announcements. LSX, on

SHORT WAVE LISTENING POST OF WILLIAM DIXON

about 28 meters, operates Saturday nights from 9 p.m. on toll, working and relaying programs from Little America. He also sends us in a list of Best Bets for this month that has been included in our Time Table.

Some Interesting Notes Gleaned from Reports

Station G6RX, Rugby, England, also uses call letters GBB, GCB and GDB. It is owned by the post office Engineering Department and is located at Hillmorton, near Rugby, Warwickshire, England. Mr. G. A. Struthers is the engineer in charge. The station communicates and tests with CGA, Drummondville, Canada, who answers on 62.7 meters. The Canadian listening post is at Yamachiche. . . . A small station in Singapore was reported by a reader last month. We learn that this is ZHI, Singapore, Straits Settlements, on 6012 kc., with a power of 90 watts. The owners are Radio Service Company of Malay, 2 Orchard Road, Singapore. . . . Another Malayan station reported this month is ZTE, on 48.92 meters, owned by the Malayan Amateur Radio Society. Can you receive it? . . . PRA3, in Rio de Janeiro, is broadcasting on 860 kc. Its short-wave station, on 8185 kc., officially has the call letters PRB3. However, it uses the transmitter of PSK, a commercial telephone station. You do not hear the announcements of either PRB3 or PSK. PRAG is a station on Porto Alegro, Brazil, on another frequency, and is not on the air at present. . . . PLV, at Bandoeng, Java, transmits phonograph music from 7:30 unti 8 a.m., E.S.T. After 8 a.m. the station is employed for commercial (scrambled) telephony, communicating with Holland. . . . XQAJ, working on 5660 kc., is located at 80 Love Lane, Shanghai, China. It is on the air from 10 to 15 G.M.T. . . . Station KNRA, on 6660 kc., is the short-wave transmitter on the Seth Parker expedition. It communicates with W2XBJ.

A Report from New Zealand

Dr. G. Campbell MacDiamond of Thames, New Zealand, reports that he has just been appointed editor of the New Zealand Shortwaver, the official organ of the New Zealand Short-Wave Club and the first short-wave periodical in New Zealand. He says that short-wave reception in New Zealand has not been marked by any recent outstanding event except the short-wave transmissions from Admiral Byrd's flagship, KJTY. KJTY has been heard at all times of the day on various wavelengths, but most often on 31.5 meters. He also notes a great improvement in the transmission of the Empire stations. He notes that W2XAF, on 31.4 meters, is heard very well Sunday afternoons radiating special programs to the Byrd expedition.

A Report from Los Angeles

Mr. Werner Howald, member of the Short-Wave League, states that his new Midwest V16, 1934 model, is working wonderfully. He lists his Best Bets as GSB, GSD, GSE, GSC, EAQ, W2XE, W1XAL, FYA, W3XAL, VK2ME, VK3ME, PLV, XETE, J1AA, HJ4ABE, YV1BC, YV3BC, HJ1ABB, HC2RL, HJ4ABB.

Reports from Minnesota

Mr. H. R. Schneider of New Ulm, Minnesota, reports the following Best Bets in his location: W1XAZ, W8XK, W3XAU, W8XAL, W2XE, W3XL, W3XAL, KEE, W9XAA, VE9GW, XETE, HC2RL, HJ1ABB, GSB, GSD, EAQ, FYA. He uses a National SW5 with an indoor aerial.

A Report from Yeungkong, China

Mr. Liu E. Lo reports the folowing Best Bets from Yeungkong with a Hammarlund SWK2 short-wave converter: RV15, J1AA, VUC, ZTC, GSA, RV50, RV59, HCK, DJC, XQAJ, GSD, PLV, DJB, KWX, KAZ, GSB, DJA, FYA. He states that station HQAJ, on 52 plus meters, is located at 80 Love Lane, Shanghai, China.

A Report from Rio de Janeiro

A report from R. Cardosa of Rio de Janeiro states that station PRAG has not been on the air recently and that PRB3 is a licensed broadcaster using station PSK (a radiophonetransmitter) on short waves. The long-wave call is PRA3. He informs us that, after becoming a reader of the RADIO NEWS DX Corner, he is now able to pick up all the listed short-wave stations at the proper hours.

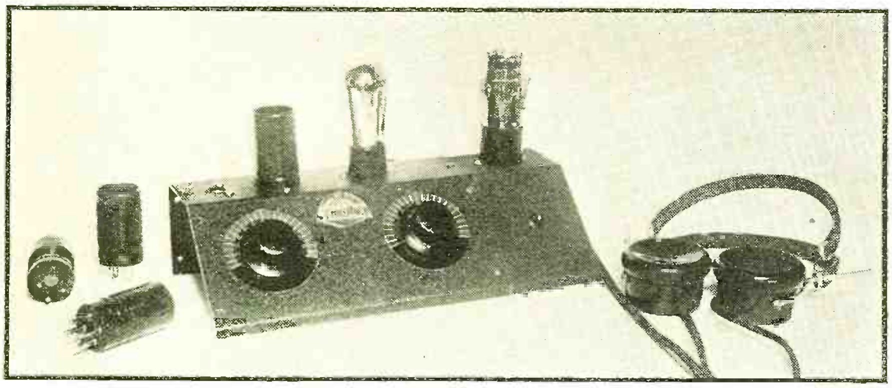
A Report from Mexico

Mr. F. L. Saldana of Huamantla, Tlax, Mexico, using a two-tube receiver, lists the following as Best Bets: DJC, GSA, YV1BC, YV3BC, HJ1ABB, CP5 (broadcasting news of the Chaco war), PSK, COC, TGW and many other American stations.

A Report from Italy

Dr. Ang. Simonini of Genoa, Italy, sends in the following list of American stations he receives regularly on his Atwater Kent receiver: W2XE, W3XL, W3XAL, VE9GW, YV1BC, YV3BC, W1XAZ,

(*Continued on page 696*)



An Audio Amplifier for the ONE-TUBE SET*

A. G. Landres and B. J. Montyn

Part Two

READERS who have constructed the one-tube set described in last month's RADIO NEWS will naturally be interested in means of improving reception with their equipment. A one-tube receiver is obviously limited in sensitivity; that is, in the distance of stations which can be received. Adding an audio-frequency amplifier stage is one step in the direction towards better reception. The function of the audio amplifier must not be misunderstood. It amplifies the audio signals delivered by the detector, and therefore stations will sound louder. However, a station which was too weak for the detector to rectify may still be weak. The result to be expected, then, is that stations will be louder and some, which were present in the phone but too weak to be intelligible, can now be heard distinctly.

In order that the audio stage could be added easily, the chassis was designed in a special way. It is obvious that by placing another chassis next to it they can be connected together, easily, by a strip of metal fastened underneath the panel and covering the joint. An additional chassis unit, with the metal strip welded to it, is available from the same manufacturer. This need only be bolted to the original unit.

There are only very few variations possible in an audio amplifier, so this stage does not offer anything new in the way of circuit arrangement. The tube employed is a pentode, type –33, which is chosen because it will give the most amplification of any tube belonging to the two-volt series. The circuit is shown in Figure 1. The transformer primary should be connected in the place of the phones of the old unit.

Now that there are two tubes with the filaments in parallel, a filament switch has been added. It would, of course, be cumbersome to remove two tubes when the set is to be turned off. Furthermore, the filament resistor deserves some mention. In the first place, a rheostat is not employed because it offers the temptation to turn it up too high and the 2-volt tubes are so easily burned out. Therefore, a fixed series resistor is inserted, which drops the voltage from 3 volts—which is the battery voltage—to about 2.1 volts, the maximum voltage these filaments can stand. When the battery voltage drops with age, the voltage on the filament will also go down. but there is quite some leeway, because these tubes will still operate on approximately 1.7 volts. The type –33 tube takes .26 ampere and the type –30 takes .06 ampere. The total filament drain is therefore .33 ampere, and to drop the voltage approximately 1 volt, we require a 3-ohm resistance (by Ohm's law).

The audio amplifier requires a "B" battery of 135 volts and a grid-battery of 15.5 volts (with respect to the positive leg of the filament). This will require an extra wire to run along the battery cable. It will be found that the detector works better on a low plate voltage than on a high one, hence we need a second extra wire (along the cable) to tap off 22½ or 45 volts for the detector.

When the new section of the sub-base is obtained, it may be easiest to mount the parts on it and do as much wiring as possible before joining the two sections. The 5-prong socket should have its single grid terminal pointed towards the back of the chassis. Mount the switch and the new filament resistor, R3, on it. Remove the pin-jack from the old unit, but put the bolts back, for they serve to make contact to the chassis. This double pin-jack is mounted on the new unit and wires can be connected from P and SG on the socket to the terminals on the pin-jack. Also connect the condenser C5 across from chassis to the left terminal. The units can now be joined. The free terminal of R3 can be connected to F minus (see Figure 2).

Finish the filament wiring by removing the resistor on the filament socket of the old unit. Bring the green wire in the cable (which was connected to F in the old unit) and connect it to the free terminal on the switch. Now the transformer should be mounted. Before putting it in place, however, solder the red wire of the cable to the terminal marked "B" plus and run a short wire to the terminal marked P. The transformer is then screwed down as shown in Figure 2 and these wires will come on the left side. The short wire, connected to the P terminal of the transformer, connects to the choke. The secondary should now be connected to G on the socket and to a long wire which runs along the cable (let this wire be black). The resistor R4 is connected across the secondary. Another long wire (red this time) should be run along the cable to the SG terminal on (*Continued on page* 707)

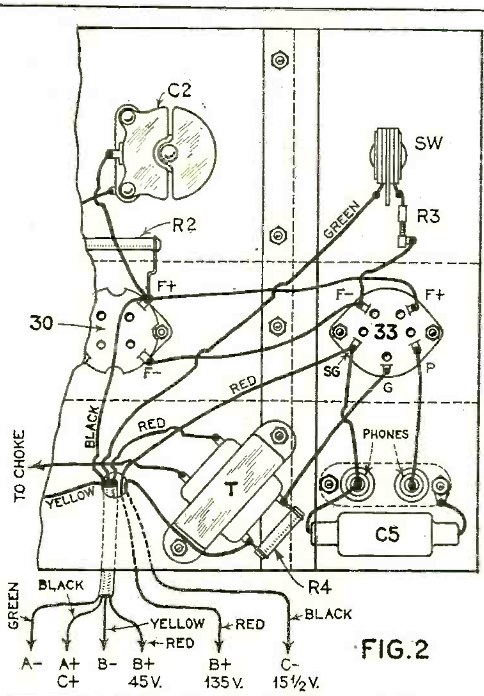


FIG.2

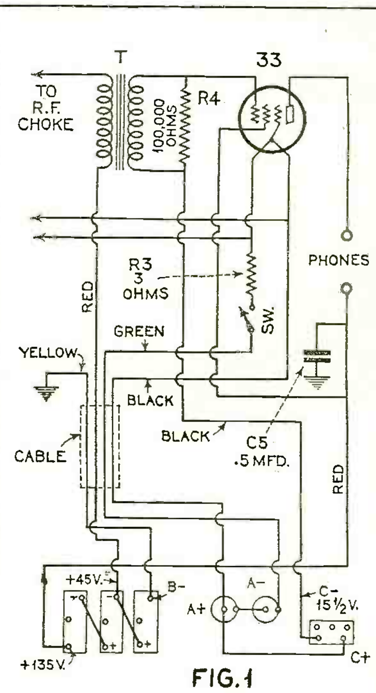
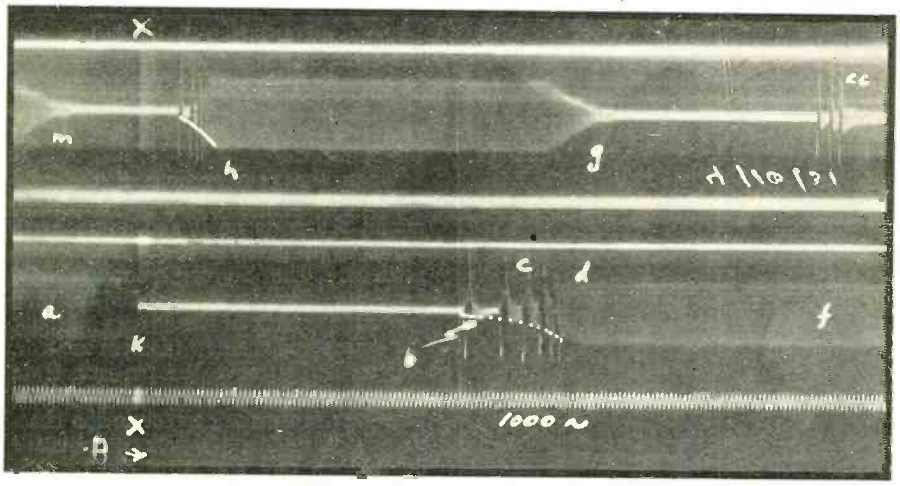


FIG.1

*See page 598, April issue.



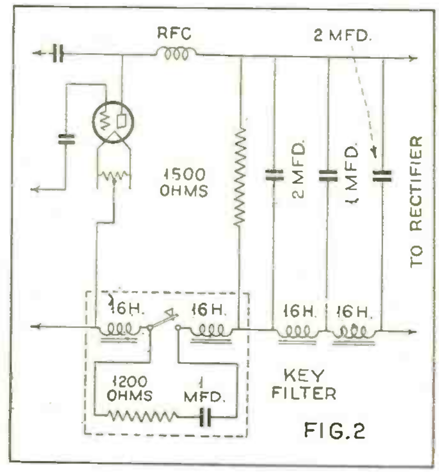
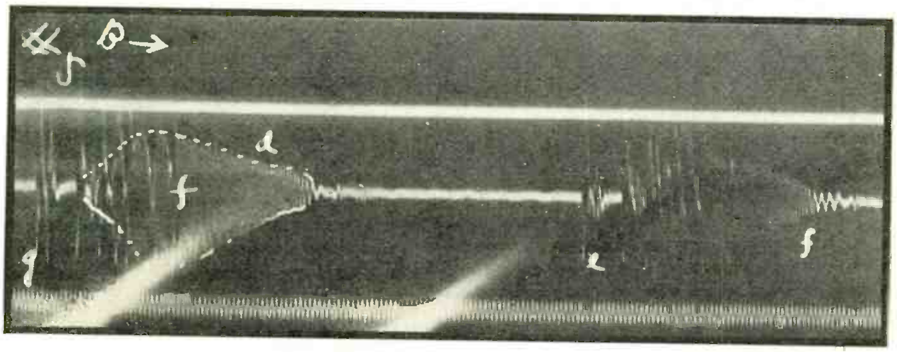


FIG. 2



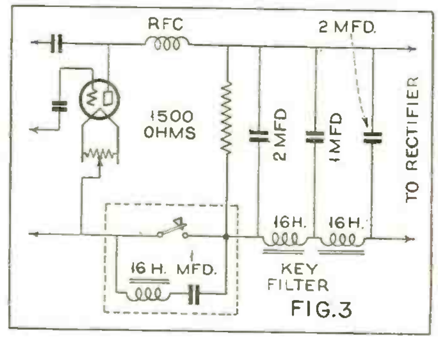
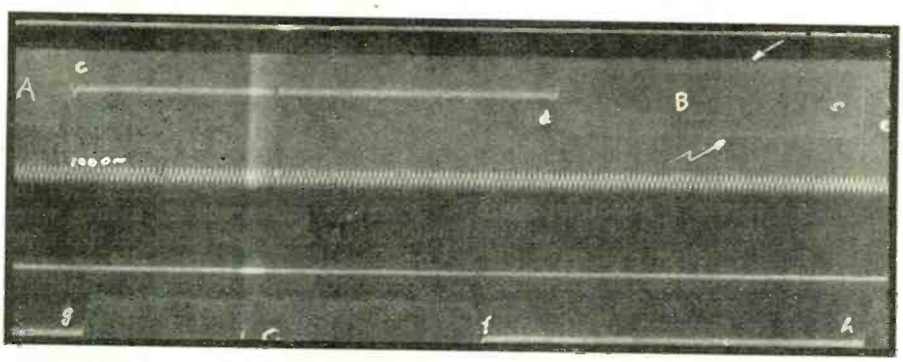


FIG. 3



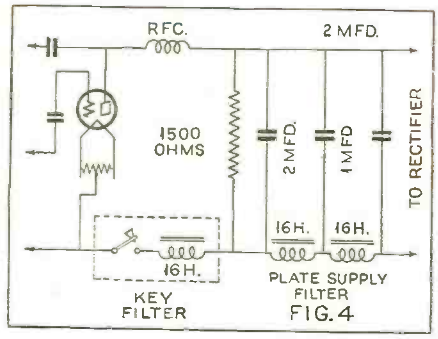
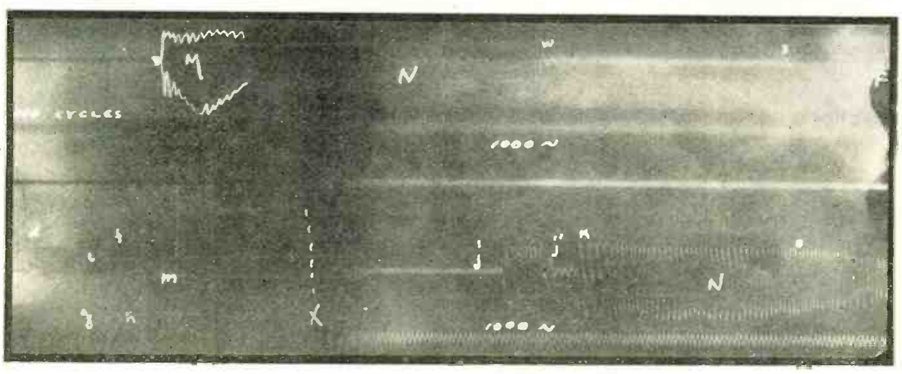


FIG. 4



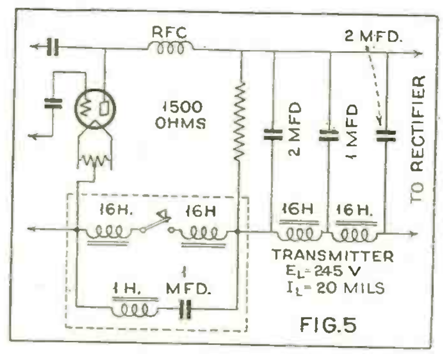
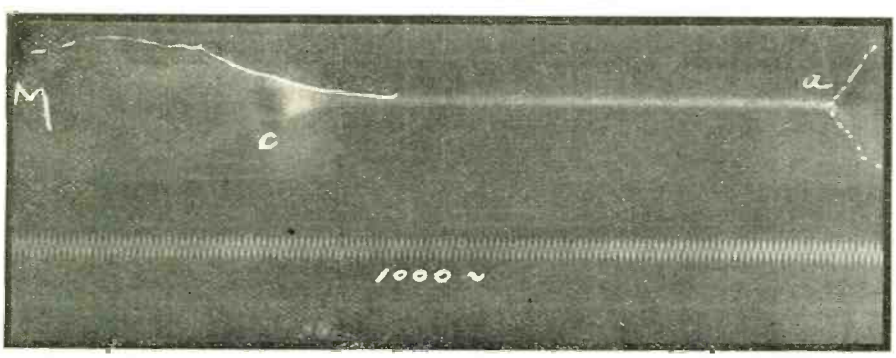


FIG. 5



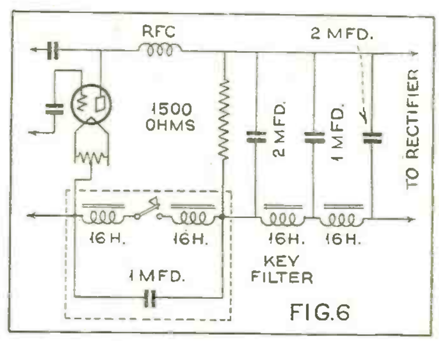


FIG. 6

Remedies for POOR NOTES *and* KEY CLICKS

The author shows the effectiveness of various key-filter circuits by means of oscillographs

Christ Kardas*

Part Three

KEY clicks and thumps are produced when suddenly applying a potential to a circuit which causes the current to build up immediately to a maximum value. They may also be produced when the circuit is opened if the current falls very quickly to zero. If inductance is inserted in the circuit, a time "lag" of the building up will result and eliminate or decrease this undesirable effect on closing the circuit. A combination of capacity and resistance will eliminate or bring to a minimum this interference quality when the key is being opened. Figure 1, Cases 1, 2 and 3, illustrate roughly some different possibilities.

When no "lag" circuit is used upon closing the key, the current suddenly rises to its maximum value and quickly drops to zero when the key is released. This condition is represented in Case 1 of Figure 1. When suitable inductance is inserted in series with the key, upon opening and closing the circuit the "lag" effect is produced and Case 2 is the pictorial illustration. If it becomes necessary to suppress arcing between the key contact points by means of a condenser and a resistance in series and shunting the key or both the key and inductance, the arrangement will give an exponential decrease of current when the key is opened. This is also a time "lag" effect and is shown in Case 3.

By placing a choke coil on each side of the key, a tapering effect at each end of the signal is produced as shown at *g* and *m* in Figure 2. In the wave, *hg*, the beginning shows a spurious oscillation, but this is due to the relay which did the keying. Its spring was not adjusted properly and therefore relay "chatter" resulted. The choke coil effect, however, can be seen from the line drawn at *h*. The "chatter" again appeared at *cc*, and by comparing it with that at the beginning of the signal *hg*, we see that both are alike.

The dotted line *b* also shows effect of the choke coil. Note the constancy of the wave's amplitude and frequency at *f*. The "lag" effect at *g* is good, but it would be better if its duration were, say, about .008 second instead of .014 second.

Figure 3 shows an oscillogram of a series of dots sent at a high rate of speed. Circuit conditions are a little different from those just discussed. That is, the resistance in series with the condenser shunting the key is now replaced by an inductance. Note in wave *f* the tapering effect produced at *d*, the end of the dot. The beginning is affected by relay "chatter" and also by a chirp. These dots were of very short duration and are shown to be about .02 second in length (not counting the time of building up and dying out).

The relay "chatter," as represented by *g* and *e*, is lasting .005 second. It occurs about (*Continued on page* 703)

* Owner and operator of short-wave amateur station W9FOK.

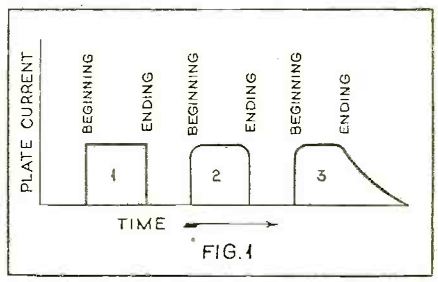


FIG. 1

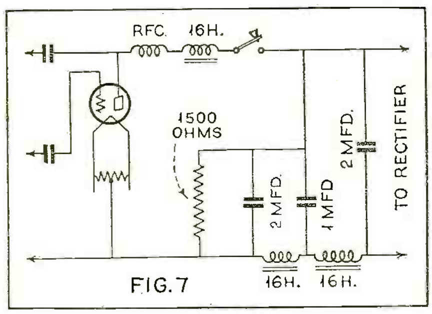
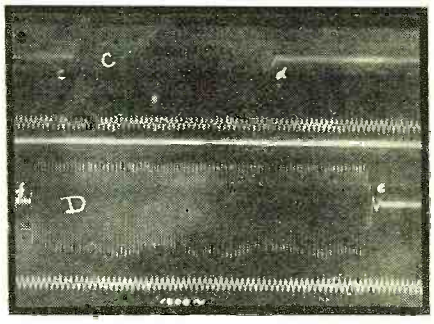


FIG. 7



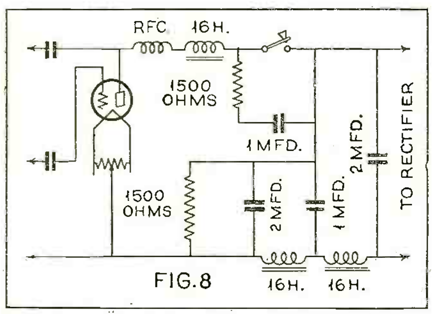
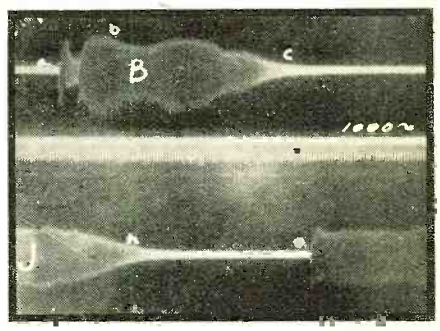


FIG. 8



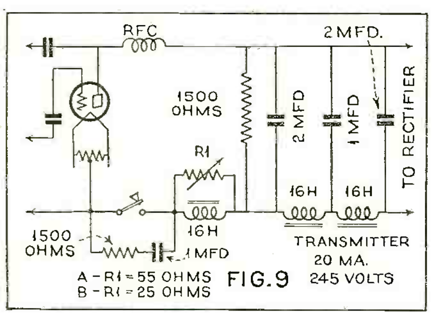
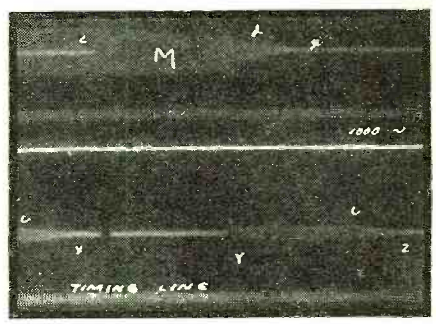


FIG. 9



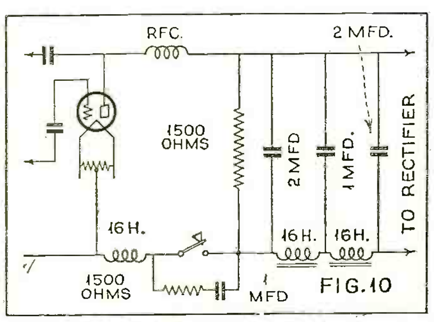
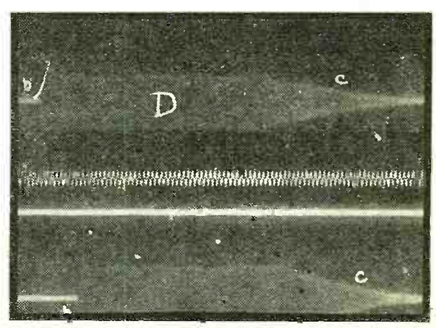
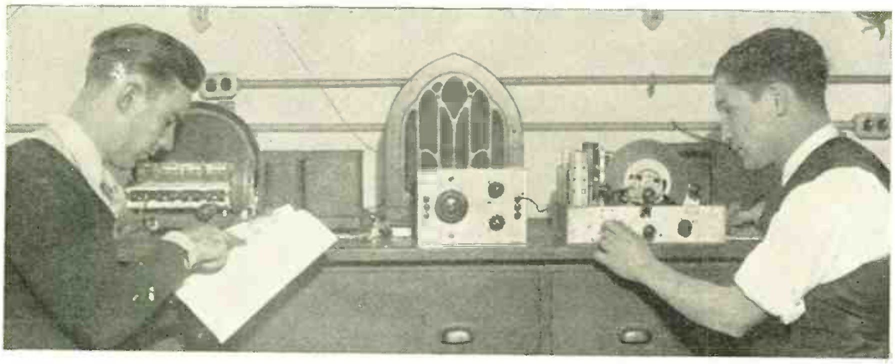


FIG. 10





THE DX CORNER

For Broadcast Waves

NOW that this department has been definitely adopted as a regular feature, the editors want to make it serve the best interests of DX listeners. Your suggestions as to the kind of material you want included will therefore be most welcome. Those desiring appointment as Official Listening Post Observers may submit their applications now. Appointments will be made on the basis of the regularity and usefulness of reports submitted during the next three or four months. These reports should include records of stations received, information concerning changes in station listings, or any other type of information which will be helpful to other DX'ers.

It is suggested that all reports and contributions to this department be mailed in time to reach this office by the twenty-fifth of each month.

AT the time of going to press numerous reports covering reception during the month of February have been received from readers. Many of the reports emphasize the poor reception conditions during a good part of the month, although these reports do not all agree as to part of the month when reception was good or bad. The "Globe Circler," bulletin of the International DX'ers Alliance, reports: "Reception was generally good during the first part of February, with good DX almost general. However, during the latter part of the month static and poor reception have been almost universal." C. H. Long, Missouri, reports that he has found conditions generally poor during the month, although on a few days reception was good. Dudley Atkins, III, also reporting on conditions in Missouri, found conditions bad during the first half of the month but that they started to clear up around the middle of the month. H. E. Rebensdorf, Harvard, Illinois, gets right down to dates: "February 2, 3, 4, 5 and 7 were fairly good DX days, but the rest of the month conditions were unfavorable. February 1, 6 and 11 were the worst, static being so bad on the two latter days that reception from stations 100 miles distant was completely broken up."

To indicate that this condition was not limited to the midwest, a card from W. N. Bird, of Flora Park (Long Island), N. Y., laments the "terrible falling off" in DX reception during the first three weeks of February. During this time he could scarcely bring in WLW and WGN at hours when he could normally expect good reception from the entire country, including the west coast. In the RADIO NEWS tests, in and around New York City, during the month conditions were found to be poor except for an occasional night.

The generally poor conditions were in all likelihood traceable to the stormy conditions experienced over a large part of the country during the month. In New York City, for instance, the average daily temperature was 10 degrees below normal for the month, according to the Weather Bureau reports, and there were two unusually heavy snowfalls. This continued cold weather would ordinarily be expected to produce good DX reception—not so much because of the extreme cold but because of the constancy of the temperature. However, the low and high pressure areas in other parts of the country have seemingly a powerful effect on DX signals crossing their paths and the prevalence of stormy weather including tornados, floods, blizzards and cold waves throughout a great part of the U. S. apparently threw up barriers which could not be traversed by radio signals on the broadcast band, thereby offsetting the advantage of the steady cold weather along the Atlantic coast.

Perhaps the strangest condition of all was reported by W. H. Boatman, of Atoka, Okla. His letter is quoted:

"The following conditions existed here Friday evening, February 16th, from 6:00 p.m., C.S.T. until 10:00 p.m., C.S.T.

"All broadcast stations operating between 540 and 800 kc. north of a straight line running from Raleigh, N. C., to Bakersfield, California, were dead. Not even their carrier wave could be received. High powered stations such as WGY, WBBM, WJZ, WGN, WLW, WEAF, WMAQ and others received regularly with good volume were dead. On the other hand stations south of this line came in with extra volume. Stations with low power on the Atlantic and Gulf coasts that had never been received before came in with good volume, having no interference from northern stations. Low power Mexican stations that could not be received before came in with good volume. These stations operate on split frequencies and have always been crowded out by the northern stations.

"Shortly after 10:00 p.m., C.S.T., this condition began to clear up and the northern stations came through.

"I would like an answer explaining what caused this unusual condition if it is possible to explain it."

The answer to this inquiry might possibly be found in an examination of weather maps for that day and for a few days preceding and following that date, to determine the movement of pressure areas. However, with the relatively limited general knowledge now existing as to the exact effect of these areas on radio reception, any indications obtained from such a study might be quite inconclusive so far as this particular freak occurrence is concerned.

Pan-American DX Specials

April 14 is Pan-American day and is being celebrated by a large number of central and south American broadcast-band and short-wave stations. This celebration will take the form of special DX broadcasts. Unfortunately, however, the plans at the date of this writing have not matured sufficiently to permit definite announcements here, with one exception. Information comes through the International DX'ers Alliance that YV1BC, 960 kc., 5 kw., of Caracas, Venezuela, will be on the air with a special program from 9 to 10 p.m., E.S.T.

DX Tips Broadcasts

Regular weekly broadcasts of DX tips can be heard by tuning in KDKA, 980 kc., between 11:30 and 12:00, C.S.T. Sunday night; KFOX, Long Beach, Calif., 1250 kc., between 2:00 and 2:10 a.m., C.S.T., Sundays; or WIND, Gary, Ind., 560 kc., 2:50 to 3:00 a.m., C.S.T., Saturdays.

Robert Rosenberger is writing the continuities for the last program and would like to have comments from listeners as to whether these programs meet with their approval. Such comments may be addressed to him in care of station WIND.

DX fans will find it worth while to tune in these programs for the helpful information they provide.

The Grounded Antenna

Several letters have come in from readers who are employing the "Calavan" antenna described in the March DX Corner. These letters indicate that this antenna system is a real "go-getter" so far as DX stations are concerned. Robert Rosenberger refers to it as "the greatest possible boon to an ardent DX'er." Mr. Rosenberger goes on to suggest that additional items be included in the DX Corner from time to time, describing unusual and effective antennas. This in an excellent idea and readers who have antennas which they have found especially effective are invited to send in descriptions for the benefit of other fans. Of equal, if not greater, interest will be information concerning effective antenna tuning systems. The "Tenatuner" described in the February issue of RADIO NEWS has been commented upon very favorably by a number of readers who have constructed duplicates. Its only drawback has been that it does not function when employed with a receiver which, instead of the ordinarily loosely coupled antenna coil, employs a choke or resistance input. This type of input offers such a high resistance in the antenna circuit that series tuning is ineffective. Has anyone worked out a system for tuning the antenna when used with receivers of this type.

DX in a New York Suburb

Following is a complete report submitted by R. H. Tomlinson, Port Chester, N. Y. This is what the editors consider an excellent sort of report—pithy and to the point:

"The following information on reception of broadcast band stations may be of help to other DX'ers in this part of Westchester County, N. Y. All stations received on a Majestic model 101, using inside antenna, also loop at times. Reception all on loudspeaker.

"'Poste Parisien' on 959 kc. is heard here nearly every morning at 2:10 a.m. (E.S.T.). They come on the air with a blare of trumpets. Announcements are 'allo allo, ici Poste Parisien'.

"LR5 on 830 kc. can be heard between 9 and 10 p.m. when KOA fades. Announces as 'Radio Excelsior'.

"LR3, on 950 kc., comes in at 6 a.m. daily. Heard with good volume until

6:30 a.m. LR4 on 990 kc. can be heard best around 10 p.m. when WBZ is fading. Announcements are 'Radio Splendid'. Last three stations are in Buenos Aires.

"Fecamp 'Radio Normandie' on 1328 kc., heard here best from 2:30 to 3 a.m.; good volume but fades badly.

"Berlin on 841 kc. and Hamburg on 840 kc. heard the past week at 1 a.m. Both fade badly and are interfered with by American stations.

Milan on 814 kc. Heard twice at 1:50 a.m.; good volume but fades badly.

"Toulouse on 895 kc. heard once at 2:05 a.m. Fades badly.

"The Australians are just audible. KGU and 2YA heard but static too heavy. Trans-pacific and most trans-atlantic reception poor so far this season. A slight improvement is noticed on the French stations during the past week. The Japs are not heard. South Americans falling off slightly."

Automobile Receiver DX

H. E. Rebensdorf, Harvard, Ill., apparently is not lacking in ingenuity, judging from his letter, quoted herewith:

"When your magazine started with this DX Corner and gave the schedules of the early morning broadcasts I didn't have what I considered a suitable receiver so about Christmas time I took out the set that I had in my car and started to DX with that. Up to date I have received 316 stations with it, using it upstairs in my room with a 20 foot aerial—that is 20 feet of wire strung around the room for an aerial. These include 27 stations in California, 1 in Honolulu, 2 in British Columbia, 1 in New Brunswick, 4 in Oregon, 8 in Washington, 5 in Mexico, 10 in Canada, etc."

The above offers a practical suggestion to those who have radio-equipped cars laid up for the winter. Many present-day auto radio sets are extremely sensitive and offer the advantage that almost any piece of wire will serve as an adequate antenna. The power supply offers no problem because the storage battery can be removed from the car also.

Mr. Renensdorf is another fan who thinks highly of the "Calavan" antenna idea. He is going to try it out and suggests that "airplanes hadn't better try to land around here after next week or they'll get tangled up plenty in aerial wire strung all over the vicinity."

Society of Wireless Pioneers

Announcement of the forming of this new organization was made last month, and a promise of more information to come in the present issue. The following is a letter received from M. Mickelson who is organizing the society under the sponsorship of the International DX'ers Alliance:

"This society is being organized for the sole purpose of banding together 'Pioneers' in high-frequency work, men and women who have devoted at least ten years prior to 1934 to experimentation, operating, engineering, amateur experimentation or reception.

"Our plans at this time are to organize local chapters, devote at least two pages of the Globe Circler to our activities (This publication was chosen as the Official Organ due to its International circulation), do a considerable bit of reminiscing, contact fellow workers with whom we have lost contact, and form a fraternal organization of strictly Pioneers, second to none. The entrance requirements are rather stringent, and all enrollment applications will be thoroughly scrutinized, and investigated before membership is granted.

"To date we have contacted representatives in nearly every civilized country of the Universe, and the enthusiasm with which this movement is being received, leads me to believe that our embryo organization is destined to meet with universal approval."

The Editors of RADIO NEWS feel that there is a definite place for an organization such as this. As a result both the Editor and the Managing Editor have applied for membership, both being qualified through radio activities dating back over a period of approximately 25 years to the time when there was no distinction between short waves and long waves. If you owned a transmitter in those days you didn't worry about the wavelength. You didn't know or care what it was. You used anything from an ordinary buzzer to a 5 kw. "rock-crusher" to power the transmitter and so long as you didn't "jam" a navy yard or other government station there were no limitations imposed either in power or wavelength. (*Evidently mention of the S.W.P. has started the writer reminiscing—The Editors.*)

Old timers who are interested in hooking-up with this new outfit can obtain further information by addressing Mr. Mickelson at 3229 Bloomington Avenue, Minneapolis, Minn.

Shoot for These

The I. D. A. "Globe Circler" offers a list of stations to try for. This list is passed along here for the benefit of those who want to try their hands at trans-atlantic reception. The hours given are Central Standard Time and indicate the time at which these stations start their daily broadcasts except LR4, which starts at this hour on Sunday morning only.

Call	*Location*	*Freq.*	*Kw.*	*Hour*
	Berlin (Tegel) Ger.	841	100	11:00 p.m.
	Beromunster, Switzerland	556	60	11:00 p.m.
	Hamburg, Germany	904	100	11:00 p.m.
	Langenburg, Ger.	658	60	11:00 p.m.
	Warsaw, Poland	1304 m.	120	12:00 n.
SBA	Stockholm, Sweden	704	55	12:20 a.m.
1IRO	Rome, Italy	713	50	12:46 a.m.
1ITO	Turin, Italy	1140	7	12:45 a.m.
P.P.	Paris, France 'Post Parisien'	959	100	1:10 a.m.
	Fecamp, France 'Radio Normandie'	1456	10	1:15 a.m.
	Lyons (La-Doua) France	648	15	1:45 a.m.
LR4	Buenos Aires, Argentina	990	20	5:40 a.m.

New Jersey—Hear! Hear!

Jack B. Schneider of Garwood, N. J., has been DX'ing more or less seriously and has an enviable record to show for it. He writes as follows:

"Have logged 780 stations and have specific verifications for 651 of them. Many of those not verified have been eliminated by the Federal Radio Commission.

"Whoever would have thought, six years ago, that it would be possible to hear 15-watt stations 1600 miles away from the point of my log. 10AB (now CHAB), Moose Jaw, Sask., 1200 kc., 15 watts, and 10AT (now CHAT), Trail, B. C., 25 watts, 1155 kc., are the two stations. Other small-power stations over 1500 miles miles from my location are: 100-watters, KDB, KREG, KXO, KPJM, KERN, KFXD, XEFV, all verified. Other stations of various power, over 2000 miles distant, include LR5, Buenos Aires; RUS, San Salvador; HJN, Bogota! YV1BC, Caracas; Frankfurt-am-Main and Heislberg, both in Germany, and Poste Parisien, France. All of these are the broadcast band of 540 to 1500 kc.

"The following statistics may be of interest to the readers of your DX Corner: Mexican heard, 28; California, 33; Oregon, 8; Nevada, 1; Arizona, 4; Washington, 9; Alberta (Canada), 4; British Columbia, 1. All, with the exception of several Mexicans, are over 2000 miles away.

"I use 100 feet of ship wire running north-south, 125 feet enameled wire east-west for aerials and a common steam radiator for ground."

Montana Speaks Up

Probably somewhat piqued by the numerous reports from Californians in the past issue or two, K. E. Pouder of Fort Benton, Montana, takes up the cudgels for his state:

"I have read your publication for many years but haven't seen Montana mentioned very often. So, am going to give the boys something to shoot at.

"I have a 1930 seven-tube Victor Model R-15 and an aerial 170 feet long and 60 feet high. My ground is a size 0 copper wire stuck into the ground about 4 feet.

"The following stations were received between November 1 and today (February 3): Every station in U. S., Canada and Mexico over 1000 watts, 86 of 1000 watts, 61 of 500 watts and 73 more down to 50 watts. WMMN, WOMT, WTAX, WWAE, WGL, XEA, XEL, XETA, XEC, XFC and XEY (a 10 watter) are some of the small ones. Daytime reception: WCCO, KFI, KSL, KYW, WENR, KVOO, KGA and several others almost every day. Have received WJZ and WABC from 3 p.m. on (local time) several occasions.

Foreign

LR4	Buenos Aires	990 kc.	Fair
H1JK	Santo Domingo	1180 kc.	Fair
KGU	Honolulu	750 kc.	Good (2 or 3 times a week)
RW35	Astrakhan, U.S.S.R.	590 kc.	Fair
2YA-3YA	New Zealand		Fair

Australia—2CO (good) 2GB, 2BL, 2FC, 3LO, 3AR, 4RK, 4QG (good), 5CK (good) 7ZL

Japan—JFAK, JFBK, JOAK1, JOAK2, JOBK, JOCK1, JOCK2 (1175 kc.), JODK1, JODK2, JOGK, JOFK, JOHK, JOIK, JOJK, JOKK, JONK, JOOK, JOPK, JOQK, JOSK, JOVK and JQAK. First 14 of these came in vermy loud.

China—XGOA, Nanking, loud; XGOD, Hangchow, faint.

Alaska—KGBU, Ketchikan, fair.

Manila, P. I.—KZRM, good.

"Most of these come in best between 2:30 a.m. and 5 a.m.

"Would like to inform you that the new Crosley transmitter, W8XO, roars in here, louder than any other station except XER. W8XO is also right on his frequency and does not blanket either 690 or 710.

"Am going to put new tubes in my receiver some day and get a little DX out of it."

The WLW 500,000-Watt Transmitter

The consensus of opinion concerning the new Crosley transmitter seems to indicate that it is getting out in fine shape. Numerous reports coming into the DX Corner state that the field strength of W8XO (the experimental call under which this transmitter is operated) is much greater than that of the present 50 kw. transmitter employed by WLW. W. R. Gurley, Munhall, Pa., a suburb of Pittsburgh, reports that the old WLW transmitter suffered badly from fading in his locality and that while the new transmitter fades some, its signals are still well above the noise level when they fade to their minimum strength. A receiver equipped with automatic volume control can hold the new signals steady, whereas the signals from the old transmitter would fade down to the noise level or lower.

Reports from both the east and west coasts show great volume on W8XO's signals, and general freedom from fading. Reports are also coming in from foreign countries indicating that the new trans-

(*Continued on page 698*)

BROADCASTING STATIONS IN THE U. S.

Alphabetically by Call Letters, Location, Frequency and Power

Compiled by John M. Borst

Call	Location	Kilocycles	Watts
KABC	San Antonio, Texas	1420	100
KALE	Portland, Ore.	1300	500
KARK	Little Rock, Ark.	890	250
KASA	Elk City, Okla.	1210	100
KBPS	Portland, Ore.	1420	100
KBTM	Jonesboro, Ark.	1200	100
KCMC	Texarkana, Ark.	1420	100
KCRC	Enid, Okla.	1370	100
KCRJ	Jerome, Ariz.	1310	100
KDB	Santa Barbara, Calif.	1500	100
KDFN	Casper, Wyo.	1440	500
KDKA	Pittsburgh, Pa.	980	50000
KDLR	Devils Lake, N. D.	1210	100
KDYL	Salt Lake City, Utah	1290	1000
KECA	Los Angeles, Calif.	1430	1000
KELW	Burbank, Calif.	780	500
KERN	Bakersfield, Calif.	1200	100
KEX	Portland, Ore.	1150	5000
KFAB	Lincoln, Nebr.	770	5000
KFAC	Los Angeles, Calif.	1300	1000
KFBB	Great Falls, Mont.	1280	1000
KFBI	Abilene, Kans.	1050	5000
KFBK	Sacramento, Calif.	1310	100
KFBL	Everett, Wash.	1370	50
KFDM	Beaumont, Texas	560	500
KFDY	Brookings, S. D.	550	500
KFEL	Denver, Colo.	920	500
KFEQ	St. Joseph, Mo.	630	2500
KFGQ	Boone, Iowa	1310	100
KFH	Wichita, Kans.	1300	1000
KFI	Los Angeles, Calif.	640	50000
KFIO	Spokane, Wash.	1120	100
KFIZ	Fond du Lac, Wis.	1420	100
KFJB	Marshalltown, Iowa	1200	100
KFJI	Klamath Falls, Ore.	1210	100
KFJM	Grand Forks, N. D.	1370	100
KFJR	Portland, Ore.	1300	500
KFJZ	Fort Worth, Texas	1370	100
KFKA	Greeley, Colo.	880	500
KFKU	Lawrence, Kans.	1220	500
KFLV	Rockford, Ill.	1410	500
KFNF	Shenandoah, Iowa	890	500
KFOR	Lincoln, Nebr.	1210	100
KFOX	Long Beach, Calif.	1250	1000
KFPL	Dublin, Texas	1310	100
KFPM	Greenville, Texas	1310	15
KFPW	Fort Smith, Ark.	1210	100
KFPY	Spokane, Wash.	1340	1000
KFQD	Anchorage, Alaska	600	250
KFRC	San Francisco, Calif.	610	1000
KFRU	Columbia, Mo.	630	500
KFSD	San Diego, Calif.	1000	600
KFSG	Los Angeles, Calif.	1120	500
KFUO	St. Louis, Mo.	550	500
KFVD	Los Angeles, Calif.	1000	250
KFVS	Cape Girardeau, Mo.	1210	100
KFWB	Hollywood, Calif.	950	1000
KFWI	San Francisco, Calif.	930	500
KFXD	Nampa, Idaho	1200	100
KFXF	Denver, Colo.	920	500
KFXJ	Grand Junction, Colo.	1200	100
KFXM	San Bernardino, Calif.	1210	100
KFXR	Oklahoma City, Okla.	1310	100
KFYO	Lubbock, Texas	1310	100
KFYR	Bismarck, N. D.	550	1000
KGA	Spokane, Wash.	1470	5000
KGAR	Tucson, Ariz.	1370	100
KGB	San Diego, Calif.	1330	1000
KGBU	Ketchikan, Alaska	900	500
KGBX	Springfield, Mo.	1310	100
KGBZ	York, Nebr.	930	500
KGCA	Decorah, Iowa	1270	100
KGCR	Watertown, S. D.	1210	100
KGCU	Mandan, N. D.	1240	250
KGCX	Fergus Falls, Minn.	1200	100
KGDM	Stockton, Calif.	1100	250
KGDY	Huron, S. D.	1340	250
KGEK	Yuma, Colo.	1200	100
KGER	Long Beach, Calif.	1360	1000
KGEZ	Kalispell, Mont.	1310	100
KGFF	Shawnee, Okla.	1420	100
KGFG	Oklahoma City, Okla.	1370	100
KGFI	Corpus Christi, Texas	1500	100
KGFJ	Los Angeles, Calif.	1200	100
KGFK	Moorhead, Minn.	1500	100
KGFL	Roswell, N. M.	1370	100
KGFW	Kearney, Nebr.	1310	100
KGFX	Pierre, S. D.	630	100
KGGC	San Francisco, Calif.	1420	100
KGGF	Coffeyville, Kans.	1010	500
KGGM	Albuquerque, N. M.	1230	250
KGHF	Pueblo, Colo.	1230	250
KGHI	Little Rock, Ark.	1200	250
KGHL	Billings, Mont.	950	1000
KGIR	Butte, Mont.	1360	1000
KGIW	Alamosa, Colo.	1420	100
KGIX	Las Vegas, Nev.	1420	100

Call	Location	Kilocycles	Watts
KGKB	Tyler, Texas	1500	100
KGKL	San Angelo, Texas	1370	100
KGKO	Wichita Falls, Texas	570	250
KGKY	Scottsbluff, Nebr.	1500	100
KGMB	Honolulu, T. H.	1320	250
KGNF	North Platte, Nebr.	1430	500
KGNO	Dodge City, Kans.	1340	250
KGO	San Francisco, Calif.	790	7500
KGRS	Amarillo, Texas	1410	1000
KGU	Honolulu, T. H.	750	2500
KGVO	Missoula, Mont.	1200	100
KGW	Portland, Ore.	620	1000
KGY	Olympia, Wash.	1210	100
KHJ	Los Angeles, Calif.	900	1000
KHQ	Spokane, Wash.	590	1000
KICA	Clovis, N. M.	1370	100
KICK	Carter Lake, Iowa	1420	100
KID	Idaho Falls, Idaho	1320	250
KIDO	Boise, Idaho	1350	1000
KIDW	Lamar, Colo.	1420	100
KIEM	Eureka, Calif.	1210	100
KIEV	Glendale, Calif.	850	100
KIFH	Juneau, Alaska	1310	100
KIT	Yakima, Wash.	1310	100
KJBS	San Francisco, Calif.	1070	100
KJB	Seattle, Wash.	970	5000
KLCN	Blytheville, Ark.	1290	100
KLO	Ogden, Utah	1400	500
KLPM	Minot, N. D.	1240	250
KLRA	Little Rock, Ark.	1390	1000
KLS	Oakland, Calif.	1440	250
KLUF	Galveston, Texas	1370	100
KLX	Oakland, Calif.	880	1000
KLZ	Denver, Colo.	560	1000
KMA	Shenandoah, Iowa	930	500
KMAC	San Antonio, Texas	1370	100
KMBC	Kansas City, Mo.	950	1000
KMED	Medford, Ore.	1310	100
KMJ	Fresno, Calif.	580	500
KMLB	Monroe, La.	1200	100
KMMJ	Clay Center, Nebr.	740	1000
KMO	Tacoma, Wash.	1330	250
KMOX	St. Louis, Mo.	1090	50000
KMPC	Beverly Hills, Calif.	710	500
KMTR	Hollywood, Calif.	570	500
KNOW	Austin, Texas	1500	100
KNX	Hollywood, Calif.	1050	25000
KOA	Denver, Colo.	830	12500
KOAC	Corvallis, Ore.	550	1000
KOB	Albuquerque, N. M.	1180	10000
KOCW	Tulsa, Okla.	1400	250
KOH	Reno, Nevada	1380	500
KOIL	Council Bluffs, Iowa	1260	1000
KOIN	Portland, Ore.	940	1000
KOL	Seattle, Wash.	1270	1000
KOMA	Oklahoma City, Okla.	1480	5000
KOMO	Seattle, Wash.	920	1000
KONO	San Antonio, Texas	1370	100
KOOS	Marshfield, Ore.	1370	100
KORE	Eugene, Ore.	1420	100
KOY	Phoenix, Ariz.	1390	1000
KPCB	Seattle, Wash.	650	100
KPJM	Prescott, Ariz.	1500	100
KPO	San Francisco, Calif.	680	50000
KPOF	Denver, Colo.	880	500
KPPC	Pasadena, Calif.	1210	50
KPQ	Wenatchee, Wash.	1500	100
KPRC	Houston, Texas	920	1000
KQV	Pittsburgh, Pa.	1380	500
KQW	San Jose, Calif.	1010	500
KRE	Berkeley, Calif.	1370	100
KREG	Santa Ana, Calif.	1500	100
KRGV	Harlingen, Texas	1260	500
KRKD	Los Angeles, Calif.	1120	500
KRLD	Dallas, Texas	1040	10000
KRMD	Shreveport, La.	1310	100
KROW	Oakland, Calif.	930	500
KRSC	Seattle, Wash.	1120	100
KSAC	Manhattan, Kans.	580	500
KSCJ	Sioux City, Iowa	1330	1000
KSD	St. Louis, Mo.	550	500
KSEI	Pocatello, Idaho	890	250
KSL	Salt Lake City, Utah	1130	50000
KSO	Des Moines, Iowa	1370	100
KSOO	Sioux Falls, S. D.	1110	1000
KSTP	St. Paul, Minn.	1460	10000
KSUN	Lowell, Ariz.	1200	100
KTAB	San Francisco, Calif.	560	1000
KTAR	Phoenix, Ariz.	620	500

Call	Location	Kilocycles	Watts
KTAT	Fort Worth, Texas	1240	1000
KTBS	Shreveport, La.	1450	1000
KTFI	Twin Falls, Idaho	1240	1000
KTHS	Hot Springs, Ark.	1040	10000
KTM	Los Angeles, Calif.	780	500
KTRH	Houston, Texas	1120	1000
KTSA	San Antonio, Texas	1290	1000
KTSM	El Paso, Texas	1310	100
KTW	Seattle, Wash.	1220	1000
KUJ	Walla Walla, Wash.	1370	100
KUMA	Yuma, Ariz.	1420	100
KUOA	Fayetteville, Ark.	1260	1000
KUSD	Vermillion, S. D.	890	500
KVI	Tacoma, Wash.	570	500
KVL	Seattle, Wash.	1370	100
KVOA	Tucson, Ariz.	1260	500
KVOO	Tulsa, Okla.	1140	25000
KVOR	Colorado Springs, Colo.	1270	1000
KVOS	Bellingham, Wash.	1200	100
KWCR	Cedar Rapids, Iowa	1420	100
KWEA	Shreveport, La.	1210	100
KWFV	Hilo, Hawaii	1210	100
KWG	Stockton, Calif.	1200	100
KWJJ	Portland, Ore.	1060	500
KWK	St. Louis, Mo.	1350	1000
KWKC	Kansas City, Mo.	1370	100
KWKH	Shreveport, La.	850	10000
KWLC	Decorah, Iowa	1270	100
KWSC	Pullman, Wash.	1220	1000
KWTO	Springfield, Mo.	560	500
KWWG	Brownsville, Texas	1260	500
KXA	Seattle, Wash.	760	250
KXL	Portland, Ore.	1420	100
KXO	El Centro, Calif.	1500	100
KXRO	Aberdeen, Wash.	1310	100
KXYZ	Houston, Texas	1440	250
KYA	San Francisco, Calif.	1230	1000
KYW	Chicago, Ill.	1020	10000
KZRM	Manila, P. I.	618.5	50000
NAA	Arlington, Va.	690	1000
WAAB	Boston, Mass.	1410	500
WAAF	Chicago, Ill.	920	500
WAAT	Jersey City, N. J.	940	500
WAAW	Omaha, Nebr.	660	500
WABC	New York, N. Y.	860	50000
WABI	Bangor, Me.	1200	100
WACO	Waco, Texas	1420	100
WADC	Akron, Ohio	1320	1000
WAGM	Presque Isle, Me.	1420	100
WAIU	Columbus, Ohio	640	500
WALR	Zanesville, Ohio	1210	100
WAMC	Anniston, Ala.	1420	100
WAML	Laurel, Miss.	1310	100
WAPI	Birmingham, Ala.	1140	5000
WARD	Brooklyn, N. Y.	1400	500
WASH	Grand Rapids, Mich.	1270	500
WAVE	Louisville, Ky.	940	1000
WAWZ	Zarepath, N. J.	1350	250
WAZL	Hazleton, Pa.	1420	100
WBAA	West Lafayette, Ind.	1400	500
WBAK	Harrisburg, Pa.	1430	1000
WBAL	Baltimore, Md.	1060	10000
WBAP	Fort Worth, Texas	800	50000
WBAX	Wilkes-Barre, Pa.	1210	100
WBBC	Brooklyn, N. Y.	1400	500
WBBL	Richmond, Va.	1210	100
WBBM	Chicago, Ill.	770	25000
WBBR	Brooklyn, N. Y.	1300	1000
WBBX	New Orleans, La.	1200	100
WBBZ	Ponca City, Okla.	1200	100
WBCM	Bay City, Mich.	1410	500
WBEN	Buffalo, N. Y.	900	1000
WBEO	Marquette, Mich.	1310	100
WBHS	Huntsville, Ala.	1200	100
WBIG	Greensboro, N. C.	1440	500
WBNX	New York, N. Y.	1350	250
WBOQ	See WABC		
WBOW	Terre Haute, Ind.	1310	100
WBRC	Birmingham, Ala.	930	500
WBRE	Wilkes-Barre, Pa.	1310	100
WBSO	Babson Park, Mass.	920	500
WBT	Charlotte, N. C.	1080	50000
WBTM	Danville, Va.	1370	100
WBZ	Boston, Mass.	990	50000
WBZA	Springfield, Mass.	990	1000
WCAC	Storrs, Conn.	600	250
WCAD	Canton, N. Y.	1220	500
WCAE	Pittsburgh, Pa.	1220	1000
WCAH	Columbus, Ohio	1430	500
WCAL	Northfield, Minn.	1250	1000
WCAM	Camden, N. J.	1280	500
WCAO	Baltimore, Md.	600	250

Call	Location	Kilocycles	Watts
WCAP	Asbury Park, N. J.	1280	500
WCAT	Rapid City, S. D.	1200	100
WCAU	Philadelphia, Pa.	1170	50000
WCAX	Burlington, Vt.	1200	100
WCAZ	Carthago, Ill.	1070	50
WCBA	Allentown, Pa.	1440	250
WCBD	Zion, Ill.	1080	5000
WCBM	Baltimore, Md.	1370	100
WCBS	Springfield, Ill.	1210	100
WCCO	Minneapolis, Minn.	810	50000
WCFL	Chicago, Ill.	970	1500
WCKY	Covington, Ky.	1490	5000
WCLO	Janesville, Wis.	1200	100
WCLS	Joliet, Ill.	1310	100
WCNW	Brooklyn, N. Y.	1500	100
WCOA	Pensacola, Fla.	1340	500
WCOC	Meridian, Miss.	880	500
WCRW	Chicago, Ill.	1210	100
WCSC	Charleston, S. C.	1360	500
WCSH	Portland, Me.	940	1000
WDAE	Tampa, Fla.	1220	1000
WDAF	Kansas City, Mo.	610	1000
WDAG	Amarillo, Texas	1410	1000
WDAH	El Paso, Texas	1310	100
WDAS	Philadelphia, Pa.	1370	100
WDAY	Fargo, N. D.	940	1000
WDBJ	Roanoke, Va.	930	500
WDBO	Orlando, Fla.	580	250
WDEL	Wilmington, Del.	1120	250
WDEV	Waterbury, Vt.	550	500
WDGY	Minneapolis, Minn.	1180	1000
WDOD	Chattanooga, Tenn.	1280	1000
WDRC	Hartford, Conn.	1330	1000
WDSU	New Orleans, La.	1250	1000
WDZ	Tuscola, Ill.	1070	100
WEAF	New York, N. Y.	660	50000
WEAN	Providence, R. I.	780	500
WEBC	Superior, Wis.	1290	1000
WEBQ	Harrisburg, Ill.	1210	100
WEBR	Buffalo, N. Y.	1310	100
WEDC	Chicago, Ill.	1210	100
WEED	Greenville, N. D.	1420	100
WEEI	Boston, Mass.	590	1000
WEEU	Reading, Pa.	830	1000
WEHC	Charlottesville, Va.	1350	500
WEHS	Cicero, Ill.	1420	100
WELL	Battle Creek, Mich.	1420	50
WENC	Albany, Ga.	1420	100
WENR	Chicago, Ill.	870	50000
WESG	Elmira, N. Y.	1040	1000
WEVD	New York, N. Y.	1300	500
WEW	St. Louis, Mo.	760	1000
WEXL	Royal Oak, Mich.	1310	50
WFAA	Dallas, Texas	800	50000
WFAB	New York, N. Y.	1300	1000
WFAM	South Bend, Ind.	1200	100
WFAS	White Plains, N. Y.	1210	100
WFBC	Greenville, S. C.	1200	100
WFBE	Cincinnati, Ohio	1200	100
WFBG	Altoona, Pa.	1310	100
WFBL	Syracuse, N. Y.	1360	1000
WFBM	Indianapolis, Ind.	1230	1000
WFBR	Baltimore, Md.	1270	500
WFDF	Flint, Mich.	1310	100
WFDV	Rome, Ga.	1500	100
WFEA	Manchester, N. H.	1430	500
WFI	Philadelphia, Pa.	560	500
WFLA	Clearwater, Fla.	620	1000
WGAL	Lancaster, Pa.	1310	100
WGAR	Cleveland, Ohio	1450	500
WGBB	Freeport, N. Y.	1210	100
WGBF	Evansville, Ind.	630	500
WGBI	Scranton, Pa.	880	250
WGCM	Mississippi City, Miss.	1210	100
WGCP	Newark, N. J.	1250	1000
WGES	Chicago, Ill.	1360	500
WGH	Newport News, Va.	1310	100
WGL	Fort Wayne, Ind.	1370	100
WGLC	Hudson Falls, N. Y.	1370	100
WGN	Chicago, Ill.	720	50000
WGNY	Chester, N. Y.	1210	100
WGR	Buffalo, N. Y.	550	1000
WGST	Atlanta, Ga.	890	250
WGY	Schenectady, N. Y.	790	50000
WHA	Madison, Wis.	940	1000
WHAD	Milwaukee, Wis.	1120	250
WHAM	Rochester, N. Y.	1150	50000
WHAS	Louisville, Ky.	820	50000
WHAT	Philadelphia, Pa.	1310	100
WHAZ	Troy, N. Y.	1300	500
WHB	Kansas City, Mo.	860	500
WHBC	Canton, Ohio	1200	100
WHBD	Mount Orab, Ohio	1370	100
WHBF	Rock Island, Ill.	1210	100
WHBL	Sheboygan, Wis.	1410	500
WHBQ	Memphis, Tenn.	1370	100
WHBU	Anderson, Ind.	1210	100
WHBY	Green Bay, Wis.	1200	100
WHDF	Calumet, Mich.	1370	100
WHDH	Boston, Mass.	830	1000
WHDL	Tupper Lake, N. Y.	1420	100
WHEB	Portsmouth, N. H.	740	250
WHEC	Rochester, N. Y.	1430	500
WHEF	Kosciusko, Miss.	1500	100
WHET	Troy, Ala.	1210	100
WHFC	Cicero, Ill.	1420	100
WHIS	Bluefield, W. Va.	1410	250
WHK	Cleveland, Ohio	1390	1000
WHN	New York, N. Y.	1010	250
WHO	See WOC		
WHOM	Jersey City, N. J.	1450	250
WHP	Harrisburg, Pa.	1430	500
WIAS	Ottumwa, Iowa	1310	100
WIBA	Madison, Wis.	1280	500
WIBG	Glenside, Pa.	970	100
WIBM	Jackson, Mich.	1370	100
WIBU	Poynette, Wis.	1210	100
WIBW	Topeka, Kans.	580	1000
WIBX	Utica, N. Y.	1200	100
WICC	Bridgeport, Conn.	600	250
WIL	St. Louis, Mo.	1200	100
WILL	Urbana, Ill.	890	250
WILM	Wilmington, Del.	1420	100
WIND	Gary, Ind.	560	1000
WINS	New York, N. Y.	1180	500
WIOD	Miami, Fla.	1300	1000
WIP	Philadelphia, Pa.	610	500
WIS	Columbia, S. C.	1010	500
WISN	Milwaukee, Wis.	1120	250
WJAC	Johnstown, Pa.	1310	100
WJAG	Norfolk, Nebr.	1060	1000
WJAR	Providence, R. I.	890	500
WJAS	Pittsburgh, Pa.	1290	1000
WJAX	Jacksonville, Fla.	900	1000
WJAY	Cleveland, Ohio	610	500
WJBC	La Salle, Ind.	1200	100
WJBI	Red Bank, N. J.	1210	100
WJBK	Detroit, Mich.	1370	50
WJBL	Decatur, Ill.	1200	100
WJBO	Baton Rouge, La.	1420	100
WJBW	New Orleans, La.	1200	100
WJBY	Gadsden, Ala.	1210	100
WJDX	Jackson, Mich.	1270	1000
WJEJ	Hagerstown, Md.	1210	100
WJEM	Tupelo, Miss.	990	500
WJJD	Chicago, Ill.	1130	20000
WJMS	Ironwood, Mich.	1420	100
WJR	Detroit, Mich.	750	10000
WJSV	Alexandria, Va.	1460	10000
WJTL	Atlanta, Ga.	1370	100
WJW	Akron, Ohio	1210	100
WJZ	New York, N. Y.	760	50000
WKAQ	San Juan, P. R.	1240	1000
WKAR	East Lansing, Mich.	1040	1000
WKBB	East Dubuque, Ill.	1500	100
WKBC	Birmingham, Ala.	1310	100
WKBF	Indianapolis, Ind.	1400	500
WKBH	LaCrosse, Wis.	1380	1000
WKBI	Cicero, Ill.	1420	100
WKBN	Youngstown, Ohio	570	500
WKBO	Harrisburg, Pa.	1200	100
WKBV	Richmond, Ind.	1500	100
WKBW	Buffalo, N. Y.	1480	5000
WKBZ	Ludington, Mich.	1500	100
WKEU	LaGrange, Ga.	1500	100
WKFI	Greenville, Miss.	1210	100
WKJC	Lancaster, Pa.	1200	100
WKOK	Sunbury, Pa.	1210	100
WKRC	Cincinnati, Ohio	550	1000
WKY	Oklahoma City, Okla.	900	1000
WKZO	Kalamazoo, Mich.	590	1000
WLAC	Nashville, Tenn.	1470	5000
WLAP	Louisville, Ky.	1200	100
WLB	Minneapolis, Minn.	1250	1000
WLBC	Muncie, Ind.	1310	100
WLBF	Kansas City, Kans.	1420	100
WLBL	Stevens Point, Wis.	900	2500
WLBW	Erie, Pa.	1200	500
WLBZ	Bangor, Me.	620	500
WLEC	Portland, Me.	1340	250
WLEY	Lexington, Mass.	1370	100
WLIT	Philadelphia, Pa.	560	500
WLS	Chicago, Ill.	870	50000
WLTH	Brooklyn, N. Y.	1400	500
WLVA	Lynchburg, Va.	1370	100
WLW	Cincinnati, Ohio (Will increase power to 500,000 watts)	700	50000
WLWL	New York, N. Y.	1100	5000
WMAC	See WSYR		
WMAL	Washington, D. C.	630	250
WMAQ	Chicago, Ill.	670	5000
WMAS	Springfield, Mass.	1420	100
WMAZ	Macon, Ga.	1180	500
WMBC	Detroit, Mich.	1420	100
WMBD	Peoria, Ill.	1440	500
WMBG	Richmond, Va.	1210	100
WMBH	Joplin, Mo.	1420	100
WMBI	Chicago, Ill.	1080	5000
WMBO	Auburn, N. Y.	1310	100
WMBQ	Brooklyn, N. Y.	1500	100
WMBR	Tampa, Fla.	1370	100
WMC	Memphis, Tenn.	780	500
WMCA	New York, N. Y.	570	500
WMMN	Fairmont, W. Va.	890	250
WMPC	Lapeer, Mich.	1500	100
WMT	Waterloo, Iowa	600	500
WNAC	Boston, Mass.	1230	1000
WNAD	Norman, Okla.	1010	500
WNAX	Yankton, S. D.	570	2500
WNBF	Binghamton, N. Y.	1500	100
WNBH	New Bedford, Mass.	1310	100
WNBO	Silverhaven, Pa.	1200	100
WNBR	Memphis, Tenn.	1430	500
WNBW	Carbondale, Pa.	1200	10
WNBX	Springfield, Vt.	1260	250
WNBZ	Saranac Lake, N. Y.	1290	50
WNEW	Newark, N. J.	1250	2500
WNOX	Knoxville, Tenn.	560	2000
WNRA	Muscle Shoals City, Ala.	1420	100
WNYC	New York, N. Y.	810	500
WOAI	San Antonio, Texas	1190	50000
WOBU	Charleston, W. Va.	580	500
WOC	Des Moines, Iowa	1000	50000
WOCL	Jamestown, N. Y.	1210	50
WODX	Mobile, Ala.	1410	500
WOI	Ames, Iowa	640	5000
WOKO	Albany, N. Y.	1430	500
WOL	Washington, D. C.	1310	100
WOMT	Manitowoc, Wis.	1210	100
WOOD	Grand Rapids, Mich.	1270	500
WOPI	Bristol, Tenn.	1500	100
WOQ	Kansas City, Mo.	1300	1000
WOR	Newark, N. J.	710	5000
WORC	Worcester, Mass.	1280	500
WORK	York, Pa.	1000	1000
WOS	Jefferson City, Mo.	630	500
WOSU	Columbus, Ohio	570	750
WOV	New York, N. Y.	1130	1000
WOW	Omaha, Nebr.	590	1000
WOWO	Fort Wayne, Ind.	1160	10000
WPAD	Paducah, Ky.	1420	100
WPEN	Philadelphia, Pa.	1500	100
WPFB	Hattiesburg, Miss.	1370	100
WPG	Atlantic City, N. J.	1100	5000
WPHR	Petersburg, Va.	1200	100
WPRO	Providence, R. I.	1210	100
WPTF	Raleigh, N. C.	680	5000
WQAM	Miami, Fla.	560	1000
WQAN	Scranton, Pa.	880	250
WQBC	Vicksburg, Miss.	1360	500
WQDM	St. Albans, Vt.	1370	100
WQDX	Thomasville, Ga.	1210	100
WRAK	Williamsport, Pa.	1370	100
WRAM	Wilmington, N. C.	1370	100
WRAW	Reading, Pa.	1310	100
WRAX	Philadelphia, Pa.	1020	250
WRBL	Columbus, Ohio	1200	100
WRBX	Roanoke, Va.	1410	250
WRC	Washington, D. C.	950	500
WRDO	Augusta, Me.	1370	100
WRDW	Augusta, Ga.	1500	100
WREC	Memphis, Tenn.	600	500
WREN	Lawrence, Kans.	1220	1000
WRHM	Minneapolis, Minn.	1250	1000
WRJN	Racine, Wis.	1370	100
WROL	Knoxville, Tenn.	1310	100
WRR	Dallas, Texas	1280	500
WRUF	Gainesville, Fla.	830	5000
WRVA	Richmond, Va.	1110	5000
WSAI	Cincinnati, Ohio	1330	1000
WSAJ	Grove City, Pa.	1310	100
WSAN	Allentown, Pa.	1440	250
WSAR	Fall River, Mass.	1450	250
WSAZ	Huntington, W. Va.	1190	1000
WSB	Atlanta, Ga.	740	50000
WSBC	Chicago, Ill.	1210	100
WSBT	South Bend, Ind.	1230	500
WSEN	Columbus, Ohio	1210	100
WSFA	Montgomery, Ala.	1410	500
WSIX	Springfield, Tenn.	1210	100
WSJS	Winston-Salem, N. C.	1310	100
WSM	Nashville, Tenn.	650	50000
WSMB	New Orleans, La.	1320	500
WSMK	Dayton, Ohio	1380	200
WSOC	Charlotte, N. C.	1210	100
WSPA	Spartanburg, S. C.	1420	100
WSPD	Toledo, Ohio	1340	1000
WSUI	Iowa City, Iowa	880	500
WSUN	St. Petersburg, Fla.	620	1000
WSVS	Buffalo, N. Y.	1370	50
WSYB	Rutland, Vt.	1500	100
WSYR	Syracuse, N. Y.	570	250
WTAD	Quincy, Ill.	1440	500
WTAG	Worcester, Mass.	580	500
WTAG	Worcester, Mass.	580	500
WTAM	Cleveland, Ohio	1070	50000
WTAQ	Eau Claire, Wis.	1330	1000
WTAR	Norfolk, Va.	780	500
WTAW	College Station, Texas	1120	500
WTAX	Springfield, Ill.	1210	100
WTBO	Cumberland, Md.	1420	100
WTEL	Philadelphia, Pa.	1310	100
WTFI	Athens, Ga.	1450	500
WTIC	Hartford, Conn.	1060	50000
WTJS	Jackson, Tenn.	1310	100
WTMJ	Milwaukee, Wis.	620	1000
WTNJ	Trenton, N. J.	1280	500
WTOC	Savannah, Ga.	1260	500
WTRC	Elkhart, Ind.	1310	50
WVFW	Brooklyn, N. Y.	1400	500
WWAE	Hammond, Ind.	1200	100
WWJ	Detroit, Mich.	920	1000
WWL	New Orleans, La.	850	10000
WWNC	Asheville, N. C.	570	1000
WWRL	Woodside, N. Y.	1500	100
WWSW	Pittsburgh, Pa.	1500	100
WWVA	Wheeling, W. Va.	1160	5000
WXYZ	Detroit, Mich.	1240	1000

NEXT MONTH

North America
(exclusive of the U. S.)
Central America
South America
West Indies

When to Tune for DOMESTIC *and* OVERSEAS 550-1500 kc. DX

A month-by-month analysis of DX reception conditions for listeners in North and South America, Europe and Oceania

C. H. Long

Part Two

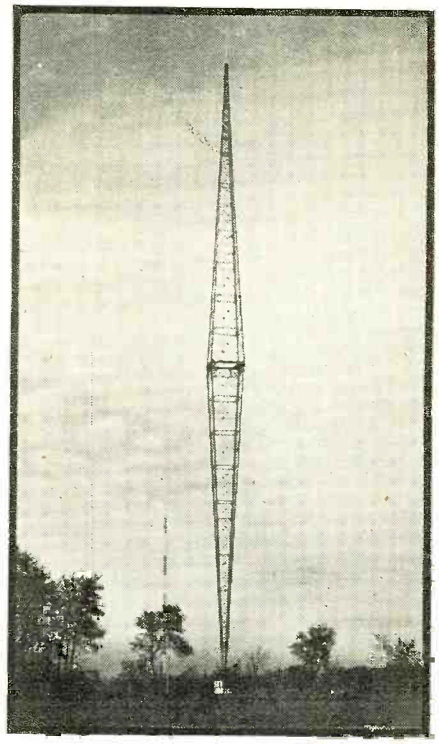
LOCAL static must have a low value for any measure of success with distance reception. This requires settled and not too warm weather. Best reception conditions are usually found in the settled weather immediately following a cold wave, though there are exceptions. There is an undoubted but at present very little known relation between pressure areas in or adjacent to the path of the wave and reception conditions. The writer has noted, for instance, that the Australian stations appear to be best received here when a low lies a short distance to the southwest, and that the most favorable conditions for reception of the Japanese stations appear to prevail when a high lies over the Ohio Valley and another high over the eastern slope of the Canadian Rockies. It has also been observed that reception appears to be affected by the moon's phases, with best reception conditions prevailing during the full moon periods.

It is felt desirable to supplement the above general remarks on seasonal and hourly variations in reception conditions with some detailed information on stations ordinarily reasonably well received from month to month, together with some indication as to the best time for reception. This data is compiled from the writer's own experience in different locations in the United States, supplemented by reports from competent listeners in various parts of this country, Canada, Australia, New Zealand, England, and Northern Europe. The reception conditions represent the average prevailing in any given country, from which the conditions in a particular locality may vary considerably either for better or worse. A very fair estimate of varying local reception conditions can usually be arrived at by applying at the same time the foregoing general principles governing reception.

Let us begin with the month of September. During this month the larger Australian and New Zealand stations, including inland stations, begin to be well received here in America, the best time for reception being the hour before sunrise. During this month also the larger American stations, both North and South, begin to be reasonably well received in England and Northern Europe. During September New Zealand listeners—southern hemisphere—can hear at good strength the European, African, Japanese, and American stations. The Americans can be heard from around sunset till about 7:30 p. m. Europeans and Africans can be heard beginning about 4 a. m., Japanese from 9:30 p. m. on, and Indian stations from midnight to 4 a. m. local time. This month marks the peak of New Zealand's reception. During this month Australian listeners hear American and Japanese stations more and more poorly.

During October reception conditions gradually improve in the northern hemisphere, and in addition to the Australian stations the Japanese stations can now be heard here—though on the Pacific Coast they could be heard in September. The Japanese and Australian stations can be heard from about 4 a. m. C.S.T. to daybreak. South American stations can be heard reasonably well at times. In Europe the American stations can be better received. In the southern hemisphere the conditions are still good to fair in New Zealand, but a gradual decline is noted. The season for long distance reception has been concluded for Australian listeners, to reopen again next May.

November brings generally improved reception in the northern hemisphere. Here in America the Australian stations are well received as are the Japanese. However, the latter part of the month brings a decline in the reception of the Australian stations, especially the inland stations. South American stations are well received. It should be remarked that owing to station interference few South American stations can be heard satisfactorily on their regular programs. A notable exception is LR4, Buenos Aires, 990 kcys., which can be heard from 11:00 C.S.T. Sundays after WBZ signs off. A few South American stations sometimes put on special programs in the early morning hours for DX clubs. Members of the DX club or clubs sponsoring the program are advised beforehand of these as well as other special transmissions, and accordingly know when to listen in. For this reason, if no other, anyone seriously interested in long distance reception should join an active DX club of international scope. Similar remarks apply to the reception of African stations in England and Northern Europe. During this month Europe begins to enjoy better reception from the North American stations and continues to hear the South American. This month closes the DX season for New Zealand, until the following April, when their summer season will have been finished.



120 KW. AT BUDAPEST

A new station known as Budapest I, with the call letters HHL, is now transmitting on 545 kc. with 120 kilowatts. It employs a mast antenna which is 997 feet high, 12 feet higher than the Eiffel Tower. Have you heard this one yet?

December continues the decline of Australian and New Zealand reception here, as well as South American reception in Europe. However, Australian stations located near the eastern coast are still well heard. Also Europe continues to hear South American stations located on the eastern coast. Japanese stations are fairly well received here in North America, as are the South American stations, especially those in the northern part of South America. During this and the next two months the European stations can occasionally be heard around sunset, especially in the eastern part of the United States and eastern Canada. Also during these months their early morning broadcasts can sometimes be heard shortly after midnight—German stations principally. It must be added that due to local station interference the regular programs of the European stations are not ordinarily received very satisfactorily. Their early morning broadcasts are the best received in the greater part of the United States and Canada. The European stations can rarely be persuaded to put on special programs for distant listeners.

During January good reception can often be had here in America from the Queensland stations and the larger Sydney and New Zealand stations, such as 2BL and 2YA. The Japanese stations are received at fair strength. South American stations can be heard much as in (*Continued on page* 704)

JIMMY DURANTE

SETH PARKER (PHILLIPS H. LORD)

MAUDE ADAMS

BACKSTAGE *in* BROADCASTING

Samuel Kaufman

THE sponsors of the Sunday NBC Chase & Sanborn Hour have made early announcement of the fact that Jimmy "Schnozzle" Durante will succeed Eddie Cantor during the latter's annual visit to Hollywood. The sponsors have so much faith in Durante that they signed him up for a total of 24 weeks. It was stated that the popularity he achieved during his brief series in 1933 was responsible for his 1934 engagement. It is our opinion, however, that Durante will have to do a somewhat different job than last year if he intends holding all of Cantor's listeners for a six-month period. It seemed that Durante worked hard enough on his last series, but had poor material. With the right continuity for his brand of humor, we believe he may click.

BUDDY ROGERS, the youthful screen star who turned band leader, is once again conducting his musical organization over NBC hook-ups. His dance music from the Paradise Restaurant, New York, is heard Sundays, Tuesdays, Wednesdays and Fridays. The inaugural program of his new series brought to the air musical salutes from the Paul Whiteman, Ted Weems and Jack Denny orchestras.

CARLOS GARDEL, the "Chevalier of South America," recently arrived in the United States to appear on a semi-weekly NBC series. His programs, heard Mondays and Thursdays, have won wide response, and his boosters believe he will equal his South American and European successes in this country. Hugo Mariani, NBC conductor, encouraged Gardel to come to this country, believing that his voice and personality will make him a microphone favorite in short time. Hugo told us much about Gardel's sensational achievements in Buenos Aires, Rio de Janeiro and Paris. Gardel sings to the accompaniment of his own guitar and Mariani's orchestra.

PHILLIPS H. LORD, better known to radio listeners as Seth Parker, is off on a round-the-world cruise in the four-masted schooner *Seth Parker*. On board is Station KNRA, a 1-kilowatt unit, which will convey short-wave programs from far corners of the earth to the NBC for re-broadcasting throughout the nation. While proceeding down the Atlantic seaboard, Lord broadcast special programs from coastal ports of call, under the sponsorship of the Frigidaire Corporation. Carey P. Sweeney, of the network's engineering staff, was assigned to the *Seth Parker* to handle the technical phases of the KNRA broadcasts.

JACK WHITING, musical comedy star; Jeanie Lang, personality singer, and Jack Denny's Orchestra are all featured on the new Marvelous Melodies series presented over CBS on Fridays. The programs are presented in musical revue pattern. As the central figure, Whiting takes parts in skits and black-outs, in addition to singing and serving as master of ceremonies. Jeanie Lang and Jack Denny have long been familiar microphone figures to NBC and CBS listeners. The Three Rascals, a novelty vocal trio, is also heard on the series. The trio, a West Coast sensation, includes Bob Keiph, Fred Fritsch and Robert Harthun.

WHEN Maude Adams made her radio début on the NBC Friday Pond's programs, all visitors were barred from the studios. Only her supporting cast and the studio staff saw the former stage star in action at the microphone. Miss Adams emerged from a retirement that had broken but once before in sixteen years to present her broadcast series of plays. NBC informants tell me that she adhered to stage technique by memorizing her lines and performing them with gestures.

THROUGH with his Hollywood talkie assignment, Al Jolson returned to the NBC Kraft Hour with the assertion that he will devote all of his future time to broadcasting. The mammy singer explained that he prefers the informality of the microphone, which permits him to enter the homes of his listeners and entertain them at their firesides, to the indirect approach necessitated by the films. Paul Whiteman's splendid orchestra is co-featured with Jolson, while Deems Taylor, the opera composer, continues as master of ceremonies.

HARRIET LEE, veteran radio contralto and winner of the "Miss Radio" designation in 1931, has returned to the air on the Sweetheart Melodies program heard

(*Continued on page* 691)

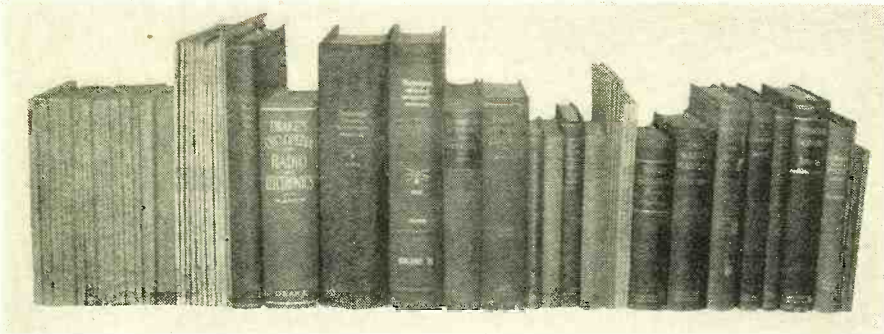
CARLOS GARDEL

BUDDY ROGERS

JACK WHITING JEANIE LANG JACK DENNY

AL JOLSON

HARRIET LEE



THE TECHNICAL REVIEW

JOSEPH CALCATERRA

Principles of Radio, by Keith Henney. Second edition. John Wiley & Sons, Inc., 1934. A textbook on the theory and practice of the radio art which is suitable for home study as well as in schools where radio is taught. It differs from other textbooks chiefly in the inclusion of numerous problems to be solved by the student, several of these are solved in the text, as an example. Furthermore, the author explains how many types of experiments and measurements can be made with fairly simple equipment. The measurement and plotting of characteristics of tubes, measurements of inductance, capacity and mutual inductance are some of these. Mathematics are employed to prove the most important electrical laws, but no higher mathematics is needed.

The second edition has been brought up to date by adding considerable new material on tubes and rewriting a great part of the book. The opening chapters deal with the fundamentals of electricity: Ohm's law, production of current, inductance, capacity, properties of alternating currents, resonance and properties of coils and condensers. Thereafter vacuum tubes are discussed with their circuits in audio amplifiers and detectors. The following chapters deal with complete receivers, transmitters, power supplies, oscillators and antennas. The radio serviceman, experimenter or student engineer can find much information of practical value in these chapters. For instance, Mr. Henney goes into some detail regarding the design of the tube circuits with the proper values to be derived from the tube characteristics.

Short-Wave Radio Handbook, by Clifford E. Denton. Standard Publications, Inc. This book is intended for the amateur, experimenter or home constructor who wishes to build his own short-wave receiver and to understand the peculiarities of short waves. It is written in a popular style and discusses the accepted practices without going into details regarding the reasons for these.

The book starts out with general information regarding phones, loudspeakers, audio amplifiers and detectors which are common to all radio receivers. Chapter III will probably interest a number of experimenters; it contains the specifications, number of turns of all standard plug-in coils. Later chapters deal with short-wave receivers, giving diagrams of simple and complicated ones and including data on the circuit constants. Various types of aerials are also discussed.

Review of Contemporary Literature

Open-Wire Program Circuits, by R. A. Leconte. Bell Laboratories Record, February, 1934. This paper gives information and data on the difference in efficiency of cable and open-wire program circuits and outlines the developments and circuits which now make possible creditable transmission of program material over open-wire circuits.

Synchronization Systems for Common Frequency Broadcasting, a pamphlet published by Western Electric Co. A description of the apparatus employed for synchronizing two broadcast stations and the theory of their operation.

A Symposium on Wire Transmission of Symphonic Music and Its Reproduction in Auditory Perspective. Electrical Engineering, January, 1934. A series of six articles —all in one issue—written by different specialists, each of whom designed a part of the equipment used in the recent experiment transmitting the Philadelphia Symphony Orchestra. Authors include: Dr. Harvey Fletcher, J. C. Steinberg, W. B. Snow, E. C. White, A. L. Thuras, E. O. Scriven, H. A. Affel, R. W. Chesnut, R. H. Mills, E. H. Bedell and Iden Kervey. These six articles describe every phase of the well-known experiment.

Supersonic Measurement of the Directional Characteristics of Horns, by Stanford Goldman. The Journal of the Acoustical Society of America, January, 1934. A discussion of a series of measurements to determine the directional properties of horns. The author describes the equipment used and shows several curves obtained.

A Practical Cathode-Ray Oscillograph for the Amateur Station, by L. E. Waller. QST, March, 1934. An article describing equipment for use with the new type 906 and 885 tubes, including data on power pack and sweep-circuit. Applications are suggested and the oscillograms of modulated waves shown.

Suppressor Grid Modulation. J. J. Lamb. QST, March, 1934. The author describes a system of modulation whereby the speech amplifier actuates the suppressor grid of the modulated radio-frequency amplifier.

Line Filters for Open-Wire Program Circuits, by A. W. Clement. Bell Laboratories Record, February, 1934. The low- and high-pass filters used in the new type open-wire program circuits to separate the program and message circuit currents which are transmitted simultaneously over the telephone wires. are described in this paper.

Resistance Lamps, by N. Insley. Bell Laboratories Record, February, 1934. This article describes a new series of resistance lamps which are designed to take the place of the older type carbon filament and tungsten filament lamps for resistance purposes.

A Continuously Adjustable Band-Pass Filter, by G. H. Lovell. Bell Laboratories Record, February, 1934. This paper describes the circuits and factors involved in the design of a band-pass filter which is required to be adjustable in the range of from 400 to 1200 kilocycles and at the same time to maintain a constant band-pass characteristic of 3000 cycles over the whole range of adjustment without requiring resetting during the sweep.

A Self-contained Bridge for Measuring Both Inductive and Capacitive Impedances, by H. T. Wilhelm. Bell Laboratories Record, February, 1934. A new type of bridge which combines the advantages of the self-contained inductive or capacitive impedance-measuring bridges with the convenience of combination bridges is described in this article.

The Alternating-Current Inductance of an Iron-Cored Coil Carrying Direct Current, by R. T. Beatty. The Wireless Engineer and Experimental Wireless, February, 1934. This article describes a simpler method of determining the design factors and the influence of variations in these factors on the inductance of the coil than the methods usually employed to determine such factors.

Measuring Average Current in a Jumpy Direct-Current Circuit, by F. W. Maxstadt. The Review of Scientific Instruments, February, 1934. This article describes the design of a simple indicating instrument which gives the average current drawn in a direct-current circuit in which the current is drawn for only a small fraction of a second.

The Copper-Oxide Rectifier as a Laboratory Instrument, by L. O. Grondahl. The Review of Scientific Instruments, February, 1934. This article enumerates the various applications to which copper-oxide rectifiers can be put and explains the characteristics which make them especially suitable for various purposes.

Recent Developments in Frequency Standards, by Charles E. Worthen, General Radio Experimenter, January-February, 1934. A description of the General Radio Class C-21-H Standard Frequency Assembly, explaining its various features, is contained in this article.

As the Wave Analyzer Views the Tuning-Fork Oscillator. General Radio Experimenter, January-March, 1934. This article demonstrates the efficiency of the wave analyzer in picking off and measuring harmonics as high as the eighth, even though the amplitudes get down to as little as .006 percent of the fundamental voltage.

Amplifier Units Find New Uses in Industry. Electronics, February, 1934. The multitudinous practical uses of amplifiers and public-address systems are described and listed in this article which gives many suggestions as to where to dig up prospects for such systems.

General Data on Receivers. Service, February, 1934. This section contains general data, circuits and service information on a number of popular radio receivers.

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

Oscillators with Automatic Control of the Threshold of Regeneration, by Janusz Groszkowski. This paper describes a method by means of which a rectified voltage, obtained from a rectifier fed by the oscillating circuit of a dynatron, is used to maintain the dynatron tube (tetrode) automatically at a given frequency.

Optimum Operating Conditions for Class C Amplifiers, by W. L. Everitt. This paper gives a theoretical analysis of the plate efficiency and output of a triode operating as a Class C amplifier.

A Compact Radio Field Strength Meter, by Paul B. Taylor. A compact portable field-strength meter for frequencies in the broadcast band is described in this article.

Radio-Telegraph Keying Transients, by Reuben Lee. This investigation shows that the objectionable features of the transients which occur when keying takes place can be reduced by suitable precautions.

Note on a Multifrequency Automatic Recorder of Ionosphere Heights, by T. R. Gilliland. This paper describes a system which gives a curve of virtual heights of the layers of the ionosphere against frequency.

Radio Observations of the Bureau of Standards During the Solar Eclipse of August 31, 1932, by S. S. Kirby, L. V. Berkner, T. R. Gilliland and K. A. Norton. This paper gives the results, and comments on findings, of a series of observations made by Bureau of Standards investigators before, during and after the period of the solar eclipse.

Free Technical Booklet Service

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

Review of Technical Booklets Available

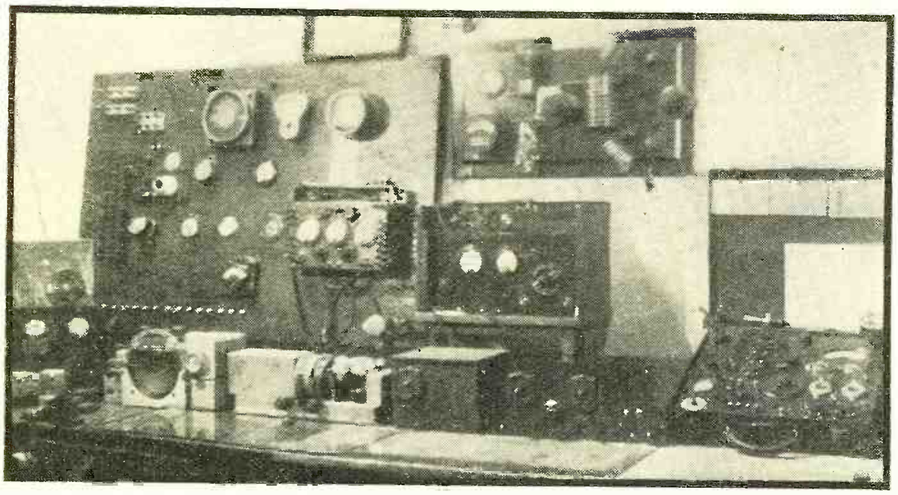
2. *1934 R.F. Parts Catalog.* Specifications on the Hammarlund line of variable and adjustable condensers, r.f. transformers, sockets, shields and miscellaneous parts for broadcast and short-wave receivers and transmitting variable condensers.

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

5. *A 1934 Volume Control and Resistor Catalog.* Data on standard and replacement volume controls, Truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers, precision wire-wound non-inductive resistors, high-quality attenuators, center-tapped filament resistors, power (50-watt) rheostats and other Electrad resistor specialties.

7. *Rich Rewards in Radio.* Interesting information on the growth of radio and the opportunities existing in the field of radio manufacturing, radio servicing, broadcasting, talking pictures, television, public-address systems and commercial station operation on land and sea, for men who

(*Continued on page* 699)



THE SERVICE BENCH

ZEH BOUCK

THE SERVICEMAN AND SHORT-WAVE RECEPTION

SHORT-WAVE transmission and reception has today arrived at a point where it offers profitable possibilities to the serviceman who is willing to devote a little specialized attention to this field. The average radio fan already has been educated into the knowledge *that there is a new and very much worth-while region of reception which his conventional broadcast receiver cannot touch!* At the same time, all-wave receivers and converters have definitely emerged from the experimental chrysalis, *providing highly potential sales opportunities!* Also, apparatus of this type, which has been in use for several years, *is* badly in need of servicing! Lastly, as the composite mechanics of short-wave reception—installation, antenna, location of set, method of operation, sources of trouble—are somewhat more complicated than with reception above 200 meters, the possibilities for profitable service are decidedly worthy of attention.

Almost every service call on a broadcast receiver offers the opportunity to inject sales talk on short-wave reception, and short-wave adaptors or converters *should be part of the serviceman's stock in trade!* There are several excellent designs on the market, but if cost is an important consideration, the serviceman can make them up himself during spare time without curtail of profit. An adaptor and converter suitable for manufacture by the serviceman and sale to his clients are described in the short-wave articles by James Millen, now being serialized in this magazine. While the adaptor is, of course, the cheaper of the two systems, the converter *should be recommended,* in consideration of superior results, whenever the customer will stand the expense.

Educate Your Client

While your short-wave sale talk rightly should be enthusiastic and convincing—don't exaggerate the joys of short-wave reception—you don't have to. *Tell the simple truth* about programs below 200 meters—emphasizing the great distances spanned day or night. Give him the low-down after the manner of Mr. Millen's excellent article in RADIO NEWS for February, 1934. He will be sold, and you may rest assured that he won't come to you for his money back. Don't let up on the process of educating him as soon as the converter or short-wave set is sold. Show him *how to operate the equipment—how to tune,* and *at what time* to tune on different frequencies for desired stations. Supply him with a *list of stations;* for the most accurate list and for the best short-wave data introduce him to the Short-Wave Corner in this magazine. RADIO NEWS *will keep him sold!*

Short-wave apparatus is, of course, prone to the ailments common to receivers in general—short-circuited condensers, burned-out resistors, etc. However, the most prevalent and consistent complaint will be that of "noise." This is due to the fact that some disturbances, apparent as noise, are short-wave radiations.

The location of the short-wave set itself, within the home, may not be the best for noise reduction. Mr. J. Warner Cass, of Oklahoma City, writes:

"I ran into a peculiar case of noise with a Pilot Super-Wasp short-wave receiver. The disturbance was especially bad under 50 meters. The antenna was in a relatively noise-free area, and a transposed lead-in was working very effectively, as was shown when a short-wave superheterodyne—a much more sensitive receiver—was substituted. In the latter case no noise at all could be heard.

"The trouble was located accidentally, when I moved a floor lamp to find a small screw that had fallen under the table. As I moved the lamp away, for less shadow, the disturbance definitely *decreased.*

"The noise was evidently being conveyed over the 110-volt line to the lamp, and picked up by the receiver itself which was not perfectly shielded. It did not get through the power supply due to the fact that it was located some distance away, and the windings of the transformer are electrically shielded from each other. Moving the lamp a few feet did the trick!"

Unfortunately, it will be seldom indeed that a case of noise will be amenable to so simple a cure. The vast majority of instances will be cases of outside pick-up—by the lead-in and antenna. It is seldom safe to guarantee *complete* noise elimination by the installation of relatively expensive antenna systems. Many a serviceman has come to grief on this gamble and lost a customer. It should be borne in mind that no noise-reduction antenna system can be really effective unless the antenna itself can be erected in a noise-free area. And it will be usually necessary to make the installation to determine if its going to work. We suggest taking a chance, and doing it on a cost basis, unless the customer is satisfied that the improvement justifies the regular cost-plus-profit fee.

The following letter from Stewart J. Robinson, of Sacramento, Calif., amplifies these considerations:

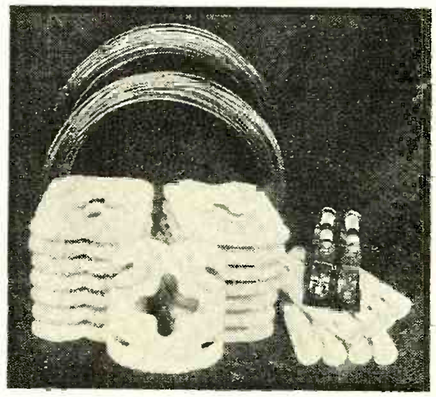
"I have recently heard some adverse criticism of the transposed or balanced lead-in for noise reduction on short-wave and all-wave sets. In each case that has come to my attention there has been no fault with the idea, but rather in the manner in which it has been applied. For example, there were several instances in which the antenna systems were sold to reduce noise originating a half block or more from the receiver and blanketing the area—including both lead-in and antenna! Other cases demonstrated sheer incompetence or negligence on the part of the servicemen making the installations, where the antennas—strung from convenient elevator shafts—*were in a more powerful noise field than the transposed lead-ins!*

"I believe that this type of installation should be recommended and sold only where it can do some good, and when it can be properly installed. The public also should not be led to believe that such an antenna will in any way effect a reduction of *bona fide* static. No attempt should be made to sell this type of installation until one competent to judge its usefulness has inspected the proposed site and can recommend it as a definite improvement.

"I recently demonstrated the effectiveness of a noise-reduction lead-in at the State Fair grounds—an exceptionally intense noise area, due to the electrically-operated carnival machinery. Three different RCA sets, ranging from 5 to 12 tubes, were permanently connected to the antenna through a Philco '3-Purpose' lead-in. Noise-free transcontinental reception was possible every day, while a fourth set, operating on an ordinary antenna and lead-in, could not bring in a 200-watt local station, one mile away, above the noise!"

Transposition Versus Parallel Spacing

There is no particular virtue in transposition itself. The transmission line lead-in will be just as effective for noise reduction if the two wires are merely run parallel, and spaced about 3 inches from each other by means of any convenient spreaders. The idea, of course, is to keep the two branches of the lead-in so close together that any impulse received by one will be received



by the other in identical strength and phase. It is improbably on wave-lengths longer than .5 meter or so that sufficient variation in field voltage or phase exists within the small dimensions of conventional transposition to justify the process from the standpoint of noise reduction.

However, transposition blocks *do provide* the most convenient method of running down the transmission line lead-in. They are extremely rugged, economical, of excellent electrical characteristics and are to be highly recommended.

Coupling to Set

Lack of sensitivity and volume will be an occasional complaint on short-wave and all-wave receivers operated with a transmission line lead-in. If operation is normal—except for noise—when the ordinary lead-in and ground are used, the trouble is in the coupling between the transmission line and the receiver. Incorrect coupling will also result in ineffective noise reduction. This is usually the result of lack of balance which causes part of the transmission line system to function as an ordinary lead-in. Such a condition should be suspected and checked before blaming the noise on an unfavorable location.

Excellent data on coupling transmission lines to every type of receiver primary has been collected by the Lynch Manufacturing Company, New York City, who will be glad to send this information to any serviceman.

Erratic Short-Wave Reception

The increased possibilities for trouble in short-wave reception are exemplified in the following letter from Harry D. Hooton, Radio Service, Beech Hill, West Va.:

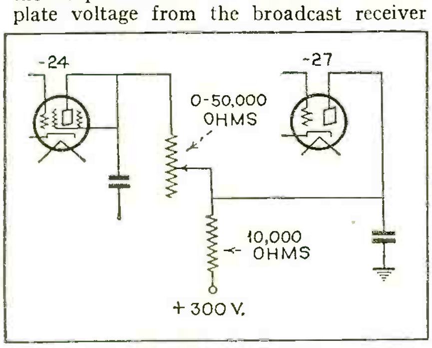
"I recently installed a new all-wave receiver of the mantel type, which operated in an erratic manner when tuned to wavelengths below 30 meters. Previous tests in my own home had shown that the set was okay.

"All the usual stunts were tried, but nothing doing until I accidentally jarred the table upon which the set had been placed. The jar was accompanied with a scraping noise similar to static or a loose connection. Opening the table drawer, I found several pair of scissors, needles and other metal articles. Upon removal of these objects the operation of the receiver *immediately became normal!*

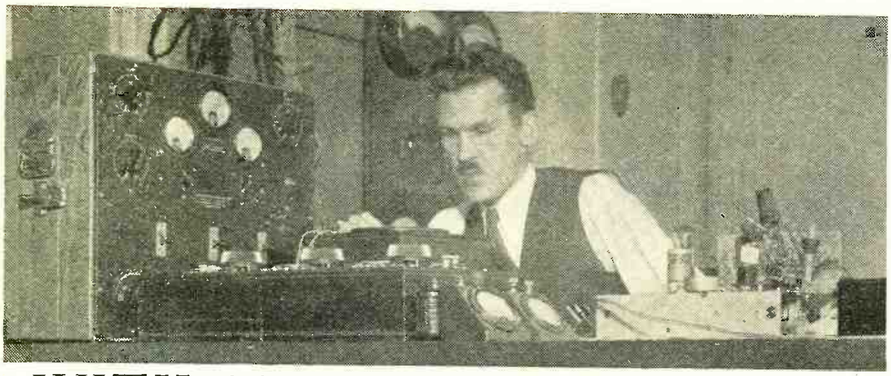
"The coils in this particular set are underneath the chassis, which has no bottom shield. The articles in the drawer were evidently causing considerable losses in the high-frequency field."

Stewart-Warner Convertor

"Six Stewart-Warner 301A superhet convertors sold by me did not come up to expectations. They worked, but not so efficiently as I figured they should, and my customers were dissatisfied. I had one in the shop and decided to dissect it. The plate voltage from the broadcast receiver



to the convertor type -27 oscillator is dropped through a 50,000-ohm resistor, giving a no-load potential at the plate of 90 volts, dropping to half this under load. This voltage is further dropped through a 100,000-ohm resistor to the plate and screen of the -24 second detector tube, providing a load potential of about 20 volts! (*Continued on page* 708)



WITH THE EXPERIMENTERS

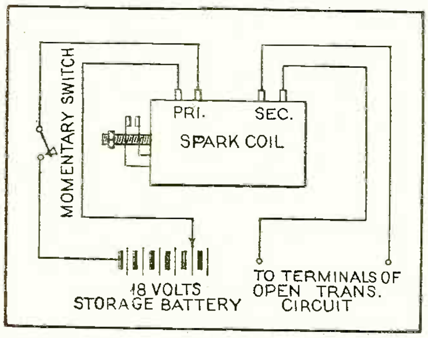
S. GORDON TAYLOR

Repairing Transformers

Referring to the art of repairing open circuits in audio transformers, column 1, page 489 of RADIO NEWS for February, 1933, I have done some experimenting with this method of coil welding and have used the apparatus extensively in my repair work. I have been able to repair transformers, 'phone windings and loudspeaker coils. Of course, I run across some coils which will not yield to this method owing to a ground or excessive corrosion.

My method differs from the writer's in that I use one, two or three 6-volt storage batteries in series (as shown in accompanying circuit) to operate the spark coil, always trying first to accomplish the feat with one battery, but never more than three.

As the writer does, I use a momentary switch or push-button to open and close the primary circuit, but in my scheme the circuit is closed for short intervals of time —just long enough to enable me to insert the end of a long, pointed wooden peg



between the spring and armature of vibrator in such a manner as to abruptly disturb the vibrations, thereby greatly enhancing the welding property of the secondary spark.

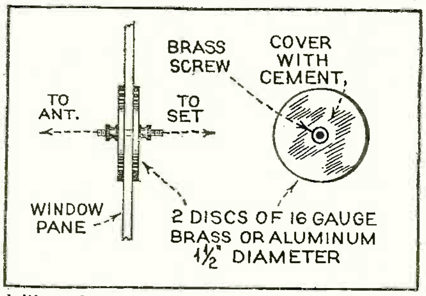
I have found that these repaired transformers do not always hold up. To overcome this very serious drawback, I found, after a little experimental work, that very good results could be obtained by connecting the repaired coil in series with an ordinary 3-ampere heating unit (such as is used in the household electric reflecting heaters) across the 110-volt line for an instant. I find it handy to secure one of the lead wires to one terminal of coil, while with the other lead wire simply tap the other terminal of coil two or three times, the small spark indicating that the coil circuit is okay and ready for use. This process either strengthens a weak weld or breaks it down entirely, in which case the original operation must be repeated.

I believe there is valuable use in store for these processes, for there is no reason why heavier windings of other equipment, such as motors, generators, induction coils, etc., could not be restored; provided, of course, the welding and reinforcing currents be of proper strength.

WEBSTER L. HOOD,
Washington, D. C.

Lead-In for Short-Wave Sets

To make this simple condenser lead-in arrangement for use with short-wave receivers, secure two discs of No. 16 gauge brass or aluminum, 1½ inches in diameter,



drill and counter-sink holes in the center as shown in the drawing. Machine screws are then inserted and fastened to the discs and serve as the respective terminals for the aerial lead and the connection to the radio receiver.

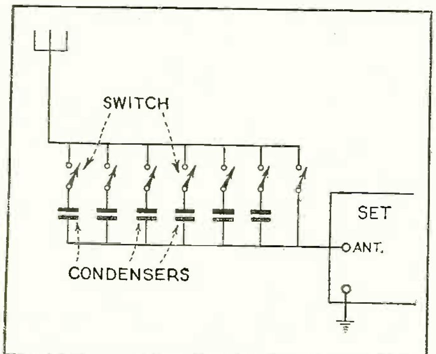
The discs are cemented to opposite sides of the window-pane as shown in the sketch. Ordinary rubber cement or water-proof glue can be used for this purpose.

For best results the surfaces must be perfectly flat, with the machine screws filed down level wtih the discs. The capacity of the two plates is sufficiently high to avoid attenuation of short-wave signals.

H. D. HOOTON,
Beech Hill, W. Va.

Improving the Selectivity of Old Receivers

There are a great many radio enthusiasts who have sets of other days which



they wouldn't swap for the new receivers when it comes to tone and signal pickup, but which, of course, are broad in tuning for present day radio reception. Rare indeed, is the old timer who hasn't an assortment of fixed condensers which can be employed to advantage, as shown in the accompanying sketch, to improve the selectivity of these old sets.

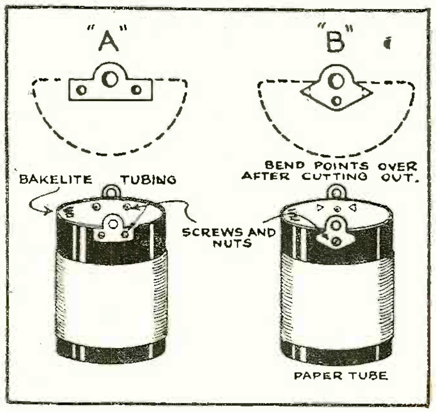
The condensers are connected in turn until the best selectivity is obtained. With all the condenser switches open and the last switch closed the antenna connects direct. The approximate range of the condensers are .00002 mfd. to .001 mfd.

J. WILLIAM DAY, JR.,
Daytona Beach, Florida.

Bearings for Variable Coils

Here is a simple method for using discarded rotor plates of old variable condensers as bearings for adjustable tickler coils, as used in three circuit tuners.

When the bearings are to be mounted



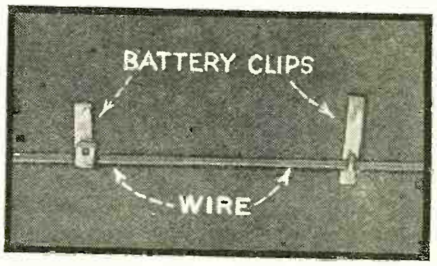
on a stator coil form of fibre, bakelite or hard rubber tube, the mounting should be cut as shown in drawing A. Two short machine screws are passed through the holes in the coil form and each bushing as illustrated. A quarter-inch shaft (preferably bakelite or wood) is passed through the rotor coil and cemented to same. Suitable washers are employed to keep it centered in the stator form.

Where a cardboard stator form is used, the plate of the condenser should be cut with sharp ends, shown in drawing B and these ends are pushed through the walls of the coil form and bent over. To take care of any strain a single screw can be placed through the bushing and coil form.

The washers which were used between the plates in the condenser will serve very nicely as spacing washers for centering the rotor coil. In most condensers the plates are made of thin sheet aluminum or brass and a pair of tin shears or heavy scissors will cut the plates without any trouble.

Utilizing Old Battery Clips

Fahnestock clips from old B batteries can be used as supports for temporary wiring, as illustrated in the photograph. The clip shown on the left has been cut off the battery, a hole drilled into the shank through which the screw passes for

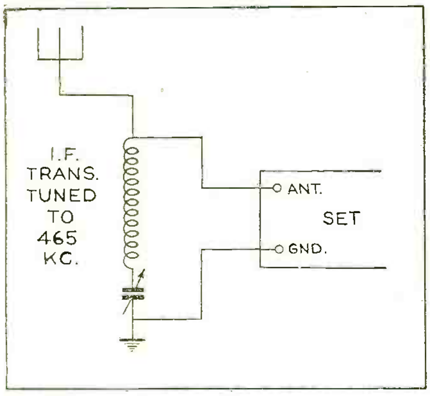


fastening the clip, and the wire is supported in the outer spring band. The clip shown on the right is made by straightening out the complete battery terminal, with the wire clamped to the under clip tab. The latter type provides a more permanent manner of support, while the former type is very handy for use around the laboratory or radio shack where the wiring is frequently changed.

JOHN W. DEELY,
Springfield, Mass.

Eliminating Code Interference on Supers with 465 k.c. Intermediates

Owners of 465 k.c. superheterodynes living in Brooklyn, Long Island and other points along the coast and in the neighborhood of shipping and naval stations complain of constant code interference. The remedy for this is simple. A series resonance circuit tuned to the offending frequency and connected across the input to the set or antenna and ground posts will do the trick nicely. It is preferable to have the small series condenser, variable, to allow for fine adjustment upon its installation. An ordinary 465 i.f. transformer with its parallel condenser connected in series with the coil will serve this purpose. Recently, upon urgings from its distributors to do something about this condition,

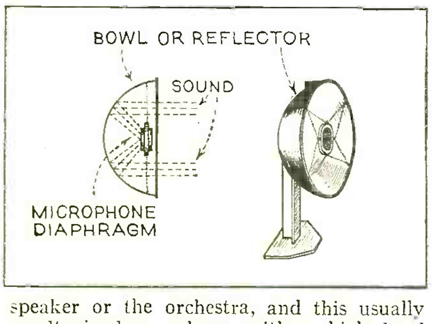


the Grigsby-Grunow Company has placed upon the market such a device. Thus, for those servicemen who do not care to make their own, they can procure this trap circuit upon the market.

M. CHERNOW,
New York, N. Y.

Home-Made Microphone Reflector

It is often necessary to place a microphone at considerable distance from the



speaker or the orchestra, and this usually results in low volume with a high level of background noise. The sound pick-up can be increased appreciably by using a reflector for the microphone, and for this purpose I use a large-size standard electric heater reflector. The hole formerly occupied by the heating element should be covered with a small piece of sheet metal shaped to fit the contour of the reflector surface. The reflector should preferably have a parabolic section, but even a large aluminum or tin bowl or basin—the larger the better—will function effectively. Note that the microphone faces away from the sound source and is placed at the focal

(*Continued on page* 699)

WHAT'S NEW IN RADIO

WILLIAM C. DORF

All-Wave Receiver

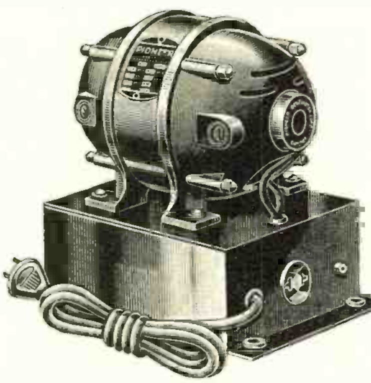
Description—A recent announcement was made of the new Silver-Marshall 7-tube model Z-10 all-wave superheterodyne receiver. It has a tuning range of 10 to 570 meters, employs two 2A5 type power tubes in a push-pull output circuit and is

equipped with full-range tone control, a noise suppressor circuit, and a ten-inch dynamic type speaker. The cabinet dimensions are: 40½ inches high by 22 inches wide, by 15½ inches deep.

Maker—Silver-Marshall Mfg. Co., 417 N. State St., Chicago, Ill.

Converters

Description—A recent announcement was made of a complete new line of Pioneer converters for changing 32 volt and 110 volt direct current to 110 volt alternating



current. The converters are provided with filtering systems to assure noiseless operation of radio receivers. They are available in different volt-ampere ratings to take care of all radio receiver and electrical appliance requirements. These generators are self-ventilating and feature perfect balance.

Maker—Pioneer Gen-E-Motor Corporation, 1160 Chatham Court, Chicago.

A New Type of Electric Soldering Iron

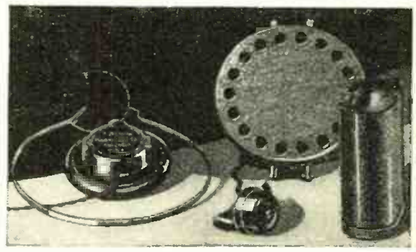
Description—The handle of the new Cornish Blue Comet balanced electric soldering iron is larger at the end nearest the

heating element. With this type of handle construction, should it inadvertently left off the stand, the hot tip is automatically suspended a sufficient distance from the bench to prevent burning. Additional new features of this iron are: a heat-element wound on a steel core with high grade michrome wire fitted into the steel tube and insulated with mica in such a manner to produce the most efficient heating unit, elimination of any possible strain on the heating element wire, easy access for replacing the line cord, air insulated handle, spring protected line cord and a steel tube treated to be rust and corrosion proof. The irons are available in 55, 75 and 100 watt rating.

Maker—Cornish Wire Co., Inc., 30 Church St., New York City.

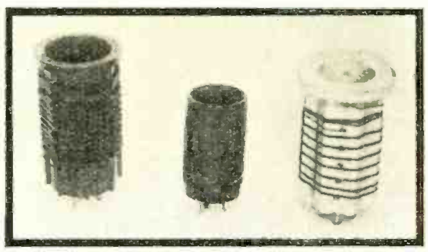
A New Hearing Aid

Description—The Trimm Excellophone hearing aid is designed for compactness, light weight and naturalness of tone. This new and inexpensive aid for the hard-of-hearing comprises a specially developed microphone, an ear piece and a battery case containing two small standard flash-



light batteries. Provision for this type of battery is a very desirable feature as they are easily obtainable from any five and ten cent store, hardware or electric dealer. The hearing aid is available with a choice of either the miniature or the featherweight flat type ear piece. The miniature earpiece is held in the ear by means of an adapter of molded hard rubber, of a size and shape to fit the ear. This earpiece is held in the outer ear by means of a short nickel spring cable which can be bent or adjusted to suit the requirement of the individual user. A soft rubber earpiece can be furnished if preferred or any standard earpiece may be used. An individually molded earpiece of hard rubber can be supplied if desired at extra cost in place of the earpiece regularly furnished. The microphone is equipped with a spring clip to attach it to one's clothing, and also with a volume control. The on-off switch is on the battery case.

Maker—Trimm Radio Mfg. Co., 1528 Armitage Ave., Chicago, Ill.



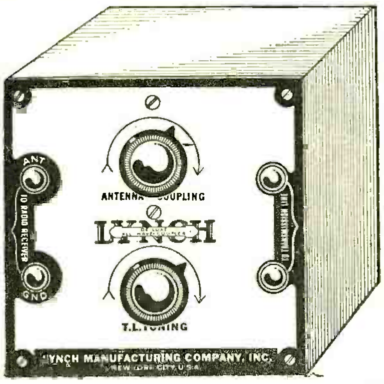
Short-Wave Coils

Description—This company offers a new complete line of short-wave coils. The coil on the left is wound on a ribbed bakelite form 1-9/16 inches in diameter. The manufacturer points out the fact that this type of coil is precision wound and the low loss ribbed construction makes for high efficiency. The small center coil is wound on a smooth bakelite form 1¼ inches in diameter. The feature of this coil is its uniformity and precision spaced windings. The plug-in coil on the right is precisely wound on an Insulex ribbed form $1\frac{1}{16}$ inches in diameter. This new coil form is made of a special non-hygroscopic ceramic compound and is ribbed to provide for maximum efficiency with minimum loss at the very high frequencies. All three types of coils are available in kits of four to cover the short wavelengths from 16 to 200 meters with a tuning condenser of .00014 mfd. capacity. Additional coils are available for the broadcast wavelength of 200 to 550 meters and also the ultra short-wave range of 9 meters.

Maker—Insuline Corp. of America, 23 Park Place, New York City.

Antenna Coupler

Description—The Lynch Mfg. Company has just brought out a new antenna coupling device which makes it possible to couple a feeder line from a noise eliminating antenna system, to any radio receiver

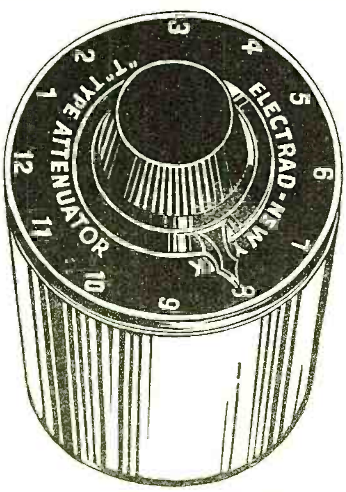


where the input antenna primary winding is grounded. The device is shielded within a metal cabinet and is designed for easy and quick attachment to any set. It is especially designed for use with all-wave and short-wave receivers and the manufacturers' claims include improved signal strength, better selectivity and noise reduction.

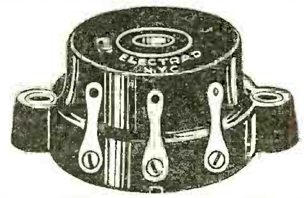
Maker—Lynch Mfg. Co., 51 Vesey St., New York City.

Variable and Fixed T-Type Attenuators

Description—The first illustration covers the new Electrad variable T type attenuator especially suitable as a volume control for input or output circuits of public address systems. This control is constructed



by using a multiple tap switch of sturdy design with wire wound resistor elements. Standard sizes are made in impedance values of 200 to 500 ohms with total attenuation of 44 decibels. This company is in a position to make these controls with special impedance and attenuation values. The attenuator will safely carry 8 watts of signal energy, and the dimensions of the device are, $2\frac{1}{4}$ inches in di-

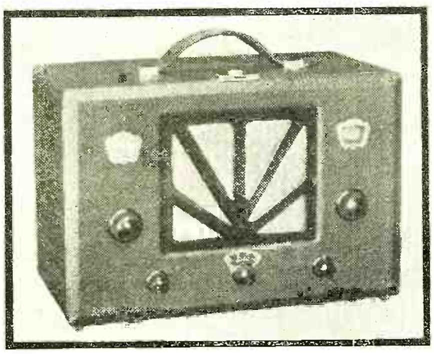


ameter by $3\frac{1}{4}$ inches deep. The second illustration shows the new Electrad fixed type attenuator, designed for fixed attenuation of low voltage signal lines or for matching signal level for two or more input circuits to a sound reproducing system. These units are available in standard values of 5, 10 and 15 decibels attenuation in either 200 or 500 ohm impedance. These attenuator pads are made by connecting 3 wire wound resistors of proper value in a T circuit. They are mounted in a bakelite case 2 inches in diameter by one inch in height.

Maker—Electrad, Inc., 175 Varick St., New York City.

Portable All-Wave Receiver

Description—Announcement is made of the new Freed six-tube portable all-wave receiver. This compact 110 volt 60 cycle a.c. superheterodyne set has a wavelength range from 15 to 560 meters, features a five inch electro dynamic type speaker, an illuminated vernier tuning dial, a tone control and employs the following tube equipment: one 6D6, two 78's, one 77, one 42 and one 80 type rectifier. The

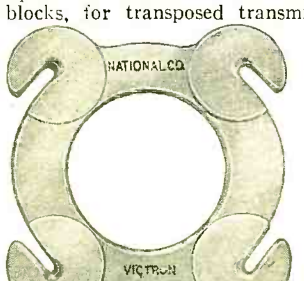


intermediate frequency is 462 kilocycles and the power output is three watts. The receiver and speaker are enclosed in an attractive Dupont fabrikoid covered carrying case measuring 16 inches high by 13 inches wide by $8\frac{1}{4}$ inches deep, it weighs 14 pounds. The case is equipped with a detachable front cover.

Maker—Freed Television & Radio Corp., Long Island City, New York.

Transposition Blocks

Description—The new National transposition blocks, for transposed transmission



lines, are wafer-thin and exceptionally light-in-weight. They measure $2\frac{1}{4}$ inches by $2\frac{1}{8}$ inches by less than 3/16 inch thick,
(*Continued on page* 699)

RADIO PHYSICS COURSE

ALFRED A. GHIRARDI*

Lesson 29

Self-Inductance

THE inductors used in radio apparatus take many forms, depending on their particular application. Some have inductances of only a few microhenries, are wound on insulating forms, and have air cores. Broadcast frequency tuning coils may be of the order to 200 to 300 microhenries and may be from 1 to 3 inches in diameter, wound with 50 to 100 turns or so of No. 20 to No. 30 wire. Radio-frequency choke coils having an inductance of 85 millihenries are also used extensively. For short-wave work, smaller values of inductance are used.

Iron-core inductances commonly used in audio amplifiers and in the filters of the B power-supply units of radio receivers have a great many turns of fine wire wound on laminated steel cores. Inductances as high as 100 henries are not uncommon in devices of this kind. The windings in inductances as large as this contain thousands of turns of wire. Their particular applications will be studied later. The approximate inductance of iron-core inductor or choke coils built with silicon steel laminated transformer-iron cores may be calculated from the following formula:

$$L = \frac{\text{core area} \times \text{turns}}{\text{air gap} \times 40{,}000{,}000}$$

A core flux density of 20,000 lines per square inch is assumed.

The inductance is in henries, the core cross-section area is in square inches, and the total air gap in inches is determined from the formula.

$$\text{Air gap in inches} = \frac{\text{turns} \times \text{amps.} \times 2.2}{\text{flux density in lines per sq. in.}}$$

The size of wire with which to wind the coil is determined by the current the coil is to carry. The wire size may be obtained from the data in a magnet wire table.

When an alternating current, or a varying direct current, flows through an inductive winding, a considerable counter-e.m.f. is developed due to the varying magnetic flux. This acts to oppose the flow of the current through the winding, as we shall see later.

The large spark noticed when opening the switch in an inductive circuit is caused by the high self-induced voltage which tends to keep the current flowing across the switch gap. Circuits having high inductance should not be opened suddenly, for dangerously high voltages may be developed in them by the self-induction. These may be high enough to puncture the otherwise satisfactory insulation on the wires. Circuits of this kind should be opened gradually by inserting resistance in them to slowly reduce the current to a low value, then finally opening the switch.

In some applications of coils where wire is wound up in the form of a solenoid in electrical and radio work, it is desirable that the solenoid should not possess any appreciable amount of inductance. Such windings are called *non-inductive windings*. For instance, when resistors are made of resistance alloy wire, the wire is usually wound up in the form of a solenoid of many turns, in order to make it compact in size. It is often desirable that the resistor not have any appreciable inductance due to this wound form, as in this case of the resistor coils used in Wheatstone bridges.

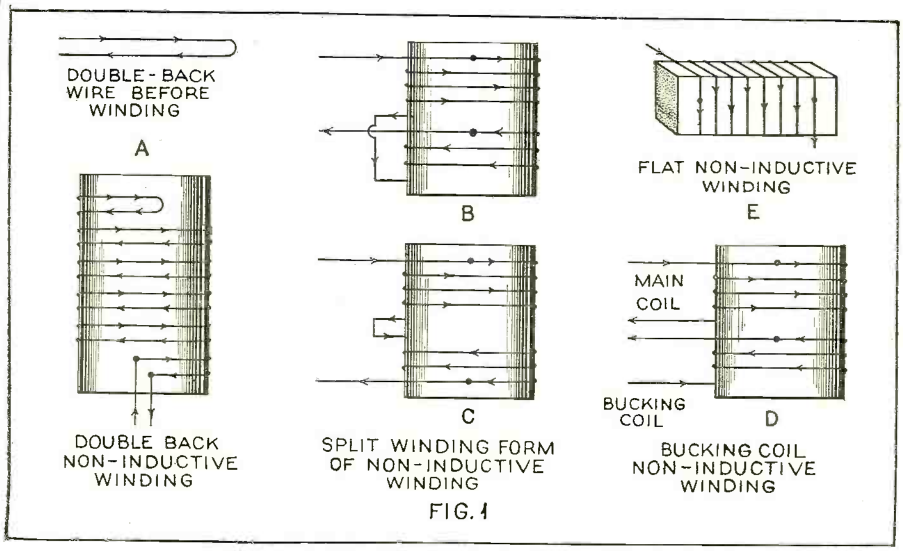


Figure 1. Several forms of non-inductive windings

Self-inductance in a coil may be neutralized by winding one-half of the coil in one direction and the remainder in the opposite direction as shown at (A) in Figure 1. The wire is really doubled back on itself. This is accomplished by folding the length of wire to be used, at its middle point, and starting at this point, winding both halves at the same time as a single wire, until the ends or terminals are reached. The magnetic effects of the current flowing in one direction through half of the total turns is equal and opposite to that produced by the same current flowing in the opposite direction through the other half of the total turns. The magnetic fields thus neutralize each other, and hence no inductive effect is present. The winding is said to be non-inductive.

As this method is rather inconvenient when a long length of wire is to be wound up, etc., it is common in manufacturing non-inductive coils or windings to simply wind two wires side by side and join the ends, or to wind the total wire up in the form of two separate coils, each having an equal number of turns equal to half

*Radio Technical Pub. Co. Publishers, Radio Physics Course.

the total turns required, as shown at (B) and (C) of Figure 1, instead of in a single part. Then the proper ends of the coils are connected together as shown, so the current progresses from one end through the two coils in the opposite direction so the magnetic fields are neutralized. The coils need not be wound in the same direction. It is merely necessary to connect them properly so the current flows in the opposite direction in each. At (B) the coils are wound similarly. At (C) they are wound in opposite directions.

Sometimes the inductive effect of one coil is neutralized by current sent through a separate *"bucking winding"* of the proper number of turns, placed near it as shown at (C) of Figure 1. The bucking coil is so wound or connected that its magnetic effect equals and opposes that of the main field. In these methods, the two windings need not be in the same direction. The right-hand rule for the magnetic field of solenoids is employed for working out the proper current directions.

Another way of winding a coil that is almost non-inductive is to wind it flattened in shape on a thin flat cardboard or bakelite form about 1/8 inch thick. Such a coil has practically no inductance because the opposite sides of each turn of wire are so close together that the magnetic fields neutralize, since the current is flowing in the opposite direction in them as shown in (E) of Figure 1.

"Backstage"

(*Continued from page* 681)

over NBC on Thursdays. She is co-featured with William Kennedy, a singer of ballads, who made his network début on this series. Kennedy had previously been heard over local New York stations.

FRANKLYN BAUR, one of broadcasting's pioneer entertainers, has returned to the air after a long absence during which he made a sensational success on the concert stage. He left the air to devote his time to preparation for the concert field, and the recent acclamation of music critics immediately placed him in a stellar musical spotlight. The tenor is under exclusive contract with NBC Artists Service and listeners can expect to hear quite a bit of him on future schedules. Baur is but thirty years old and is a native New Yorker.

THE trend toward hill-billy radio programs seemed somewhat checked when the NBC suddenly snatched up the Ozarkian quartet of Pappy, Zeke, Ezra and Elton from a local New York station and assigned it several programs each week. The mountaineer aggregation earned a large metropolitan following through their programs over WMCA. The hill-billies attract considerable attention by appearing on the New York streets in mountaineer costumes.

S.-W. Beginner

(*Continued from page* 667)

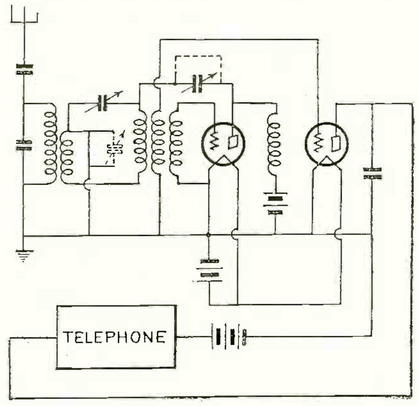
volume control until the oscillations stop, and adjust for the desired volume. Whenever the position of the volume control is changed, it will probably be necessary to retune slightly.

The operation of the battery model is identical with that of the a.c. version as described above. The battery connections are not at all complicated and are clearly indicated in Figure 3. James Millen, the National Co.

LATEST RADIO PATENTS

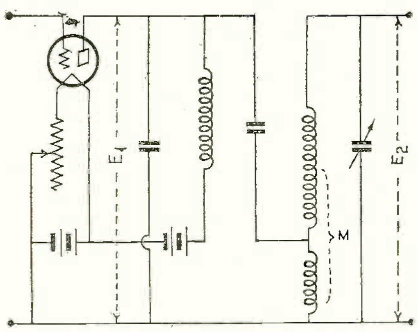
BEN J. CHROMY*

1,895,103. HETERODYNE OSCILLATOR. EARL G. PORTS, Woodside, N. Y., assignor to International Communications Laboratories, Inc., New York, N. Y., a Corporation of New York. Filed Mar. 7, 1931. Serial No. 520,783. 9 Claims.



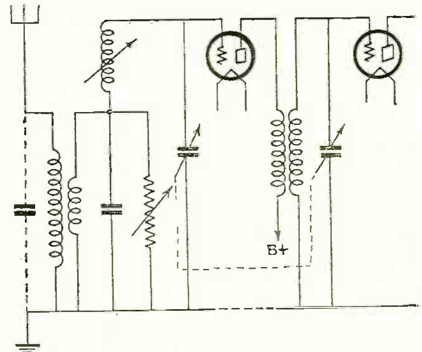
1. In a radio receiving system adapted to receive signals of either damped or undamped waves, an electron discharge device having input and output circuits, a tuned frequency selecting network having an output circuit, a detector having an input circuit, inductances individual to each of said input circuits, an inductance common to said output circuits, all of said inductances being coupled together, and a variable condenser in circuit with said first output circuit and said frequency selecting network for controlling the operation of said electron discharge device.

1,908,934. ELECTRIC COUPLING SYSTEM. CARL E. TRUBE, deceased, Ossining, N. Y., by Sarah M. Trube, administratrix, Ossining, N. Y., assignor to Hazeltine Corporation a Corporation of Delaware. Original application filed May 14, 1930, Serial No. 452,464, now Patent No. 1,798,962, dated Mar. 31, 1931, and in Great Britain Sept. 14, 1926. Divided and this application filed Mar. 13, 1931. Serial No. 522,344. 6 Claims.



1. In a high-frequency system, a thermionic tube having anode, cathode and control electrodes, an electric coupling system comprising a resonant circuit tunable throughout a range in frequency, and a second circuit including fixed inductance and capacity proportioned to produce resonance at a frequency below said tunable range, said fixed capacity being external to said resonant circuit, and said fixed inductance being electromagnetically uncoupled from said tunable circuit, a coupling impedance having a fixed voltage ratio relative to said tunable circuit, and a path through said coupling system between said anode and cathode including in series said coupling impedance and at least a portion of said fixed capacity, said coupling impedance being much smaller than that of said portion of said fixed capacity throughout said range in frequency, the elements of said coupling system being so proportioned that the ratio of resonant voltage developed across said tunable circuit to an input voltage impressed between said cathode and control electrodes remains substantially constant as the tuning is varied throughout said frequency range.

1,911,096. INPUT SYSTEM FOR ELECTRICAL AMPLIFIERS. HAROLD A. SNOW, Mountain Lakes, N. J., assignor, by mesne assignments, to Radio Corporation of America, New York, N. Y., a Corporation of Delaware. Filed July 5, 1929. Serial No. 376,130. Renewed Oct. 24, 1931. 24 Claims.



1. A vacuum tube input system of the type including a series-resonant circuit comprising a fixed condenser, a variable condenser and an inductance, coupling means for impressing signal energy across said fixed condenser, and means for applying the voltage across said variable condenser to the input terminals of a vacuum tube, characterized by the fact that said coupling means includes a transformer effective to increase the apparent impedence of said fixed condenser.

1,912,234. RADIO DIRECTION FINDER. JOHN A. WILLOUGHBY, Cambridge, Mass. Filed Jan. 8, 1929. Serial No. 331,003. 13 Claims.

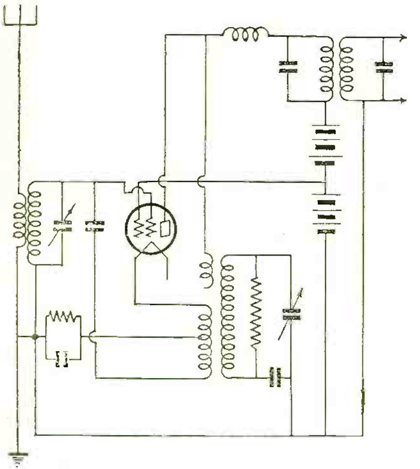
1. In a guiding system for moving vessels the combination of a plurality of directional antenna systems mounted in predetermined planes in spaced relation on the vessel, a plurality of electron discharge devices, equal in number to the number of antenna systems, output and input circuits therefor, each of said directional antennæ being in individual electrical relation with an input circuit of one of said electron discharge devices, a non-directional antenna carried by the vessel in symmetrical relation to said directional antenna systems on said vessel, means coupling said non-directional antenna with the input circuits of said electron discharge devices, and a source of anode supply for said electron discharge devices adapted for periodically successively energizing the output circuits of said electron discharge devices.

1,893,813. OSCILLATOR. VERNON E. WHITMAN, New York, N. Y., assignor to Hazeltine Corporation. Filed Apr. 9,

*Patent Attorney, Washington, D. C.

1932. Serial No 604,172. 14 Claims.

1. In an oscillator-modulator arrangement, a vacuum tube having grid, anode, and cathode, an input circuit connected between said grid and said cathode, an



output circuit connected between said anode and said cathode, a tuned circuit included in said input circuit and tunable to the frequency of a current to be modulated, an oscillation circuit coupled to said output circuit and tunable to the frequency of a modulating current, means for impressing voltages of said oscillation frequency upon the input circuit of said tube, means for producing substantially constant amplitude of oscillation voltage as said oscillation circuit is tuned throughout a range of frequencies, and means for neutralizing the grid-to-cathode capacity of said tube relative to the oscillation-frequency input thereof, whereby the presence of the tuned input circuit will not affect the oscillation-frequency voltage impressed upon the input of said tube.

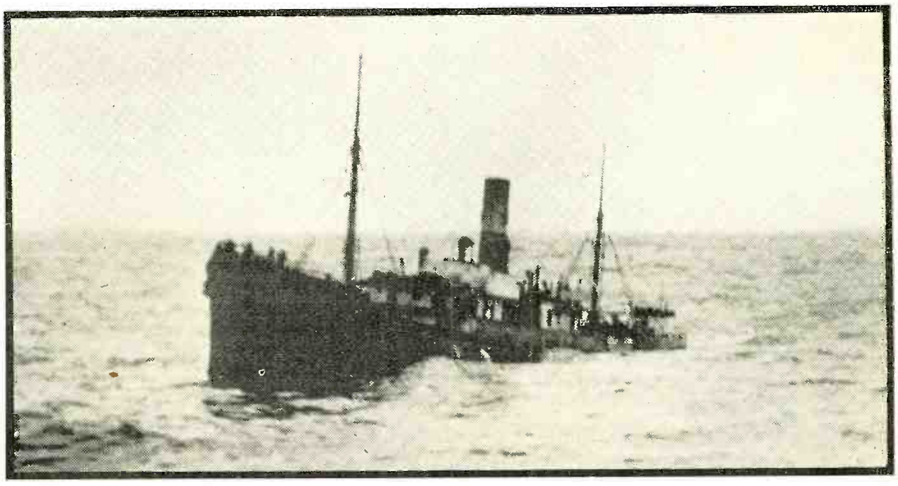
World's Radio Market

(*Continued from page* 661)

tubes are handled mainly in conjunction with other lines, such as mechanical refrigerators, automobiles, tires, and so on. The European radio merchandisers are of a high type, in the main. Their shops are most attractive, dignified, permanent-looking. Radio shows are still very much the vogue, for they are replete with radio offerings and substantial information for the visitor.

Europe is a good radio customer. But so is Latin America, our neighbors to the south. In Latin America the situation is simpler, for there is little domestic radio production. In the leading South American countries there are set manufacturers, mainly operating as assembly plants. However, most sets as well as tubes are imported. European and American offerings compete on practically even terms. The fact that American goods outsell others once more tells the story of mass production, thorough research and sound engineering.

Far-away Australia is the outstanding foreign market for American radio tubes. The demand by type closely parallels the demand in America, as Australian manufacturers follow American radio engineering closely. Nearby is Japan, which has a growing radio industry of her own. For the most part, the Far East is not as yet economically ready for radio on a large scale, but the day must come when the millions upon millions of Chinese and Hindus and others will demand radio receivers. W. A. Coogan, Foreign Sales Manager, Hygrade Sylvania Corp.



QRD? QRD? QRD?

CONDUCTED BY GY

AND 'twas only a few years back, sometime B.P., when "yours truly" happened to walk into a barroom and overheard the following conversation: ". . . an' there warn't any wires tacked onto it. Jerry just sits there and turns a dial on the front of it and music and speeches come through the horn like as if they were in the room." "Well," replied the listener after a moment of deep thought, "it can't be a success, because the windows can't stay open in the winter to let the electricity come through."

Leon Athey and Walter Adams are with us again after the harrowing experience they had when the *S.S. Exeter City* went down off the coast of Newfoundland. It was just one of those routine sinkings without any of the thrills attending a real, honest-to-goodness shipwreck, according to Athey. They did a little routine brass work and the *S.S. American Merchant* hove into sight and took off all hands. The photo on this month's heading, taken by Brother Athey, shows the *Exeter City* settling in the stern for the final plunge. And they still insist that a radio op's job is to take care of the *routine traffic!*

Sam Liles, who recently graduated from the C.R.E.I. course, is now at WPTF, Raleigh, N. C., and he recently advised Ye Ed that he would be willing to make his own ice-cream freezer if he could get a billet with Admiral Byrd's expedition for the purpose of radio experimentation under Antarctic conditions. Brother Liles should be happy that he remained at home, close to the fireside, as some of the reports coming through from Little America show what a really tough time they are having down there. One can get a faint idea of the situation if one had ever renewed antenna cables up in Boston on a 5-below-zero day.

Continuing in our efforts to make radio ops and radio personnel study-wise, we quote from a recent speech given before a noted body by Mr. E. H. Rietzke, president of the C.R.E.I., ". . . Radio has outgrown the 'ham' stage. It is a serious engineering business, with hundreds of millions of dollars involved. It is a business big enough to offer almost unlimited opportunities for the *trained man* in radio. Don't kid yourself! Any man who says there are no opportunities for fully qualified men in radio is simply offering an excuse for his own lack of technical training and ability, or else he is inherently lazy and unwilling to devote the time and effort necessary to get the proper training that will make him worthy of an opportunity. . . . You men, who have the necessary practical experience, can easily, with the proper technical training and study, be eligible for the numerous positions which are opening up by the broadcast stations and other mediums which use radio for their business. One year ago there were just six broadcast stations in the United States using 50 kw. power, and today twenty-three stations are licensed for 50 kw. and WLW, Cincinnati, is on the air experimentally with 500 kw. *It will require better trained men to hold down these greater power jobs. . . .!*"

Radio hams are doing their bit toward keeping the home fires burning for the boys who are with the expedition down at Little America. Mr. John Paige, whose brother, David Paige, the noted artist, is with Admiral Byrd, came to the writer recently to see if he could get some amateur in N. Y. C. who would be willing to aid him in making contact with his brother. As many hams were only too happy to help, it was an easy matter to get in touch with Brother Bamberg of the Bronx to make up a schedule with NY1AB, Canal Zone, to relay the traffic. His last message was received via W9NMR, Manhattan, Kansas.

Fire Island, N. Y., better known to radio men as the QTE station NJY for the second district, has been going through a tough time those frosty days, according to the dope received from C. A. Stevens, the big compass and battery man of the island. He sez it got so cold that the bay between there and the mainland froze up completely, so that no boats could break through, and yet it wasn't strong enough to permit anyone to walk on it to the city of Bay Shore, directly across. Grub ran low, as everyone had planned to hit the beach for the holiday, so it was a toss-up whether to feed the dogs to the frying pan or gnaw on shoeleather. Just one of those spots on the map that make men wonder whether it pays to study in seclusion or concentrate on the profession of an actor.

"Whew! Cut out that effervescence of youth or you'll be making us all feel like Methuselah!" That rootin', tootin' Morry Schatt, who was formerly with the Pan-Am Airways, All-Amer. Cables, T.R.T., etc. and etc., is now the dashing man-about-town for the C.R.E.I. He is the guy who tells you what to study and when and keeps on insisting that C.R.E.I. course for Advanced Technical Training is the besta of the besta. He popped in to show Ye Ed the brand-new catalogue, 46 pages of which are devoted entirely to explanations and photographs of the various activities at the school and the various types of home-study courses. This is now available to all those wishing to take advantage of this opportunity. So, me hearties, first come, first served. Just drop a line to this colyum or to Brother Schatt at 200 Broadway, N'Yoik.

Brother Bob Nisler of Wynnewood, Okla, is the smart one, all right. He rightly writes to Mr. Duffy of the RCA Static Room at 75 Varick Street, N. Y. C., for while toasting his toes in his homestead back in them thar hills his letters will bring him an assignment as though he were physically in the buzzer room. . . . Malden, Mass., cracks through Brother Stockellburg, who should be presented with the Croix de Guerre, the Hors d'Oeuvres and the Filet de Mignon for his latest remark about this colyum. No, pardner, this is not a club, but just a chatterbox. And as for the address of the V.W.O.A., we cawn't sye, y'know, since Fred Muller moved from the offices of the T.R.T. . . . North Manchester, Ind., comes in with a blast by Brother Thurston Hoffman, who cannot understand why broadcast stations refuse to recognize the experience of a radio op for broadcast work. We advise Old Hoffy to indulge in a bit of study of the rudiments of their xmtrs and other equipment and see why the boys are called engineers. . . . Enyho, the old hams and ham-ands are piling up the mahogany with short-wave advice and suggestions, and we are all for them, what with their Berlin, Moscow, Borneo, etc., reception—why dampen it? So until next time 73. . . . ge . . . GY.

Dial P. A. System

(*Continued from page* 658)

the point where three-digit combinations may provide several hundred available programs over the building loudspeaker hook-up.

The types of programs available to NBC executives and personnel over the elaborate P.A. system are varied indeed. Separate combinations are provided to dial the two New York key stations, WEAF and WJZ, to obtain the programs either off the transmission line or off the air. Another pair of dial combinations can "tune-in" programs directly off the telephone lines conveying programs to the Red and Blue networks. At certain times, WEAF or WJZ convey local programs while other programs are routed to out of town stations on the Red and Blue hook-ups of the NBC. Other dialing combinations provide the selection of programs from any of the main Radio City studios and rehearsal rooms. Whenever any studio is in use for a broadcast, rehearsal or audition, the audible proceedings can be "tuned-in" at any loudspeaker outlet in the building. In addition to programs originating within the building, broadcasts or auditions at other associated NBC stations are conveyed to Radio City by telephone and made available to the P.A. users through special dialing combinations.

A group of stations in the New York area are constantly tuned in on master receiving sets and their programs are also made available to the P. A. users.

The DX Corner

(Short Waves)

(Continued from page 672)

W8XK, W3XAU. He also gets the following European station: GSA, GSB, GSC, GSD, GSE, GSF, GSG, DJA, DJC, DJD, FYA, OXY, EAQ, CT1AA, RV59, RV72, RV50, HBL, PHI and, of course, I2RO and HVJ.

A Report from Cuba

Mr. F. H. Kydd of Ceballos, Cuba, reports that short-wave reception has not been good lately on the 25- and 31-meter bands. Many days the 19-meter band was very good and the 48-meter band also has been good. He lists the following Best Bets: W2XAD, FYA, W3XE, W8XK, DJB, W3XAL, W3XL, YV3BC, W8XK, YV1BC, W9XF, VE9GW, W8XAL, GSA, DJC, HJ4ABE.

Report from Australia

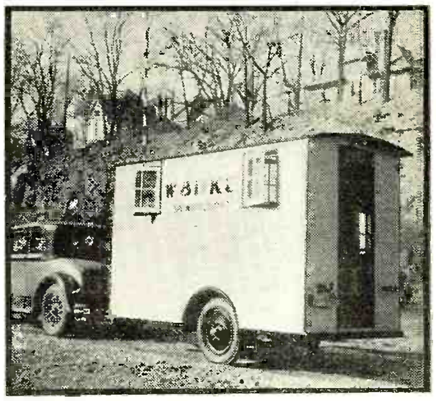
Mr. C. N. H. Richardson of Stawell, Victoria, Australia, reports that he hears American, Dutch, English, Russian, Siberian, Javanese and French stations on his Philips all-wave four-tube receiver. His Best Bets are FYA, RV15, VK2ME and many other well-known stations.

Readers Who Helped Log Stations for This Month's Report

We are indebted to the following readers of RADIO NEWS who sent in reports of reception this month: F. D. Craig, Berkeley, Calif.; J. N. Hughes, Philadelphia, Pa.; J. D. Hall, Chicago, Ill.; J. N. Naff, Camden, Tex.; O. Johnsen, Portland, Ore.; J. E. Brooks, Montgomery, Ala.; H. G. Taggart, Reedy Creek, Manitoba, Can.; B. F. Locke, Marthaville, La.; J. Stokes, Pittsburgh, Pa.; A. Miller, Morganton, N. C.; D. Smith, Woburn, Mass.; P. J. Kecks, Pittsburgh, Pa.; J. F. Leonard, Waynesboro, Va.; W. F. Buhl, Newark, N. J.; H. L. Harris, Pacific Grove, Calif.; H. Adams, Jr., Baltimore, Md.; C. H. Skatzes, Delaware, O.; A. J. George, Neath, South Wales, Great Britain; P. A. Stalder, Overton, Tex.; Dr. F. C. Naegeli, Devils Lake, N. D.; C. Will, Glencoe, Ill.; P. A. Jordon, Wichita Falls, Tex.; G. R. Bigbee, Fort Benning, Ga.; H. Johnson, Big Spring, Tex.; R. F. Hinck, Fort Sill, Okla.; J. J. Maling, Diss, Norfolk, England; R. Lawton, Whitefield, near Manchester, England; G. E. Dubbe, Walla Walla, Wash.; S. Kosko, Cohoes, N. Y.; E. J. Wilson, Boston, Mass.; D. W. Shields, Roseville, O.; C. L. Wright, Leicester, England; C. H. Armstrong, Atlanta, Ga.; E. A. Kalthoff, St. Louis, Mo.; B. Ott, Bronxville, N. Y.; E. F. Orne, Cambridge, Mass.; K. Boord, Smithfield, W. Va.; F. Roberts, Kearney, Neb.; C. H. Long, Winston, Mo.; Dr. J. P. Watson, Hazlehurst, Miss.; J. A. Check, Adah, Pa.; Wm. Dixon, Plainfield, N. J.; D. W. Parsons, Cape Henry, Va.; G. K. Harrison, Hobbs, N. M.; E. S. Christiani, Jr., Georgetown, Demerara, B. G.; H. Hansen, Omaha, Neb.; W. G. Wey, Mannette, Wis.; C. Sharp, Toronto, Ont., Can.; R. L. Weber, West McHenry, Ill.; S. S. McNamara, Brooklyn, N. Y.; A. Hamilton, Somerville, Mass.; P. J. Mraz, Keystone, S. D.; A. Wolbert, Bronx, N. Y.; J. O. Mosseau, Mechanicville, N. Y.; W. H. Ward, Vallejo, Calif.; H. Kraus, Bristol, Conn.; D. R. Barker, Boulder City, Nev.; R. Wright, Brooklyn, N. Y.; V. Scott, Rochland, O.; A. B. Baadsgaard, Ponoka, Alta., Can.; Dr. Max Hausdorff, Lugano, Viganello, Switzerland; K. A. Staats, Aliquippa, Pa.; W. I. Gilgore, Savannah, Ga.; H. F. Lyman, New York City; G. W. Twomey, Fort Snelling, Minn.; W. J. Vette, Denver, Colo.; P. C. Atwood, Nashua, N. H.; C. N. A. Richardson, Stawell, Victoria, Australia; P. Simmons, Chicago, Ill.; A. A. Boussy, Springfield, Mass.; E. G. Derrick, Antigua, B. W. I.; G. H. Allison, Emory, Va.; F. F. Anderson, Caracas, Venezuela; Oker Radio & Elec. Shop, Cincinnati, O.; H. D. Nordeen, Provo, Utah.; H. L. Pribble, Duncan, Okla.; G. L. Rich, Richmond, Va.; F. H. Kydd, Ceballos, Cuba; Dr. I. A. Simonini, Genoa, Italy; F. L. Saldana, Huamantla, Tlax, Mexico; R. Cardosa, Rio de Janeiro, Brazil; L. E. Lo, Shanghai, China; H. R. Schneider, New Ulm, Minn.; W. Howald, Los Angeles, Calif.; Dr. G. C. MacDiamond, Thames, N. Z.; E. S. Foster, Sr., New Orleans, La.; W. T. Thompson, Fredericksburg, Va.

A Short-Wave Amateur Radio Explorer

SPRINGFIELD, OHIO—To obtain accurate comparisons in the results of short-wave transmission and reception by the use of the *same* apparatus in the *same* station and with the *same* operator, but in *different* locations, L. A. Morrow, a radio amateur of this city, has recently built a



complete radio station on wheels. The station's call is W8DKE. It is built in a two-wheel auto trailer. Although the station is entirely portable, it can be put on the air within 15 minutes after reaching a location. A 66-foot antenna with a single voltage feed is used. The trailer carries a 100-foot flexible cable to plug into a convenient electric-light line. Morrow plans to tour the country, spending several months in Florida and other Southern states, making tests. He uses a modern vacuum-tube transmitter. (Readers of RADIO NEWS who hear his transmissions are invited to send their reports to RADIO NEWS. We will see that they are forwarded to the portable station.)

A Report from Alberta, Canada

Mr. A. B. Baadsgaard of Ponoka, Alberta, Canada, reports Best Bets in his location as follows: FYA, GSD, PHI, RV15, HBL, VK2ME, VK3ME, PSK, LSI, EAQ, and all the Eastern short-wave American stations. Mr. Baadsgaard uses a Canadian Marconi all-wave eleven tube receiver. He is situated six miles south of the city of Edmonton, Alberta, and 500 miles east of Vancouver, B. C., and 2500 miles northwest from New York City.

Have You Heard Singapore?

Mr. John White of New York City reports hearing a station giving its address as Singapore, Malay Federated States. He wrote them and obtained an official verification of their programs. They are on 49.9 meters with 90 watts output power. The owner is Douglas Newton. Their address is Radio Service Company, Singapore, Malaya. They transmit news on Mondays, Wednesdays and Thursdays from 6 to 8:30. On Wednesdays at 7 p.m. they transmit news and stock market reports. On Thursdays they transmit news followed by a choir from the Singapore Presbyterian Church. On Sundays from 11 a.m. to 1:30 p.m. they transmit records, while at 12:30 there is an organ recital. All these times are Singapore time. Do any other readers hear this station? It is surely one fine DX to go after.

Another English Report

Mr. John J. Malling of Norfolk sends in his Official report for Best Bets during the past month: HBL, W8XK, W1XAZ, XETE, HJ3ABF, W3XAL, FYA, RV59, VK2ME, X3XL, FIQA, QTJ (Johannesburg, 49 meters), VQ7LO, HVJ, DJC, DJA, W3XAU, CT1AA, YV1BC, RV72 (Moscow, 46 meters), DJB, I2RO.

To Relatives and Friends of the Byrd Expedition

The General Electric station, W2XAF, has been sending letters and messages to members of the Byrd expedition through their short-wave facilities. Future broadcasts and the reading of short-wave letters to Byrd will take place on March 11th and 25th, April 8th and 22nd, May 6th and 20th, June 3rd and 17th. Friends and relatives sending letters to be broadcast on these dates should send them to the General Electric Company, 1 River Road, Schenectady, New York, or addressed to Station W2XAF at Schenectady, New York. These letters should be received not later than the Friday preceding or two days before any broadcast. Letters should be marked to the attention of Mr. C. D. Wagoner. Messages should be limited to 50 words. The messages will be read immediately following the half hour program which goes out on the red network of the National Broadcasting Company. Friends or members of the families of men on the Byrd expedition may stop in at Schenectady on any of these broadcast dates to personally chat with their friends or relatives on the expedition.

Report from Louisiana

Mr. R. J. Heinen of Lake Arthur reports the following Best Bets in his location: WXAZ, EAQ, VE9JR, W8XK, W2XAF, DJA, W3XAL, XETE, KES, W9XF, DJD, GSB, W2XE, W3XAU, WEF, VE9GW, LSX, DJC, YV1BC, W3XL, W2XAD, WEA, W9XAA, GSA, YV3BC, HC2RL, HJ1ABB, TGW, W4B, W8XAL.

A Fine Report

Mr. Kenneth Boord, Official Listening Post Observer for West Virginia, sends in a report from his "Little Switzerland of America" Listening Post. The material has been included in Best Bets for this month. We believe this is the finest report that we have received from any listening post this month, as it coincids almost exactly with our own Westchester Listening Post data.

Report from Illinois

An official report from Mr. R. Weber of West McHenry, Illinois, gives the following Best Bets: HIX, HIZ, PSK, HJ1ABB, HJ3ABD, HJ4ABD, YV1BC, YV3BC, GSA, DJC, VK2ME, LSX, FYA, PHI, ZFS, HBP, CNR, ZFA, G6RX, W4XB.

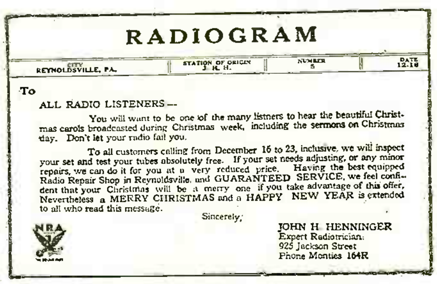
Send in Your Reports

The Editors acknowledge with thanks the assistance of public-spirited readers who have thus co-operated to make these columns so successful and helpful. Let us urge our readers, one and all, to continue, in even a larger way, to send in these reports. We would be grateful if every reader who hears even a single station would send it in to us with just the data as to its wavelength, the time which it was heard, etc. Of course, we would prefer to get more information, including the Best Bets in each listener's locality, as well as definite lots of stations, their wavelengths and times of transmission. Readers will also help by stating what type of receiver they use in logging these stations.

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

THE demand for tuning dials in 1934 will unquestionably turn to the airplane or instrument type. A round dial with a pointer with either plain bezels or ornamental modernistic escutcheons in silver or chromium finishes. These dials will vary in size and speed ratios for consoles or the larger midget cabinets. For compacts, smaller dials of the same general type for direct drive or the geared condensers will have a large sale. Of course, the older styles of dials will continue to sell, but for those desiring something new and practical the airplane type will have an appeal. Winslow Goodwin, Crowe Name Plate & Mfg. Co.

ELECTRICAL hearing aids are being accepted today as never before. Many hard-of-hearing people have felt that wearing a hearing aid was something to be ashamed of, a sign of weakness. Today hearing aids are rapidly being accepted on the same basis as glasses for those with imperfect eyesight. Much of this acceptance can of course be traced to the refinements in manufacture making hearing aids lighter, more compact and less conspicious. A. J. Eaves, Research Products Sales Manager, Graybar Electric Company.



RADIOGRAM

CITY	STATION OF ORIGIN	NUMBER	DATE
REYNOLDSVILLE, PA.	J. H. H.	5	12-16

To

ALL RADIO LISTENERS—

You will want to be one of the many listners to hear the beautiful Christmas carols broadcasted during Christmas week, including the sermons on Christmas day. Don't let your radio fail you.

To all customers calling from December 16 to 23, inclusive, we will inspect your set and test your tubes absolutely free. If your set needs adjusting, or any minor repairs, we can do it for you at a very reduced price. Having the best equipped Radio Repair Shop in Reynoldsville, and GUARANTEED SERVICE, we feel confident that your Christmas will be a merry one if you take advantage of this offer. Nevertheless a MERRY CHRISTMAS and a HAPPY NEW YEAR is extended to all who read this message.

Sincerely,

JOHN H. HENNINGER
Expert Radiotrician.
925 Jackson Street
Phone Monties 164R

The "Radiogram" shown above illustrates the adaptation of a popular sales idea to the radio servicing business. Mr. Henninger used this as a hand-bill and declares it very effective. It may, of course, be used on occasions other than Christmas. Particularly apropos at the present time would be the slight change in wording to make the advertisement apply to the opening games in the American and National leagues.

The DX Corner (Broadcast Band)

(*Continued from page* 677)

mitter is covering a large part of the world with its signals.

An interesting fact is that as yet not one report has been received by the DX Corner complaining of blanketing by this transmitter. When the idea of a 500 kw. transmitter was first broached there were many who felt that such high power would practically ruin reception for miles around Cincinnati. The Crosley engineers claimed that such would not be the case and, if reports sent in to this department are a criterion, their confidence was fully justified.

Again—from Missouri

C. H. Long, the all-time champion contributor, whose excellent article on broadcast-band DX reception appears elsewhere in this issue, writes his experience with reception during February:

"Conditions for reception have been on the whole rather poor during the last month. However, on a few occasions reception conditions were favorable. The Japanese stations have been heard unusually well a number of times. The Melbourne and Adelaide stations are now being heard again at fair strength, and it is expected that conditions for their reception will be good within the next few weeks. Poste Parisien is now being heard, since the change of European frequencies, on 959 kc. They come in daily at about 1:10 a.m., C.S.T. Their reception has improved markedly since their change of frequency. The reverse is true of most of the other European stations."

6F7

(*Continued from page* 656)

(at maximum volume-control setting) should be about minus 20 volts for the detector and minus 3 volts for the pentode. The output from the detector can be approximately 10 volts r.m.s. with a 20 percent modulated signal. If the tube following the detector is a sensitive tube and the signal is weak, a grid bias of minus 14.8 volts will be best for the detector. These figures were obtained with a 250-volt power supply. The triode can also be employed as a grid-leak detector (and so

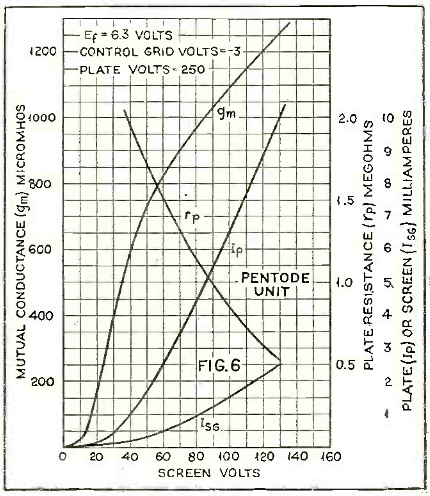


FIG. 6

can the pentode). The following figures give some idea of their sensitivity with a signal 30 percent modulated. The triode delivers 2 volts r.m.s. audio-frequency potential with an input of 2.1 volts r.m.s. when the plate supply is 100 volts. A 250-volt supply yields 3.85 volts ouput, with 3 volts input. These are the maximum signals obtainable. The pentode delivers 5.5 volts r.m.s. with .7 volt input when the power supply is 100 volts. The same input with a 250-volt supply gives an input of 8.6 volts. All values are r.m.s. and maximum undistorted output voltages.

The screen voltage is quite critical for best results. Curves, which cannot be shown for lack of space, indicate the re-

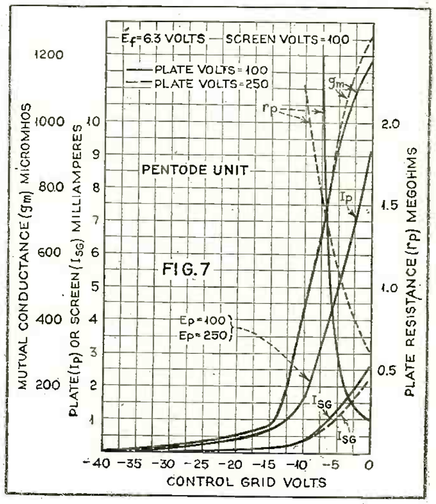


FIG. 7

quired value is approximately 15 volts. This applies to a circuit with a .5-megohm plate resistor, a 1-megohm grid leak and a .00025 mfd. grid condenser and 250-volt plate supply.

Finally, the triode can be employed as a diode detector and an automatic volume-control tube. The diode function is obtained by connecting grid and plate together or by connecting the plate to the cathode. Figure 3 shows the circuit for a combination second detector and audio amplifier. The bias for the two units is again obtained by means of a tapped resistor in series with the cathode. Proper values are shown in the diagram. The grid leak for the next a.f. tube should be 1 megohm. If it is a tube which is not designed for so large a resistance, the highest allowable value should be employed. The technical information on which this article is based was obtained from National Union engineers and RCA engineers.

Phenomena

(*Continued from page* 657)

signaling, and for the detection of underwater obstacles. Pierce has used a quartz oscillator for the determination of the velocities of waves of high frequencies in gases. Crystals have also been applied the study of vibrations in heavy machinery and we may expect a rapid extension of its use to other laboratory and engineering measurements. Hund has suggested the use of an unsymmetrical quartz plate for the production of audio-frequency power. He has also suggested that a vibrating plate could be used as an optical shutter, making it possible to measure the velocity of light in a manner similar to Fizeau's mechanical shutter arrangement; a very important suggestion, since the velocity of light enters in such a fundamental way into the calculations of radio theory. The optical properties and the behavior of quartz are most interesting. There are many likely applications ahead in the fields of phototelegraphy, facsimile transmission and television.

With the Experimenters

(*Continued from page* 687)

point of the parabola. The proper location of the microphone can be easily determined by experiment. In operation, the reflector is simply aimed at the source of sound.

The microphone itself may be of either the carbon or condenser type, but it should be remembered that carbon microphones must be operated with the diaphragm in a vertical position or distortion will result.

RALPH P. GLOVER,
Chicago, Ill.

What's New in Radio

(*Continued from page* 689)

overall, and provide 1½-inch spacing between leads. They weigh approximately ¼ of an ounce each. Using 24 of these blocks in a transposed lead-in system their total weight would only be 6 ounces. The blocks are made of a translucent material known as Victron and their design reduces losses to a minimum. The edges of the slots which hold the wires are rounded to overcome any possibility of chafing or cutting the transposed leads.

Maker—National Company, Inc., Malden, Mass.

The Technical Review

(*Continued from page* 683)

are trained to fill the many jobs created by the radio and allied industries. The book also contains detailed information on the home-study courses in radio and allied subjects offered by the National Radio Institute. This book is available only to the RADIO NEWS readers who are over 16 years of age and who are residents of the United States or Canada.

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

16. *R.M.A. Standard Resistor Color-Code Chart.* A handy postcard-size color-code chart designed by the Lynch Mfg. Co. to simplify the job of identifying the resistance values of resistors used in most of the standard receivers. It also contains a complete list of the most commonly used values of resistors with their corresponding color designations. A complete catalog of Lynch products is included.

25. *Noise-Reducing Antenna Systems.* This folder describes in detail the two types of noise-reducing systems perfected by the Lynch Mfg. Co. for both broadcast and short-wave reception.

34. *Service Man's 1934 Replacement Volume Control Guide.* Vest-pocket size booklet containing a list, in alphabetical order, of all old and new receivers showing model number, value of control in ohms and a recommended Electrad control for replacement purposes.

41. *How to Build the "Economy Eight."* A folder prepared by Wholesale Radio Service Co. giving constructional information, diagrams, list of parts, etc., of an efficient 8-tube receiver which can be built from a kit which sells for $13.75.

42. *How to Build Useful Servicing and Testing Instruments with Simple, Standard Meters.* Data, with diagrams, showing how any meter—preferably a low range milliammeter—can be used to measure amperes, volts and ohms over any desired range through the use of proper shunt and series resistors.

52. *The Servicer.* Contains information designed to help the serviceman do better work and make more money doing it.

56. *Servicing and Testing Instruments.* Descriptions of a new line of low-priced analyzers, set testers, tube testers, ohmmeters, capacity testers, oscillators and universal meters. Complete information is also given on the new Supreme model 55 tube tester and the new master diagnometer which employs the "free reference point system of analysis."

59. *The IRC Volt-Ohmmeter.* Characteristics and uses of the International Resistance Co. volt-ohmmeter, a combination voltmeter and ohmmeter specially designed for the point-to-point method of trouble-shooting.

60. *Audio and Power Transformers and Choke Coils.* Information on the characteristics of a wide variety of Amer-Tran DeLuxe and Silcor (popular priced line) audio and power transformers and chokes.

61. *Replacement Parts for Dealers and Servicemen.* A pocket-size book, prepared by Wholesale Radio Service Co., listing manufacturer's name and model number of a large number of current model and old type receivers with the recommended replacement power transformers, condenser blocks, volume controls, voltage dividers and audio transformers required for such sets.

62. *How to Make Money on Public Address.* Articles on how to make money with public-address equipment, together with descriptions and prices of a variety of Lafayette amplifiers and public-address equipment available through Wholesale Radio Service Co., Inc.

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A 3-Tube Compact

(*Continued from page 653*)

by mounting a strip of copper about 2½ inches long by 1¼ inches wide at the grid end of the antenna coil. This shield can be fastened to the speaker frame and the tube shield as shown in Figure 2.

List of Parts

C1—Mica condenser, .002 mfd.
C2, C3—General Instrument 2-gang condenser, type 1450, each section 365 mmfd., clockwise rotation, low non-extending end plates, low extended shield, compensating condensers on short side
C4, C5—Tubular type 2-section paper condenser, .1 mfd., 200 volts
C6, C7—Electrolytic condensers, 5 mfd., 25 volts
C8—Mica condenser, .0005 mfd.
C9—Paper condenser, .02 mfd., 200 volts
C10—Paper condenser, .05 mfd., 200 volts
C11, C12—Electrolytic 2-section condensers, 4 mfd., 175 volts, mounting holes space 1⅜ inch

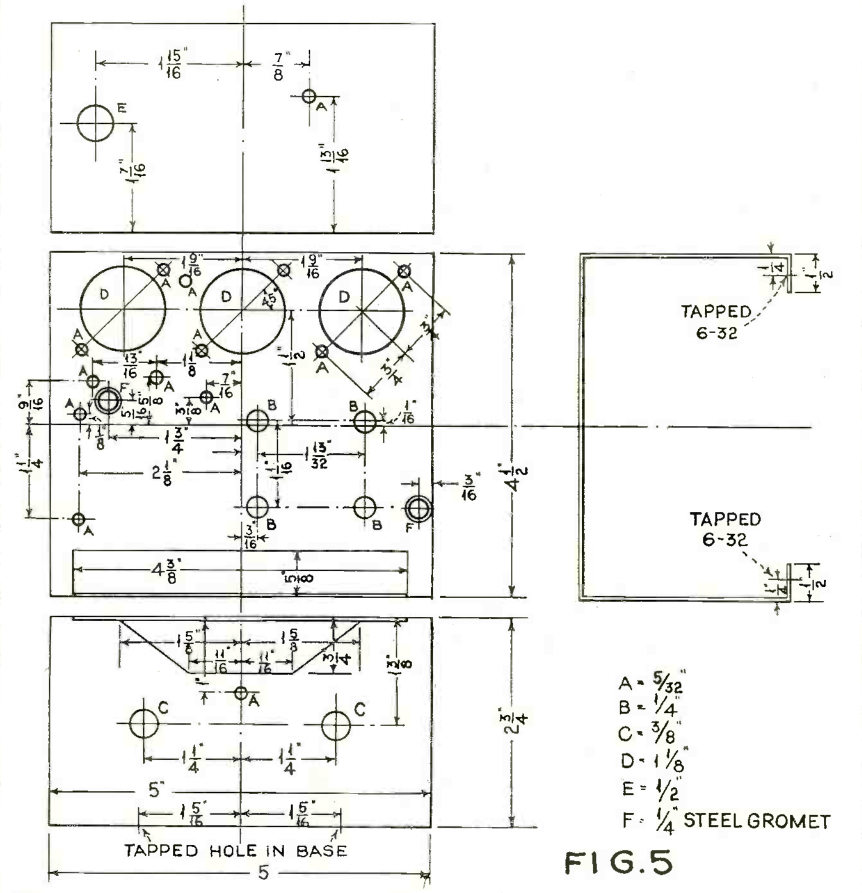
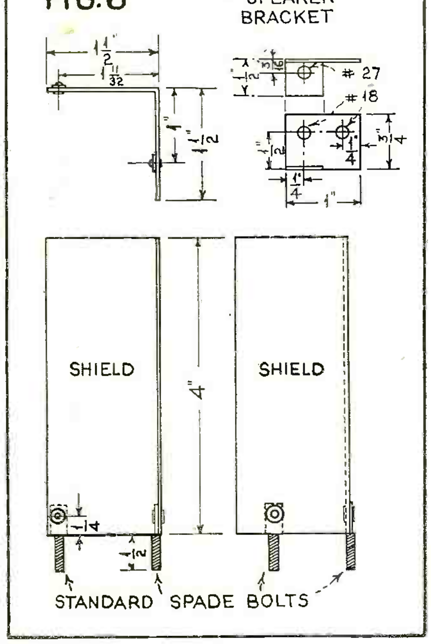


FIG. 5

FIG. 6 SPEAKER BRACKET



C13—Paper condenser, .1 mfd., 200 volts
L1—Sickles antenna coil
L2—Sickles radio-frequency coil
L3—Kenyon filter choke, 30-henry, 500 ohms, type KC500
R1—Carbon resistor, 400 ohms, ½ watt
R1A—Centralab rheostat, 200,000 ohms
R2—Carbon resistor, 20,000 ohms, ⅓ watt
R3—Carbon resistor, 250,000 ohms, ⅓ watt
R4—Carbon resistor, 500,000 ohms, ⅓ watt
R5—Carbon resistor, 1,000 ohms, ⅓ watt
R6, R7—Carbon resistors, 50,000 ohms, ⅓ watt
R8—Ohmite 250-ohm heater line cord, 10 feet long
SW—Power switch on volume control, R1A
2 six-prong wafer sockets
1 seven-prong wafer socket
1 tube shield and speaker bracket
1 metal chassis
1 New York Case Company leatherette-covered cabinet, 7¾ inches high by 6¼ inches wide by 5¾ inches deep, outside dimensions
1 Best 5-inch magnetic type loudspeaker, 8500 ohms for a single 12A7 type tube

The condensers and resistors can be of any reliable manufacture.

Hearing Aid

(*Continued from page 654*)

attached to the inside of the box cover, by means of wood screws.

Now for the battery cases. The A battery holder is made from a cheap tubular type flashlight case. Remove the switch and its connections, and also the lens. Solder an 8-inch wire lead to the reflector, after first soldering a piece of metal, such as a brass thumb nut, into the lamp threads to serve as the positive contact stud. Cut a circle of heavy cardboard or fibre the size of the lens, punch a hole in it to pass this 8-inch wire (the positive lead) and screw the reflector and fibre disc in place. Now solder another 8-inch lead to any exposed metal part of the case to serve as the negative lead.

The B battery case is more trouble, which is justified because it permits the use of ordinary "pen-light" batteries which are cheap and obtainable anywhere. If you wish you may dodge the construction of this case by employing an ordinary 22½ volt B battery, midget size.

Assuming that you have decided upon the use of the "pen-light" batteries, construct your case as shown in Figure 4, following all dimensions exactly. Batteries can easily be replaced by removing the bottom cover of the case and pulling out the nail which serves to hold the bottom insulator in place. This can now be removed and the old batteries dumped out. Always put the batteries in with the brass caps against the spring contacts.

The wood carrying case is a cigar box and can be obtained for the asking at any cigar counter. Get one of the kind that is made of redwood or Spanish cedar, and used to hold fifty "corona" size cigars. These boxes are nicely made with dovetailed or glued and nailed corners and are of unfinished natural wood instead of being paper covered. The one used by the writer measured 7½ inches long, 6¼ inches wide and 3½ inches high on the outside, and came equipped with nickeled hinges and catch. The inside dimensions corresponding to the above, after pulling out the thin wood liners, which we shall not use, are 6⅝ inches by 5½ inches by 3 inches. If the constructor employs a box of different dimensions, the layout of parts may have to be varied from that shown.

The first thing is to lay out the parts in the case to determine where the mounting holes and the holes in the cover must be drilled. The drilling having been accomplished, the burned-in printing on the box must be removed. This is most easily complished with a plane; or else a sanding drum or wheel covered with a coarse grit sand or garnet paper. Be sure to remove all printed indentations, or these will show through on your finished case, which is now ready for ebonizing.

This is easy and gives an inconspicuous, durable, professional looking dull black luster to your case. Here's how to do it. Get a twenty-five cent bottle of Griffin's Black Rapid Dye, a shoe coloring preparation sold everywhere. Using the swab in the package, give your case two copious coats about an hour apart, which will dry quickly into the wood. After the dye is *thoroughly dry*, a matter of several hours, go over the whole case with a soft cloth, rubbing hard to remove all excess dye.

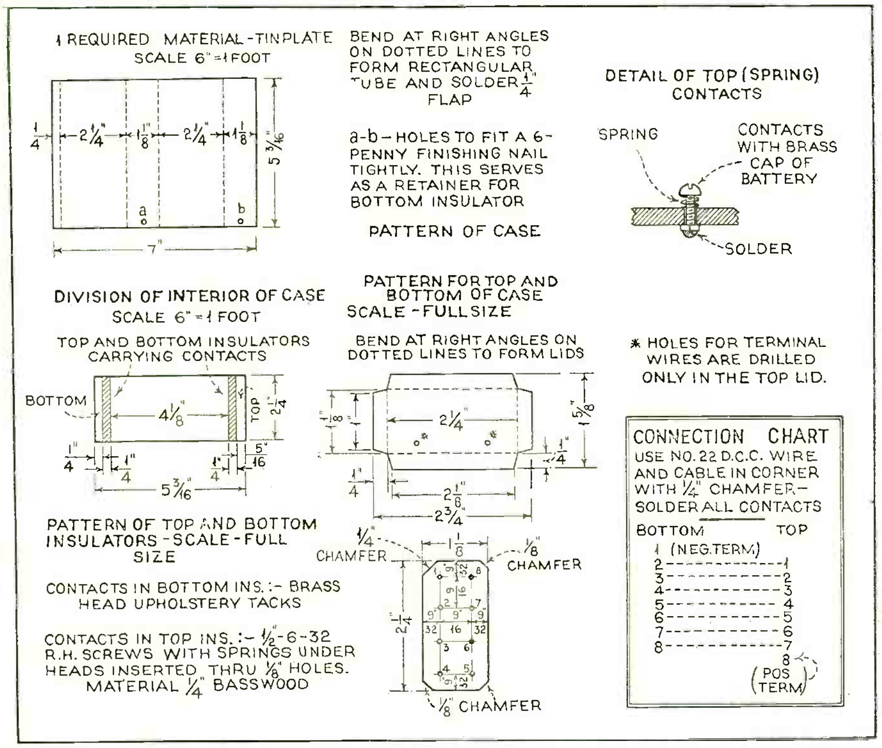


FIGURE 4. THE B BATTERY CASE

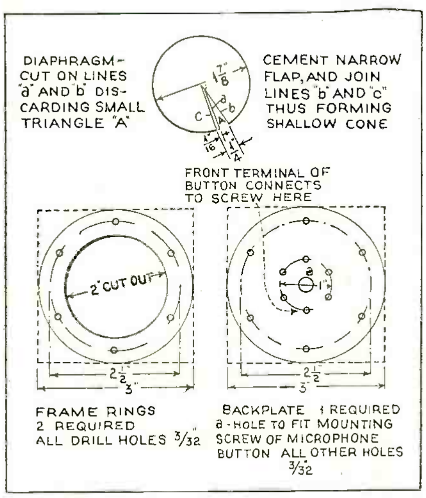


FIGURE 3. MICROPHONE PARTS

Now apply a thin coat of floor wax (not liquid wax), and after a half hour rub it to a polish. Do this three or four times, and you can almost swear your case is made of solid ebony.

The model illustrated is equipped with a carrying lanyard, by which the aid is slung over the shoulder like a camera. This is a piece of ½ inch black grosgrain ribbon, fastened to the sides of the case with screw eyes and ¾ inch loose-leaf notebook rings. If preferred a leather or metal handle could be attached.

Now mount all parts in the outside case, wiring according to the diagram in Figure 2 as you go along, and soldering all contacts securely.

The headphone used by the writer was one from a set of "Cannon Ball Dixies." Any light weight receiver rated at 1000 ohms or higher will do. The Trimm "Featherweight" is excellent but if lower cost is imperative there are the "Erpee" and "Acme" headphones, both of which are extremely light and inexpensive.

In operating the instrument, do not advance the filament rheostat any more than is necessary, and always be careful to shut it off entirely when the aid is not in use. No volume control is included, other than that provided by the filament rheostat and this is only partially effective. The constructor may wish to improve on this feature and can do so by connecting a 50,000 ohm potentiometer across the transformer secondary, and then connecting the grid of the tube to the arm of the potentiometer.

Parts List

M—Microphone as described in text
R—Carter type M-30-S midget 30-ohm rheostat with switch
T—Polymet type TA-737 microphone transformer
VT—Type -30 vacuum tube
1 tubular flashlight for A battery case as described in text
2 tip jacks
7 four-prong wafer socket
1 case as described in text
2 Eveready No. 950 unit cells
8 Eveready 3-volt "pen-light" batteries
1 lightweight 1000-ohm or 2000-ohm headphone with cord and headband
Wire, screws, sheet metal, small mounting angles, etc.

Television

(*Continued from page* 665)

L should tune to 2800 kc. with about 10 mmfd. of the condenser capacity in use. Assuming 10 mmfd. of stray capacity or a total of 20 mmfd., L should be .16 millihenry. The coupling coefficient should be .143, and M .023 millihenry. R should be 10,000 ohms. Amplification per stage will be about 24 times. The band width should be 400 kc. The circuit will tune to about 1500 kc. minimum, but the resonance curve will be rather badly peaked on the lower carrier frequencies.

To cover the same range of carrier frequencies, but with best operation on 2100 kc., make L .16 millihenry as before, to tune to 2100 kc. with about 26 mfd. of the tuning condenser in use (assuming 10 mmfd. stray capacity). Make the coupling coefficient .191, and M .031 millihenry. R should be 6000 ohms. The gain per stage will be about 14 times.

For the intermediate-frequency amplifier of a superheterodyne operating at 6000 kc., use 20 mmfd. adjustable condensers for the permanent tuning. Make L .035 millihenry, the coupling coefficient .094, and M .0032 millihenry. R should be 10,000 ohms and the gain per stage about 17 times.

A good way of measuring the values of L and M, so that they may be adjusted by the cut-and-try method, is to use a dynatron oscillator, a calibrated broadcast receiver, and an accurately known capacitance. The dynatron oscillator circuit is given in Figure 2. The potentiometer P is adjusted for maximum oscillation. The capacitance C can be a 150 or 250 mfd. variable or fixed condenser for which the capacity is fairly accurately known. The frequency determined by L_x and C can be found by turning the dial of the broadcast receiver, with the dynatron in its vicinity and the aerial disconnected. A hum will be heard at one or more points on the dial, unless the coil L_x is too small to give an oscillation frequency below 1500 kc. The frequencies at which the hum is heard will be the fundamental frequency or that frequency multiplied by an integral number. Note all frequencies at which the hum is heard; the average frequency separation between them will be the fundamental frequency, or if only one point occurs, it should be the fundamental, except where between 1100 and 1000 kc., in which case it may be a second harmonic. For example, 375 kc. oscillations would be heard at 750, 1125 and 1500 kc., and 800 kc. oscillations would be heard only at 800 kc. on the usual broadcast receiver. The value of L_x in millihenries is given by

$$\left(\frac{25{,}300{,}000}{f^2 \times C}\right)$$

where f is the frequency in kc. and C the capacity in micromicrofarads.

To measure L, M and the coupling coefficient k most easily, connect the two coils of the r.f. or i.f. transformer in series, first in opposition and then so as to aid each other, using the combination as L_x in the dynatron oscillator. L_x will then be first $2(L-M)$ and then $2(L+M)$. Measure the frequencies obtained; call them f_1 and f_2. Then the values of L, M and the coupling coefficient k will be given by the following formulas:

$$L = \frac{25{,}300{,}000}{4C}\left(\frac{1}{f_2^2} + \frac{1}{f_1^2}\right)$$

$$M = \frac{25{,}300{,}000}{4C}\left(\frac{1}{f_2^2} - \frac{1}{f_1^2}\right)$$

$$k = 2\left(\frac{f_1 - f_2}{f_1 + f_2}\right) \text{ approximately}$$

The formula for the coefficient of coupling does not require knowledge of the condenser capacity. The inductance values above are in millihenries when C is in mmfd. and frequency kilocycles.

One other matter worth mentioning is the antenna coupling system. The method shown in Figure 1 allows ganging of all tuning condensers without having too much detuning effect from the aerial, and the shunt resistance (2R) can be made accurately twice the value of that used on the double tuned circuits, which will give proper results. Since damping is introduced artificially by the shunt resistance, the same damping effect and more output could be obtained by using more antenna coupling and omitting the resistor. This is not recommended, because the damping and tuning will change whenever the aerial used is changed, and ganged tuning will not be possible.

It is to be hoped that this series of articles has given its readers better familiarity with the cathode-ray tube and its uses, together with some practical information on its application.

Graphs and Charts

(*Continued from page 662*)

meter and a 1.5-volt battery it would be 1500 ohms, etc. The range of such an ohmmeter is from 1/10 R to 10 R. It is possible to obtain some kind of reading above and below this, but they are not accurate.

The second type of ohmmeter has the advantage of being especially suited to the measurement of low resistances without drawing a very heavy current. This is illustrated in Figure 3. The unknown resistance is shunted across the meter, which also makes the meter go down from full-scale deflection. For higher resistances it may be placed across the meter, plus a resistance, *a*, in series with it. The sum of *a*, and the resistance of the meter we shall call R. Then the value of X is

$$X = \frac{R\,m}{n-m} \text{ ohms}$$

where *m* is the reading of the meter with X connected to the test prods and *n* is the reading when the test prods do not touch each other. The same chart (Figure 5) can be used again, but for this type of ohmmeter use scale M (B). The sample line shows that if the meter went down to .8 mils and the resistance of the meter was 45 ohms, the resistance of X would be 180 ohms. You can extend the ranges of R and X by adding or subtracting the *same number of zeros to both*

A scale can be constructed for a given ohmmeter rather easily. This is illustrated in Figure 4. Line L represents the scale on the meter. The same divisions and numbers should be put on it. Then, in order to get the ohmmeter divisions, draw two lines, *a* and *b*, through the ends of the scale at any convenient angle as shown, *a* and *b* are parallel. On *a*, regular divisions are set off representing ohms, on any convenient scale. Next you should find a point P on scale B so that OP equals R when measured in the unit employed on *a*. Then draw lines from P to the divisions on *a*. The intersections give the divisions for the ohmmeter scale on L. This construction is good for the series ohmmeter (Figure 2) only. For the shunt type, the divisions of *a* should be put on *b* instead and the point P should be taken on *a* in the same manner as before. It will be found difficult to get to both ends of the scale with just one position of P. After some divisions have been made with P in one position, the point can be shifted, which means that you are using another measuring unit on both line *a* and *b*. It will be found that the scales obtained by this method, for the ohmmeter of Figure 2, resemble those for Figure 3 if R is the same; only, they are mirror views of each other. When another range is required, it can be done by making R twice as large (or 10 times as large) and then multiplying the readings of your previous scale.

In Figure 6, two examples of completed scales are given. One is for a 0-1-ma. meter in the series circuit with *a* resistance of R equals 4500 ohms. Its range can be extended by employing a resistance of 45000 ohms and a 45-volt battery. Then the scale readings should be multiplied by 10. The other scale is designed for an ohmmeter of the shunt type, employing an 0-1-ma. meter with an internal resistance of 30 ohms. If your meter is somewhat less than 30 ohms you should connect some resistance in series with it so as to make the total 30 ohms.

Shunting the meter with a 3.3-ohm resistor will make the scale lower, multiply all values with .1. When your meter has a resistance of 50 ohms (such as the universal meter) all scale values should be multiplied by 5/3 or 1.67.

Poor Notes

(*Continued from page 675*)

.004 second previous to the beginning of the signal.

Waves *A* and *B* of Figure 4 show very nicely the effect of fair keying conditions, very good voltage regulation, and an excellent plate supply filter. The choke in the key circuit smooths out the power supply and also gives a time "lag" effect as may be seen by *c* and *e*. There is, however, a slight modulation at the beginning of the signal, but no chirp or key thump was present in the note. The effect at *c* (lower wave) appears because the oscillographic shutter opened and closed at this point. The end of signal which starts at *g* is not shown. Also the complete beginning of signal whose end is *f* is not shown.

The choke in the keying circuit of Figure 4 was transferred to the left of the key and another oscillogram was made. This oscillogram is not shown for lack of space, but the negative showed a gradual building up—thus proving that the position of the choke actually makes a difference in the time "lag" effect.

Figure 5 illustrates the bad effects one may get by using extra chokes, condensers and resistances indiscriminately. The key circuit as shown in the accompanying diagram has produced an unevenly modulated wave, as may be seen by looking at *N*. The note of the signal was "chirpy" with changeable frequency. At *K* and *P* there is a pronounced change of frequency more than that of the general drift shown throughout the wave. This can safely be blamed on the oscillator's instability. There is a possibility that the a.c. voltage feeding the transmitter was varying by a large amount. The interruption between *g* and *f* of wave *m*, also between *j* and *k* of wave *N* cannot definitely be accounted for; however, there is a possibility that the power feeding the transmitter was off for that .007 second.

The circuit of Figure 6 is responsible for the long-drawn-out ends of the signals which are entirely too long. The beginnings of the dots build up nicely, but are a little too slow in reaching their maximum amplitude. A total of .012 second is consumed for the beginning of the dot and .03 second is used up for the decay, while the dot's maximum average amplitude consumes .043 second.

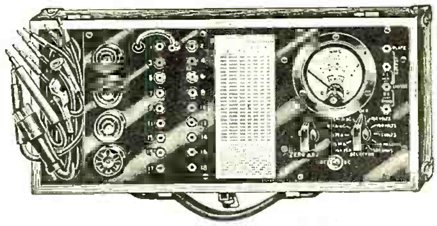
Looking at *M*, it can be seen that the wave has a 60-cycle modulation; however, its frequency from the very beginning to the end of the decay is constant. This type of wave would not cause any chirps, key thumps or clicks, but it may cause the note to have a slight "swing."

Keying the transmitter in the positive "lead" with only one choke in this same line, the "lag" effect was again produced as shown in the oscillogram of Figure 7.

Wave *C* is that of a dot. The time "lag" is shown at *d*, which is affected by a change of frequency, thus causing a slight chirp at the end of the signal. Wave *D* is the same except that the key was held down a longer length of time and the film was turning at a much greater speed; thus spreading out of the wave resulted. As can be seen, its frequency is steady, but the lower part of this wave is somewhat modulated. No definite reason for this can be given.

The filter combination of Figure 8 is not very good, as can be seen from the record of the wave.

In wave *B*, the cut-off at *c* is much too long. If a smaller condenser were used, it would be shortened. The wave has a



40-cycle modulation which is undoubtedly due to causes at the receiving end and not at the transmitter. The waves on the second line were made as a continuation of the same signals (first line), and these show hardly any modulation effects. They do show very much better building up, as at *o*, in comparison with the poor beginning *a* of wave *B*. It ought to be mentioned that there would be no chirp in either wave, but a slight key click will be heard.

Figure 9 is a very interesting oscillogram, for it shows the effect of the "decay" with two different values of resistance shunting an inductance in series with the key. In wave *M*, the "decay" *d* is due to a 55-ohm resistance in shunt with the 16-henry choke coil while the "decay" *z* of lower wave is due to a 25-ohm resistance. The better of the two is, of course, that of wave *M*, and even this consumes too much time for the "decay."

Figure 10 exhibits a very good building up of the wave, but the key circuit resistance is too low and thus a long-drawn-out "decay" resulted.

550-1500 Kc. DX

(*Continued from page* 680)

December. European stations continue to be heard. Europe hears North American stations reasonably well and still hears a number of the South American stations.

February brings an improvement in the general reception conditions which is especially noticeable during the latter part of the month. Inland Australian stations begin to be received here in the United States again, and other Australian stations show an increase in signal strength. The Japanese stations are better received, as are the South American stations. The European stations can still be heard.

March ushers in the peak season for long range reception in the northern hemisphere. Australian, New Zealand, Japanese, and South American stations are now all well received here in the United States and Canada. New Zealand stations can now be heard beginning about 2 a. m., the Australian stations beginning about 3:30 a. m., the Japanese beginning about 4 a. m., and the Philippine and Chinese stations beginning about 5 a. m. C.S.T. The Hawaiian Islands are best received from about 1 to 3 a. m. European stations are not heard so well as before.

April continues the good reception conditions here in America for stations in the southern hemisphere.

May brings a general decline in reception conditions in the northern hemisphere. At times Australian, New Zealand, and South American stations can be fairly well received in America, but Japanese and European stations are no longer heard satisfactorily.

June brings summer north of the equator and marks the close of the season for long distance reception, with generally poor reception conditions during the next two months. However, during this period westerly stations in the southern hemisphere can sometimes be heard—Australian stations here in America and Argentine stations in Europe.

During July reception conditions in Australia slowly improve. Reception of American and Japanese stations improves, and Europeans can sometimes be heard toward the end of the month. Reception conditions in New Zealand show comparatively little change.

August sees a further improvement in the general reception conditions in Australia,

Meter Accuracy

(*Continued from page* 659)

cover this portion of the scale with the accuracy rating. A reading made at the 100 point might be in error ±2 volts or 2% of the indication, but a reading at the 50 point might be in error ± volts, or 4% of the indication. The cramping present on this scale does not affect the application of the standard for accuracy. On instruments of this type it is obvious that deflections which carry the pointer into the open part of the scale are required for best accuracy.

Special scale instruments in the group are those that:

(a) are without divisions as such, (Figure 3);

(b) are calibrated in secondary values, (Figure 4);

(c) have their markings so distributed that zero and maximum readings do not coincide with the zero and maximum deflection points, (Figure 5);

(d) have a suppressed zero reading point, (Figure 6).

This group requires a somewhat special interpretation of the accuracy rating standard.

An examination of Figure 1 will show that as far as an evenly divided scale is concerned, there is no difference between an error expressed as a percent of full scale reading, and one expressed as the same percent of scale length. In either case the result is the same.

Figure 3 shows a scale which has no divisions as such. The instrument on which this scale is used is one of many that are made to indicate when the circuit in question is properly adjusted to some definite value of voltage, current, or power. The length of this scale is twice the distance along the arc traced by the pointer tip from one end to the line at center scale.

The instrument is calibrated at the mark shown on the scale, and hence the 2% tolerance applies at the mark and not as a percent of scale length or the reading that might be obtained at the full scale or end scale position.

Figure 4 shows the scale of a typical series type ohmmeter. A true series type ohmmeter scale has but one arc, marked off in ohms. The scale shown in Figure 4 is that of a volt-ohmmeter and is taken from the Weston Model 663 volt-ohmmeter. This scale was chosen in order to have available a uniformly divided arc below the ohm arc, thus facilitating the explanation made below.

It is obvious that, since the ohmmeter scale can be added to the face of an instrument already bearing a uniformly divided arc, the method of figuring the accuracy must be the same for both. In other words, the accuracy of the instrument is a function of pointer movement and is, therefore, independent of the type of scale used.

Like the uniformly divided scale the ohmmeter accuracy can be expressed as a percent of scale length. In Figure 4 2% of the full scale range of the voltmeter becomes one division of the scale length. While this one division is always a fixed number of volts on the voltage scale, it is not a fixed number of ohms on the ohms scale, but depends on the location of the division along the arc.

In Figure 4, 2% at the zero ohms position is equal to approximately .5 ohm. At center scale the maximum error may be equal to 2 ohms in 25, or 8%; at 1/5th scale 12 ohms in 100, or 12%. Here it is again apparent that the greatest accuracy is available when ranges are selected such that large deflections are obtained.

An instrument having a 2% rating and using a scale as shown in Figure 5 would be considered as being within its guaranteed accuracy if the pointer indicated within plus or minus a distance equal to 2% of the scale length of the true value at any point on the scale.

Figure 6 shows a suppressed zero scale which is also special as far as applying an accuracy rating is concerned. The zero deflection point of the instrument using this scale is suppressed by winding up the pointer spring equivalent to 30 volts deflection and permitting the left-hand pointer bumper to hold the pointer slightly to the left of the 30 volt mark when no current is flowing. Current through the instrument produced by the first 30 volts in the circuit under test is not indicated on the scale. The deflection of the pointer produced by the additional current through the instrument due to each additional volt between 30 and 100 volts is greater than would be the case if the scale and instrument were adjusted to read from 0-100 in the regular way. The accuracy of an instrument bearing a scale of this sort is taken as a percent of the top mark value indicated on the scale.

Amplified A.V.C.

(*Continued from page* 655)

high. To overcome this condition in noisy locations the manual gain control may be retarded and the maximum sensitivity reduced accordingly to any desired level. Curves B and C show the characteristics resulting for two different degrees of retardation of the manual control. In the case of curve B the maximum sensitivity has been reduced to approximately 1 microvolt, while curve C shows the sensitivity reduced to 10 microvolts. The manual control functions independent of the automatic control and the control characteristics of the a.v.c., including the "delay," remain unimpaired, as indicated by the similarity in the shape of curves B and C. The shape of curve A would, if carried out to the fractional microvolt sensitivity of which the receiver is capable, be similar to B and C.

In making curve A a 100,000 microvolt signal was provided at the receiver input and the audio volume control knob adjusted to provide the 3 watts output at which the 2A5 power tube is rated. Then the input was reduced in steps to 1 microvolt and measurements of the output voltage made at each step. As indicated by this curve, these measurements show that with a signal input voltage reduction of 100,000 to 1 the output voltage changed only in the ratio of 2.75 to 1.

The "delay" action shown in curves B and C is interesting. Curve A shows that at 1 microvolt input the a.v.c. still has complete control of sensitivity. In curve B, however, the a.v.c. system begins to lose control when the input drops to about 100 microvolts and loses control completely at around 10 microvolts. Below this point the full sensitivity of the receiver is realized, or at least the full sensitivity allowed by the retarded setting of the manual gain control in this particular instance.

The excellence of control indicated in the curves of Figure 2 is unquestionable but an even more definite and striking illustration is found in Figure 3. In preparing these curves a signal from an oscillator was applied to the input of the receiver, then this original signal was attenuated in steps until an attenuation of 1000 times was obtained and at each step the audio output was measured. The purpose was to determine the effectiveness of the a.v.c. system in holding steady a signal which is fading in the ratio of 1000 to 1, and to permit direct comparison with the variation in output obtained from such a signal when the a.v.c. system is cut out.

The measurements were first made with the a.v.c. operating, the manual gain control fully advanced and the audio volume control retarded to provide nominal output volume (80 volts). The output voltage variation was as represented in curve D. Then curve E was made by cutting out the a.v.c. and retarding the manual gain control until an output of 80 volts was again obtained, using the same maximum signal input as before and with the same setting of the audio volume control as before. These two curves are therefore an accurate picture of what actually happens at the output of the receiver when a signal fades through a large voltage range. With the a.v.c. the output dropped from 80 volts to 32.5 volts when the input was reduced to 1/1000 of its original value. Without the a.v.c. the signal passed out of the picture when the signal had been reduced to about 1/20 of its maximum value.

All-Wave Super

(*Continued from page* 668)

three German stations. Spain, Italy, France, South America, Canada, Mexico, Cuba, Switzerland, England and Germany are all represented, not to mention the United States. Many of these stations came in strong and clear enough to be of high entertainment value. There was probably no hour in the day when less than two or three stations could have been tuned in to provide really satisfactory reception. And this was not a particularly good day for short-wave reception. The location is a good one, but not unusually so. The net conclusion is that the receiver put on a highly creditable performance, showing high sensitivity, unusual selectivity (short-

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wave), favorable signal-to-noise ratios and tone quality above the average.

It was found that a good lengthy antenna produced the best results with this receiver when used on the short-wave ranges, although an antenna of 25 or 30 feet provided good results. On the broadcast band it appeared that an antenna length of 75 feet represented a good all around length (including lead-in) except where high selectivity is an essential and in that case a limit of 50 feet, including the lead-in seemed desirable. This reduced length is necessary only when absolute 10-kc selectivity is necessary, and then only where the receiver is operated in the vicinity of powerful locals.

From the standpoint of tone quality this receiver rates well up among the top-notchers of commercial receivers. The solid construction of the console contributes a mellowness, depth and solidarity of tone which is pleasing to the ear. Evidently considerable attention has been paid to the problem of acoustics in designing the cabinet.

There are two features of outstanding merit, which will appeal to anyone tuning short-wave stations with this receiver. These both contribute to the ease of finding and tuning individual stations. The first is the thoroughness and accuracy of the dial calibration. A check of the calibration through all ranges was made as part of the test. On the broadcast band the calibration was correct within about 3 kilocycles. Going down through the short-wave ranges the greatest error was found at the highest frequency range and there did not exceed 6/10 of 1 percent. This same error continued through the upper half of next to the highest range and there decreased gradually to 1/6 of 1 percent which means that at 50 meters the inaccuracy amounted to only 10 kc., an entirely negligible factor at this high frequency.

The second of these features is the gear shift on the tuning knob. In general use the reduction ratio of the tuning knob mechanism is normal but for critical tuning of the short-wave stations a "slow-motion" gear ratio is brought into play by pulling out on the tuning knob.

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Service Profits

(*Continued from page 660*)

6. *CONTACT YOUR LOCAL DISTRIBUTOR.* Take full advantage of the promotional and advertising suggestions and activities fostered by the manufacturers and by their wholesale distributors. Contact the local distributor, and get to know the service manager. He is the manufacturer's service representative in your territory, and he is in a position to do you some good.

You may think you do not care to do sales work, or it may seem hard at first, but do not forget that making *more* money means work for anyone—but it can be done. If you can double your income from service work through increased sales activity, it is certainly to your advantage to make every possible effort to obtain the additional work and additional sales that lead to your goal. J. R. Jackson, Service Manager, Philco Radio & Television Corp.

Radio Education

(*Continued from page 649*)

Some of these schools are resident schools where one may go to take a course and stay until it is completed. This is true of both colleges and special trade schools and other institutions. But often there is no chance for the prospective student to leave his city or to attend courses at a school in the daytime. For students such as these, there are a number of fine correspondence courses in radio offered today by institutions who have specialized in this work for many years and know just how to handle the student's problems.

Who should study? There are cases where engineers themselves must bring themselves up to date by taking some extension course in a specialized field of radio. The young student should familiarize himself with radio by either a resident course or by a reliable correspondence course. The radio operator must keep up to date and either a correspondence or resident course may be best suited to his particular needs. The serviceman is going to need more radio knowledge of a technical nature than in earlier days when he was considered just a Jack-of-all-trades. We find that the successful serviceman of today (and the future) is borne from either one of two channels. Either he is a trained technical radio man who learns the principles of business and salesmanship or else he is a trained salesman and business man who makes an effort and learns radio principles and technique. Of course, it is true there are many servicemen today who feel *they know enough* but who really would improve themselves and their business by *more* knowledge. Sometimes it is the rush of business and sometimes just plain procrastination that prevents them from learning more about radio technique.

There are increasing opportunities for operators of radio-telephone transmitters, for broadcasting stations, for aviation, police, fire and other special services. These operators must have a technical training and there is a growing opportunity in this field. Also the field for young well-trained engineers is increasing, and as we pointed out at the beginning of this short article, there is to be a *big future for the bright young radio engineer who has all the new theories, principles and design data at his finger tips!*

The Editor receives many letters from people wondering just *how* they should study and *where* they should study to increase their knowledge. And for each one who writes to me I suppose there are hundreds, possibly thousands, who feel the *need* for study but *do not get started* just out of inertia. If you are interested, simply sit down now and write me a note stating your needs and I will be glad to advise you and see that you get the necessary information regarding suitable institutions that could furnish you this opportunity for increasing your radio education.

One-tube Amplifier

(*Continued from page 673*)

the new socket. The unit is now complete.

Place the phones in the pin-jack, connect the green and black wires (those in the cable) to the No. 6 dry cells, insert the tubes and turn on the switch. The filaments should light. Turn the switch off and connect the yellow wire to the negative "B" battery terminal, the red one in the cable to plus 45 and the free one outside the cable to plus 135. Two more "B" battery blocks are required to do so. This leaves one black wire coming from the set. It should be connected to the negative—15½ volts of a 22½-volt tapped "C" battery. The positive side of this battery connects to "A" plus. See Figures 1 and 2.

The operation is now exactly the same as before. It will be found that a low plate voltage on the detector will make it go into oscillation more gradually and it then becomes easier to keep the regenerative control on the most sensitive point.

Parts List

C5—Amplex condenser, .5 mfd., 200 volts
R3—Wire-wound filament resistor, 3 ohms
R4—Carbon resistor, 100,000 ohms, ½ watt
SW—Single-pole-single-throw toggle switch
T—Amplex No. 30 audio transformer
VT3—5-prong wafer socket
One a.f. Cha-Set section
One type -33 tube
Two 45-volt "B" batteries
One 22½-volt tapped "C" battery
Wire, hardware, etc.

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The Service Bench

(*Continued from page* 685)

"These voltages are apparently much too low for efficient operation, and I substituted a 10,000-ohm resistor for the original 50,000-ohm unit and a variable 0-to-50,000 ohm resistor for the 100,000-ohm unit—as shown in drawing. Adjust the 50,000-ohm resistor for best results.

"The improvement is remarkable, and the satisfaction of my clients more than repaid me for the revamping of the six sets in the field.

"Hoping this helps some of the boys."—R. O. Lamb, Lamb Radio Service, Wilkinsburg, Pa.

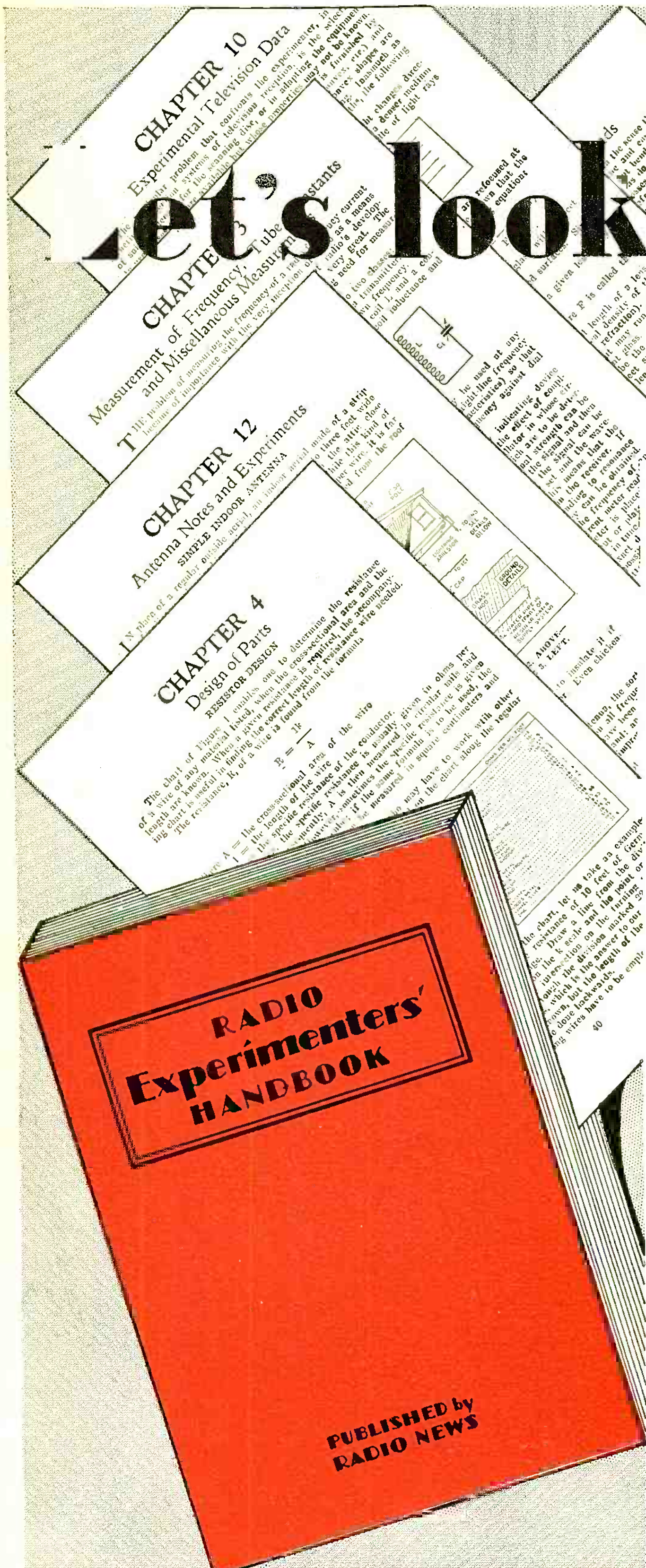
THIS MONTH'S SERVICE SHOP

Proving that it's an ill wind that blows no one good, Harry R. Robinson—Radio, Magneto and Electrical Service—of Shaunavon, Sask., Canada, gives credit to the three consecutive crop failures in his part of the country for a lot of service business. No one is buying new radios and the old ones are beginning to totter and grow weary. Mr. Robinson's service shop is shown in heading. Most of this equipment is arranged so that it may be readily demounted and carried as portable apparatus to nearby towns. The equipment is up-to-date in every respect and most of it has been constructed by the proprietor. The unit in the upper center is a short-wave transmitter, Mr. Robinson operating station VE4DD in between service calls.

An Old Stunt—Still Good for Those That Like It

"A customer of mine owning a Crosley 41 wanted the tone deepened to compare with the output of a Philco recently purchased by his neighbor. He objected to a variable control. A .005 mfd. condenser across the grids of the push-pull -45's did the trick, and my client is perfectly satisfied that he is keeping up with the Joneses."
F. Naseworthy, St. John's, Newfoundland.

"Let's look into this"



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150 Illustrations

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