SHORT WAVE INFORMATION

RADIO NEWS and The SHORT-WAVE

DECEMBER

25 Cents

New!
Radio Ears
for the Deaf

A Publication Devoted to Progress and Development in Radio

Service Work
Engineering
Industrial Application
Experimental Research

Short Waves
Broadcasting
Television
Electronics

DX Reception
Set Building
Amateur Activity
Electrical Measurement

YOUR DOLLAR BUYS MORE AT ALLIED

ALLIED COOPERATES

In spite of tremendous increases in the cost of labor and commodities, *thousands of items* in this book are being sold at *below the current market.* Hundreds of other items are being sold at prices that are still less than last year. *How was this achieved?* The answer is simple, *huge contracts, huge purchases,* made during the summer of 1933 when radio prices were at their *lowest in history.* Merchandise which was purchased at last year's low record prices is being passed on to our customers at tremendous savings. *Send for this Catalog now and save money.*

Here is the book that is making radio history. The *most complete lines* of quality radio sets, tubes, replacement parts, test equipment, and service men supplies, at the *lowest wholesale prices.*

A FEW BARGAINS FROM OUR BOOK OF VALUES

"WORLD-WIDE" SPECIAL
7 TUBE RADIO
15 to 2400 Meters
4 separate wavebands
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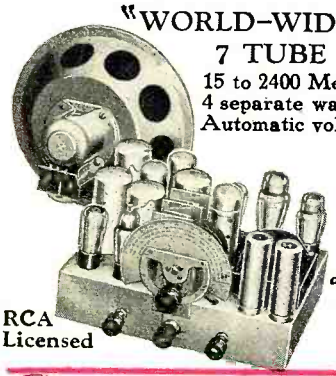

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Complete with Speaker and RCA Tubes
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5 inch Magnetic Speaker
$1.28

8000 ADDITIONAL BARGAINS IN THIS BIG BOOK OF VALUES

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26c	31c	33c

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Thousands of radio dealers, service men, engineers and many broadcasting stations depend upon Allied for their radio needs. Allied consistently justifies this wide spread faith by offering a *complete* selection of high grade standard apparatus that can be counted on for *efficiency, long life* and *customer satisfaction*—at the lowest possible prices. Allied's huge stock enables you to get unusually *prompt* and *efficient* service. This is the simple secret of our great repeat business. If there ever was a time that you had to decide carefully where your money will buy its full money's worth, it is now. Allied will continue to protect you against unwarranted price increases to the fullest extent of its power. Allied's low net cash prices mean low, and will continue to mean low.

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ALLIED RADIO CORP., 833 W. Jackson Blvd., Chicago, Ill.

Please send me Free your NEW 1934 Catalog.

Name_____

Address_____

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☐ Serviceman ☐ Dealer ☐ Engineer ☐ Experimenter

Allied Radio
CORPORATION
833 W. JACKSON BLVD. CHICAGO ILL.

Make Your CHRISTMAS *INTERNATIONAL with a* SCOTT ALL-WAVE *Deluxe* RADIO

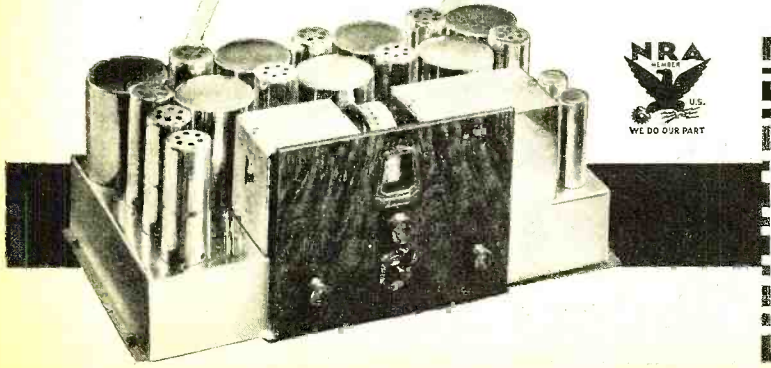
This year . . . and for many a year to come . . . you can enjoy by radio the Yuletide entertainment of the whole world. Not just the carols and celebrations of your own land, which this radio brings you with the finest tone quality known, but those of every country on earth where Christmas is celebrated can come to you with all the sweetness and richness of tone with which they are broadcast from stations in England, France, Germany, Spain, Italy, Australia . . . everywhere!

The SCOTT ALL-WAVE Deluxe makes this marvelous Holiday experience possible . . . and extends its delight to linger through every day of the year. No longer need you be restricted in your radio reception. This custom-built receiver makes you listening neighbor to all the wide world. With your fingers upon its single tuning dial you can twirl away countless leagues and listen in on strange and fascinating entertainment from 10,000 miles or more away as though you were actually there in person.

What a marvelous gift for someone whom you want to please and honor! Or what a sensible indulgence to give yourself such a wonderfully-performing instrument that will bring you years of pleasure and closer communion with the whole globe's amusement and entertainment as broadcast from radio stations everywhere (at home or in foreign lands) on all the wave lengths between 15 and 550 meters.

If you decide to purchase an all-wave radio for Christmas make sure of this one thing . . . that it is the best! For there are many all-wave receivers to be had that can, with more or less regularity, bring in foreign reception. The question is not "*Can* the set do it?" but, "*How well can the set do it?*" The perfect answer will be found *only* in the precision-built, 12-tube SCOTT ALL-WAVE Deluxe. Proof, together with price, technical data and all information sent upon receipt of the coupon below.

E. H. SCOTT RADIO LABORATORIES, INC.
4450 Ravenswood Ave., Dept. N123 Chicago, Ill.



NRA MEMBER U.S. WE DO OUR PART

E. H. Scott Radio Laboratories, Inc.
4450 Ravenswood Ave., Dept. N123 Chicago, Ill.

Send me at once, without obligation, PROOF of SCOTT ALL-WAVE Deluxe Radio's superiority, together with all other information.

Name .....

Address .....

Town ..... *State* .....

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Associate Editor

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Ass't Tech. Editor

RADIO NEWS

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Associate Editor

Samuel Kaufman
Broadcast Editor

Jos. F. Odenbach
Art Editor

Edited by Laurence M. Cockaday

VOLUME XV | December, 1933 | NUMBER 6

THIS MONTH—

Service Data

Electronics

Short-Waves

Programs

Departments

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

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222 WEST 39th STREET, NEW YORK CITY, N. Y.

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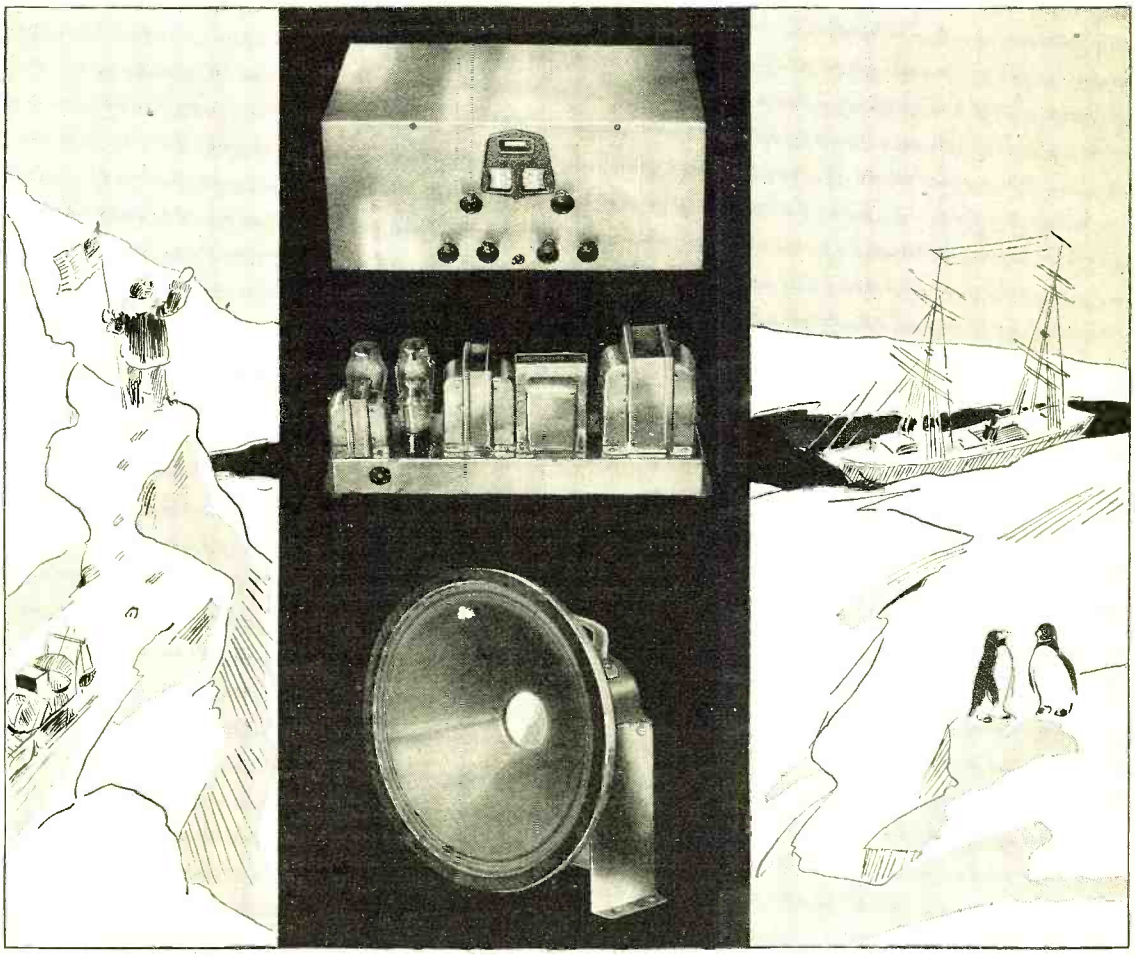
Now ..YOU CAN HAVE A RECEIVER EXACTLY LIKE ADMIRAL BYRD'S



MASTERPIECE IIs . Especially designed to serve as broadcast and communication receivers on the Byrd Antarctic Expedition

For the first time in the history of a radio, a broadcast receiver is considered sufficiently able to fulfill the functions of communication receiver as well.

MASTERPIECE II, product of McMurdo Silver's laboratory, is relied upon for communication and broadcast service, by the Byrd Expedition during his two year stay in the Antarctic.

But . . . let us not deceive ourselves. This receiver is not "just a good radio," selected for an important task simply because it appeared to be better than others available. Indeed not! MASTERPIECE II was designed especially for the work to be done—five of them serve as the official communication receivers of the expedition.

The engineering of Masterpiece II provides a degree of dependability in transoceanic reception that eliminates all possibility of failure. It's just good enough to stake lives on—the lives of the whole Byrd Expedition!

Its construction incorporates ample provision for equally certain performance in tropic heat and antarctic cold. Mechanically, MASTERPIECE II will withstand most anything.

A great eastern university . . . the greatest in the field of radio research and engineering, having collaborated in furnishing the specifications for Admiral Byrd's receiver, considers MASTERPIECE II a major advancement in the art of radio reception. And now YOU can have one . . . a radio exactly like Admiral Byrd's!

10 Day Trial—Money Back Guarantee

So that you can see for yourself . . . by actual test . . . that MASTERPIECE II is the finest receiver for 10-570 meter world wide reception, I will gladly send it on 10 day trial. If for any reason you decide not to keep it, simply return the receiver and I'll make complete refund instantly—no questions asked. The coupon from this page will bring full details of MASTERPIECE II.

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

Name.....

Street.....

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

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.

Interstation 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, 15 watts.

Automatic and manual tone controls.

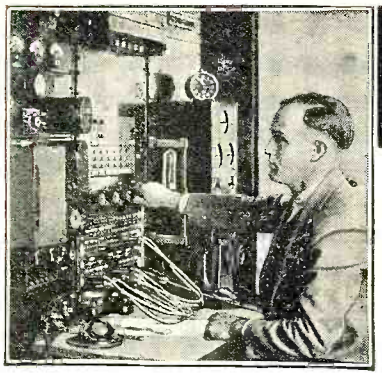
Special impregnation for tropical climates.

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

Chromium plated steel shielding case eliminates need for cabinet.

10 day trial in your home. Open-and-shut guarantee. Money back instantly if *you* are not absolutely satisfied—no questions asked.

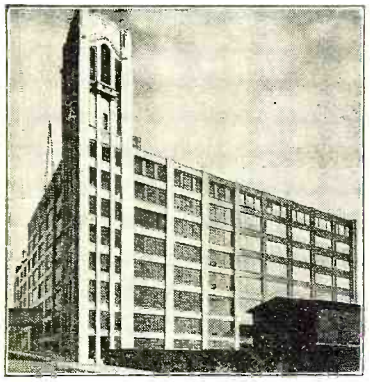
McMURDO SILVER, Inc.
1733 BELMONT AVENUE - CHICAGO, U. S A.



Broadcasting Stations employ trained men continually for jobs paying up to $5,000 a year.

Police Departments are finding Radio a great aid in their work. Many good jobs have been made in this new field.

Spare-time set servicing pays many N.R.I. men $5, $10, $15 a week extra. Full-time men make as much as $40, $60, $75 a week.



Radio Factories—Employ testers, inspectors, foremen, engineers, servicemen, for jobs paying up to $7,500 a year.

Television—the coming field of many great opportunities—is covered by my Course.

I WILL TRAIN YOU AT HOME

Many Make $40, $60, $75 a Week in Radio -- *the Field With a Future*

My book, "Rich Rewards in Radio," gives you full information on the opportunities in Radio and explains how I can train you quickly to become a Radio Expert through my practical Home-Study training. It is free. Clip and mail the coupon NOW. Radio's amazing growth has made hundreds of fine jobs which pay $40, $60, $75 a week. Many of these jobs may quickly lead to salaries as high as $100, $125 and $150 a week.

Radio—the Field With a Future

Ever so often a new business is started in this country. You have seen how the men and young men who got into the automobile, motion picture and other industries when they were started had the first chance at the big jobs—the $5,000, $10,000 and $15,000 a year jobs. Radio offers the same chance that made men rich in those businesses. It has already made many men independent and will make many more wealthy in the future. You will be kicking yourself if you pass up this once-in-a-lifetime opportunity for financial independence.

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

In the short space of a few years 300,000 Radio jobs have been created, and thousands more will be made by its future development. Men with the right training—the kind of training I will give you in the N.R.I. Course—have stepped into Radio at 2 and 3 times their former salaries. Experienced servicemen as well as beginners praise N.R.I. training for what it has done for them.

Many Make $5, $10, $15 a Week Extra In Spare Time Almost At Once

My Course is world-famous as the one "that pays for itself." The day you enroll I send you instructions, which you should master quickly, for doing 28 Radio jobs common in most every neighborhood. Throughout your Course I will show you how to do other repair and service jobs on the side for extra money. I will not only show you how to do the jobs but how to get them. I'll give you the plans and ideas that have made $200 to $1,000 a year for hundreds of fellows. G. W. Page, 110 Raleigh Apts., Nashville, Tenn., writes: "I made $935 in my spare time while taking your Course." My book, "Rich Rewards in Radio," gives many letters from students who earned four, five, and six times their tuition fees before they graduated.

Get Ready Now for Jobs Like These

Broadcasting stations use engineers, operators, station managers and pay up to $5,000 a year. Radio manufacturers employ testers, inspectors, foremen, engineers, servicemen, buyers and managers for jobs paying up to $7,500 a year. Radio dealers and jobbers (there are over 35,000) employ servicemen, salesmen, buyers, managers and pay up to $100 a week. There are hundreds of opportunities for you to have a spare-time or full-time Radio business of your own—to be your own boss. I'll show you how to start your own business with practically no capital—how to do it on money made in spare time while learning. My book tells you of other opportunities. Be sure to get it at once. Just clip and mail the coupon.

I HAVE STARTED MANY IN RADIO AT 2 AND 3 TIMES

Now Owns Own Business

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

$800.00 In Spare Time

"Money could not pay for what I got out of your Course. I did not know a single thing about Radio before I enrolled, but I have made $800 in my spare time, although my work keeps me away from home from 6:00 A.M. to 7:00 P.M. Every word I ever read about your Course I have found true."—Milton I. Leiby, Jr., Topton, Pennsylvania.

Made $17 In One Night

"Who says there's a depression? I have made more money in Radio than ever before. I am busy day and night. Last night I made $17. Last week $45. I had a tough struggle at first but you fellows helped me back in the race and kept me going."—William J. Maki, Creighton Mine, Ont., Canada.

TO BE A RADIO EXPERT

Act Now --- Mail Coupon Below for Free Book of Facts and Proof

You Can Learn at Home in Your Spare Time to be a Radio Expert

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don't have to be a high school or college graduate. My Course is written in a clear, interesting style that most anyone can grasp. I give you practical experience under my 50-50 method of training—one-half from lesson books and one-half from practical experiments with equipment given without extra charge. This unique and unequalled method has been called one of the greatest developments in correspondence Radio training. N.R.I. pioneered and developed it. It makes learning at home easy, fascinating, practical.

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.

Your Money Back if You are Not Satisfied

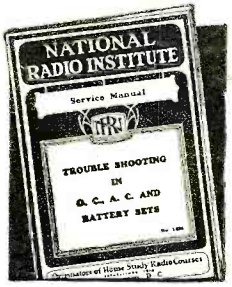
I will give you an agreement in writing, legal and binding upon this Institute, to refund every penny of your money upon completing my Course if you are not satisfied with my Lessons and Instruction Service. The resources of the National Radio Institute, Pioneer and World's Largest Home-Study Radio School, stand behind this agreement.

Find Out What Radio Offers. Get My Book

One copy of my valuable 64-page book, "Rich Rewards in Radio," is free to any ambitious fellow over 15 years old. It has started hundreds of men and young men on the road to better jobs and a bright future. It has shown hundreds of men who were in blind-alley jobs, how to get into easier, more fascinating, better-paying work. It tells you where the good Radio jobs are, what they pay, how you can quickly and easily fit yourself to be a Radio Expert. The Coupon will bring you a copy free. Send it at once. Your request does not obligate you in any way. Mail coupon in envelope or paste on postcard. ACT NOW.

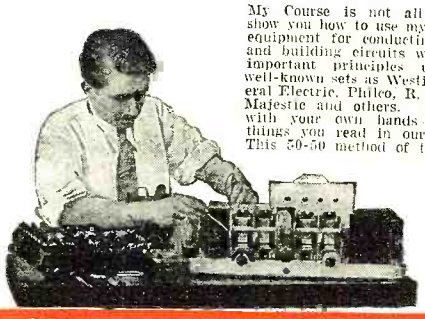
J. E. SMITH, President
Dept. 3NR, National Radio Institute
Washington, D. C.

Special FREE Offer



Act now and receive in addition to my big free book, "Rich Rewards in Radio," this Service Manual on D. C., A. C. and Battery Operated sets. Only my students could have this book in the past. Now readers of this magazine who mail the coupon will receive it free. Overcoming hum, noises of all kinds, fading signals, broad tuning, howls and oscillations, poor distance reception, distorted or muffled signals, poor Audio and Radio Frequency amplification—and other vital service information is contained in it. Get a free copy by mailing the coupon below. ACT NOW.

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.

Clip and mail NOW for FREE INFORMATION

J. E. SMITH, President
National Radio Institute, Dept. 3NR
Washington, D. C.

Dear Mr. Smith: Please send me your sample lesson "Trouble Shooting in D.C., A.C. and Battery Sets" and your book, "Rich Rewards in Radio," which points out the opportunities for spare-time and full-time jobs in Radio and your famous 50-50 method of training men to become Radio Experts through home study. I understand that this places me under no obligation.

(Please Print Plainly)

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

Address.....

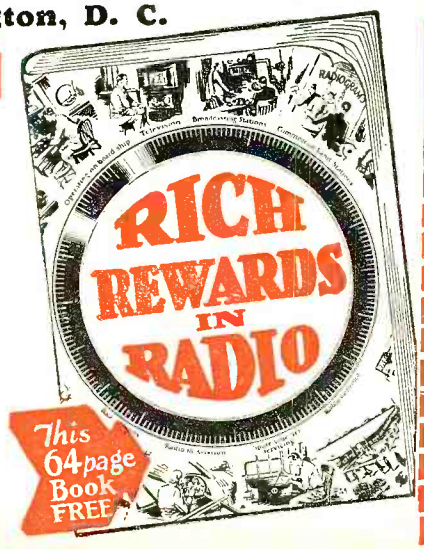
City.....*State*.....

"M"

FORMER PAY

Experienced Radio Man Praises N.R.I. Course

"Before taking your Course, I had worked at Radio for over seven years, doing quite a bit of servicing, but I realized that I was in need of better training. From the first lesson on I began to understand points that had had me wondering. The Course has taught me what I could not have learned otherwise and I would not take many times the price it has cost me, for the knowledge I have gained. In a period of nine months, I have made at least $3,500."—C. J. Siegner, 28 So. Sandusky St., Delaware, Ohio.



The Editor—*to You*

A NEW DEAL for radio and for radio men is in the offing. Due to the efforts of General Hugh S. Johnson in his strenuous sponsorship of NRA principles and the enthusiastic support given to this effort by manufacturers as well as the encouraging conditions that have been shown up during the recent Radio Prosperity Campaign, we can definitely state that the chaotic conditions in the trade during the past year have already been supplanted by a recovery during the past two months that, to our unaccustomed eyes, looks phenomenal. A recent Bradstreet report shows that orders are being received in such volume that manufacturers are behind in deliveries, retailers are pressing for new shipments as their shelves have been cleared of stocks and consumer demand is forging ahead. To quote parts of this report:

* * *

"THE future of the radio industry seems brighter than it has been in several years. Its prices have increased, stocks have been cleaned of antiquated models, budgets have been adjusted and many evil trade practices have been eliminated.

* * *

"THERE has been an unusually strong upturn in the demand for radios in most parts of the country.

* * *

"WITH many manufacturers of popular-priced sets, orders now are running ahead of production, with retailers placing fresh commitments as soon as the delivery of former ones has been made. With the increase in the prices of sets and the shift of demand to the better-grade units, value of output has increased from 50 to 85 percent.

* * *

"RADIO receiving set manufacturers estimate their production costs have been increased by one-third by operating under the National Electrical Manufacturers' Association Code.

* * *

"IT is estimated conservatively that unit sales during the last three months of the year will be from 35 to 50 percent larger than for the comparative period of a year ago.

* * *

"MORE interest has been displayed in the small console sets falling within the price range of $30.00 to $70.00. Short-wave sets are increasing in popularity, as listeners are interested in tuning in on foreign programs. Production of radio parts has almost trebled and a steady increase of component parts is expected."

* * *

FROM this it may be seen that the manufacturer and retail trades have been putting more radio men to work and paying better salaries to those who have remained employed. This means that engineers are once more being returned to research work in laboratories, that production men are busy once more on an enlarged scale and that additional men who have had to turn away from the radio industry are being recalled.

* * *

THE radio public is beginning to realize that now is the time to replace old equipment and reports show that this replacement demand for worn and obsolete sets has been increasing to a rising scale with the coming of cooler weather. Servicemen report increased business in repair work and maintenance as well as in installing new sets in homes never before equipped. The radio-minded public is advised that today they can get more radio for their dollar than they will at any time in the future. An indication of this is seen in the fact that quotations on some sets have been advanced as much as 20 to 35 percent and further increases are in prospect on goods now being manufactured under the NRA. Retailers are finding they are compelled to require larger initial payments from customers because of the higher prices for manufacture and the smaller discounts allowed by distributors.

* * *

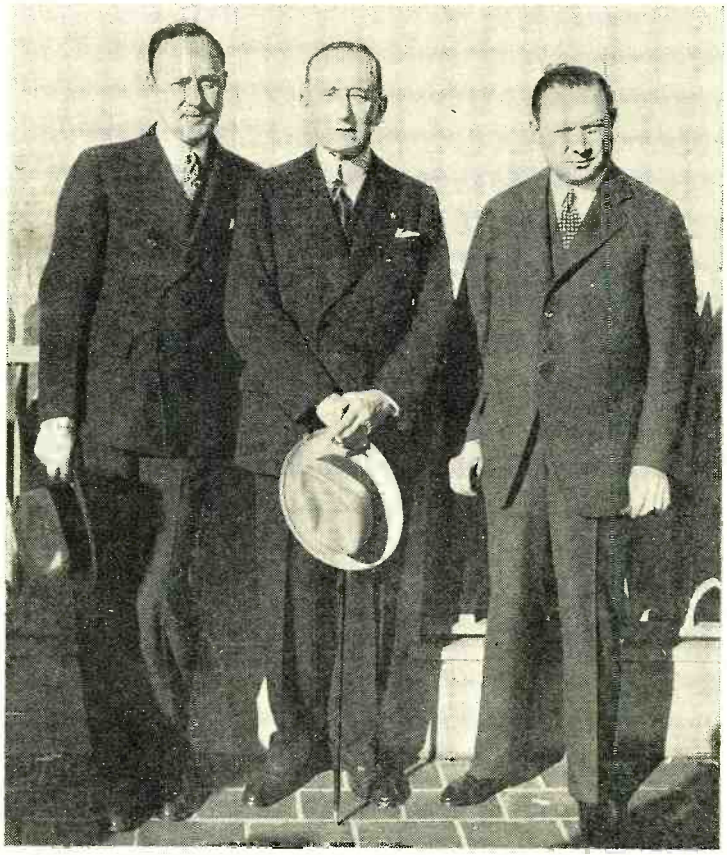
IF you intend to buy a radio set or any form of radio equipment, it is advisable that you *buy now*. This will save you money and will at the same time help to make for further progress in the industry. It will set many worthy engineers, designers and radio men in general, to work in producing more radio enjoyment for the future. It will help advance technical developments so necessary in many branches of the science of radio and especially in television. Let us all get behind our hobby, vocation, or industry, as the case may be, and help radio increase its scope of service to mankind.

* * *

"Buy now," says General Johnson, and lay in the equipment you have been needing for so long, you servicemen. Your shelves are bare of the type of equipment to adequately carry on your work. And there are many new things that will help you expand your business immediately; replacement transformers of a superior type that will make the serviced receivers better than when they were first purchased; a new stock of tubes that will enable you to replace all types of worn-outs; a new stock of resistors that will enable servicing any type of receiver you may come up against; new noiseless antenna equipment for replacing the old-style antennas in noisy locations; new loudspeakers for improving earlier models.

* * *

So let's make this a Radio Christmas! All together, now! Let's go!



CELEBRITIES AT CENTURY OF PROGRESS

The renowned Marchese Marconi, center, honored at "Marconi Day," is caught by the camera with Marlin H. Aylesworth and David Sarnoff, RCA officials

. . . say these 30 Leading Radio Manufacturers . . to their 40,000 DISTRIBUTORS and DEALERS throughout United States and Canada

AMERICAN BOSCH
AMERICAN TELEVISION
ARCTURUS TUBES
BALKEIT • BRUNSWICK
CAPEHART
CLOUGH-BRENGLE CO.
CROSLEY • CLARION
DeFOREST • ECHOPHONE
FADA • GREBE • HOWARD
HAMMERLUND • HICKOK
INTERNATIONAL RESISTANCE CO.
KENNEDY • KOLSTER • LYRIC
MAJESTIC • PHILCO
RADIO PRODUCTS CO.
SANGAMO ELECTRIC
SENTINEL • SHELDON
SILVER-MARSHALL CO.
STEWART RADIO
STEWART-WARNER
STROMBERG-CARLSON
UNIVERSAL MICROPHONE
ZENITH

The need for men, PROPERLY trained, is one of the Radio Industry's major problems, today.

In fact, the very future of the Radio Industry is dependent on the industry having available, at all times, an adequate supply of PROPERLY trained men to install and service—not only the present-day highly complicated Radio and Electronic equipment—but the still more complicated equipment that will be brought out by the Industry, from time to time.

The above manufacturers all realize this. They know that under such circumstances, no ordinary Radio Training is going to give them the type of "trained" man they want. Only a Training that is right-up-to-the-minute, and properly prepared, highly practical, and properly supervised, will answer their purpose.

Radio and Television Institute home-training has successfully met their every test. That's why these manufacturers recommend R. T. I. Training, not only to their own men, everywhere—but to all men who want to get somewhere in Radio.

★This entire advertisement approved by the above thirty-two manufacturers.

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-Brenglе 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,
—and R.T.I. Staff.

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

GOOD PAY RADIO WORK

To the man who wants to make $35 to $75 a week and more—*Here's a Message for You!*

"The great Radio Industry, today—more than ever before—is on the lookout for PROPERLY trained men to fill its more responsible jobs. These are the better-paying jobs in Radio . . . jobs which give steady work at good pay, as a starter; and an early advancement to still better-paying jobs, as a future."

HERE, THEN, IS REAL OPPORTUNITY

But to qualify for these better-paying jobs, men must be PROPERLY "trained"—they must know the theory of Radio, as well as the practical side, and be able to teach other men some of the things they know.

The Radio Industry, itself, has no time to train these men. That's why the Radio & Television Institute, of Chicago, is doing the job.

You'll be trained at home — in your spare time—easily and quickly, and at a cost of only a few cents a day. And as you are taught to "earn as you learn"—R. T. I. Training need cost you nothing.

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.

You learn by doing, of course, because that's the Shop Way of teaching. But you also learn the theory of Radio — without which you can't hope to go far, or make much money, in this great industry.

ELECTRONICS—SOUND PICTURES P. A. SYSTEMS—PHOTO CELLS—TELEVISION—all included

Radio service 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.

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The Deaf Shall Hear

One of radio's most important contributions to the deaf is found in the service it renders in helping to overcome the tremendous handicap of children born to a world of silence. Individual and group hearing aids enable them to hear and understand speech—and therefore to learn to speak themselves. Thus, if their ability to hear is not completely lost, they can obtain a more nearly normal outlook on life, can partake of educational activities and can grow into normal men and women. In the above scene a group of institution children are not only hearing a program spoken into the microphone of a group-hearing system—they are enjoying it and with every indication of intelligent understanding. Such procedure marks a radical advance over the limitations of a few years ago when children so afflicted had to depend largely upon sign language as a means of intercourse

Radio News

VOLUME XV December, 1933 NUMBER 6

RADIO EARS for the DEAF

Radio has contributed extensively to the striking advances in hearing-aid development made during the past two years—advances which are overcoming the handicap of defective hearing to an extent unthought of a few years ago

By S. Gordon Taylor

THE prophecy that radio would usher in a new era for the deaf is now definitely on the way to fulfillment. During the past few months several new hearing-aid devices employing one or more vacuum tubes have been placed on the market, some at prices considerably below the average at which aids of the old "telephone" type are being sold. In addition, special microphones and earpieces have been made available to enable the technically trained radio serviceman and dealer to produce custom-built vacuum-tube hearing-aid equipment. During the next year or two there will be further developments along this line, with the result that the hard-of-hearing individual can definitely anticipate aids of a degree of effectiveness never before encountered.

Just what are some of the advantages that radio can offer the deaf?

More Effective Individual, Portable Devices. With vacuum tubes to provide any desired degree of amplification, microphones offering a high degree of fidelity may be employed, thus getting away from distortion encountered heretofore where the microphone was called upon to provide an extreme degree of sensitivity. Also, the surplus of output volume obtainable with vacuum-tube amplification will permit the use of the less efficient miniature type earpiece, eliminating the headband and offering the attraction of inconspicuousness.

Group Hearing Equipment. For churches, schools and theatres, vacuum-tube amplification will permit any number of hard-of-hearing persons to listen in at one time, with volume and tone controls at each outlet to meet the requirements of each individual.

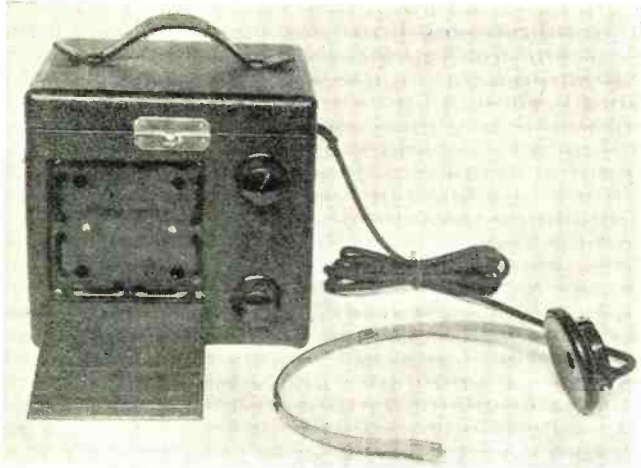
Equipment for Measuring and Analyzing Hearing Defects. Radio principles and vacuum tubes offer a medium for analyzing deafness to determine the extent of hearing loss at different frequencies, with the object of prescribing the characteristics required in a hearing aid to most effectively overcome the losses of hearing in each individual, in much the same way that eyes are tested to determine the individual's requirements for glasses.

HEARING LOSSES ANALYZED

Figure 1. Hearing aid development is approaching the stage where defects will be analyzed and corrective aids prescribed in the same way that glasses are ground and fitted to the individual today. The audiometer shown here consists of a phonograph and amplifier to produce sounds of different pitch. At each pitch the intensity required for audibility is measured, providing a graphic chart of the hearing ability of the individual

Matching Hearing Loss Characteristics. The use of an individually designed audio filter system will make it possible to closely match the vacuum-tube hearing aid to the needs of the individual, thus compensating for different degrees of hearing loss at different frequencies and producing substantially normal overall hearing characteristic.

Variable Tone Compensation. Controls, not unlike the tone controls employed in modern radio sets, may be incorporated in vacuum-tube hearing aids to permit adjustment for the best reproduction of different types of voices, etc. In this way a standardized hearing device can be produced in quantity and readily adjusted to the



A PORTABLE VACUUM-TUBE HEARING AID

Figure 2. Except for the microphone and carrying case, this device, known as the "RADIO NEWS Ear Aid," is constructed entirely of standard radio parts. An article describing its construction, enabling anyone to build a similar unit at home, was published in the January, 1932, issue of RADIO NEWS. *The picture wiring diagram is shown below*

approximate requirements of the individual purchaser by means of these variable controls.

Automatic Volume Control. So far as is known, nothing of this nature has thus far been applied to hearing-aid equipment. It is believed, however, that the future holds this development in store. The advantage to the deaf person in having all sounds reproduced at a substantially constant volume is manifest, particularly where the deaf person is participating in group conversation with the other members of the group arrayed at different distances from the microphone position.

Elimination of Batteries. For certain types of service, operation from either the a.c. or d.c. lighting lines is practical and there are already at least two such portable, batteryless vacuum-tube aids on the market, one of which is shown in Figure 8.

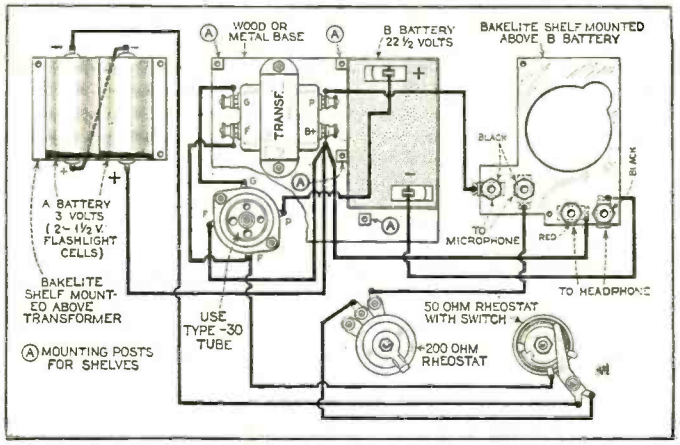
No article on the subject of radio's aid to the deaf would be complete without emphasis on equipment designed to measure degrees of hearing loss. Figure 1 shows one of the latest devices of this type, the Sonotone Audiometer. This consists of an electric phonograph and pick-up with an amplifier and calibrated attenuator. Standard sound-frequency phonograph records are employed which provide sustained notes on different frequencies. The person under test listens to the amplifier output through an earpiece or bone conduction unit and the output volume at each frequency is attenuated until it is just barely audible to him. The reading of the attenuator scale then shows the degree of variation from normal hearing.

With this equipment the hearing curve of the subject may be readily plotted and compared with a normal hearing curve. It may be found that at certain frequencies his hearing is almost normal while at other frequencies the hearing loss may be great. Thus the type of hearing-aid correction best suited to the requirements can be provided.

It would seem that a deaf person could determine this himself by simply trying different hearing aids until he found the one that seemed to work best for him. Experiment shows that this is often not the case, however. A person may become accustomed to the characteristics of one particular hearing aid and when he tries another for the first time it may seem less satisfactory to him than his old one. Continued use of the new one, even for a few hours, may convince him that it is really far more satisfactory than the old.

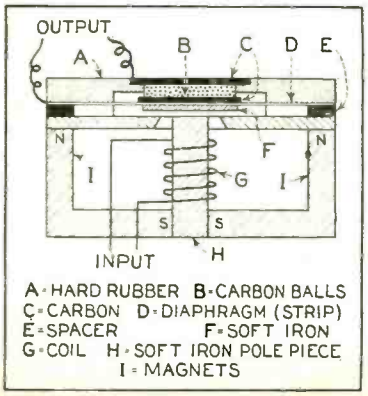
The real advantage of the audiometer will not be realized until hearing-aid design has developed to a point where the response characteristic of the aid can be shaped to closely coincide with the requirements indicated by the hearing curve of the individual. Even today this can be done roughly and within certain limits by varying the adjustment of the hearing-aid microphone. Before long it is hoped and believed that vacuum-tube equipment development will have progressed to a point where a hearing aid can be fitted to the individual just as a man has his glasses fitted to his individual requirements today.

Some of the vacuum-tube devices developed thus far are shown in the accompanying illustrations. Figure 2 shows the "RADIO NEWS Ear Aid." This was developed in our own laboratory and is made up entirely of standard radio parts available on the open market. It was designed for the dual purpose of demonstrating the effectiveness of vacuum-tube hearing equipment, and serving as a model for readers who desired to construct such equipment for themselves or others. The picture wiring diagram which accompanied the constructional article in the



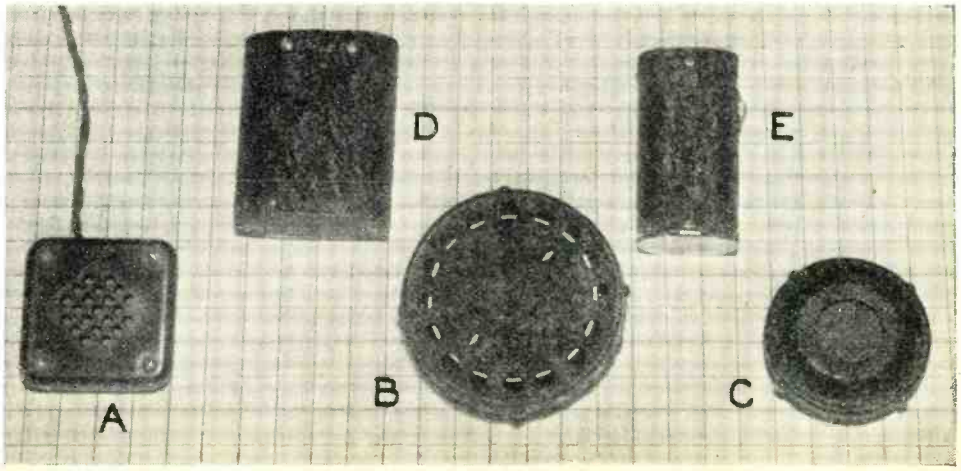
MECHANICAL AMPLIFIER

Figure 9. A drawing of the "booster" unit of Figure 4



SPECIALLY DESIGNED

Until recently electrical hearing aids were available only to those who could afford the parts are available which permit assembly of the "telephone" type at home at costs ranging left, shows three types of highly sensitive microphones now on the market. Samples of different earpieces available. An indication of the size of these parts is

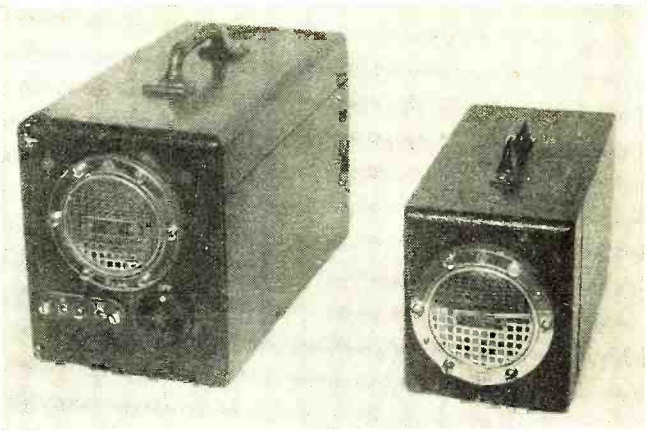


January, 1932, issue is also shown in Figure 2. Many hundreds of these instruments were built by readers and, judging from the mass of letters received from users in the United States, Canada, Europe and even Africa, are rendering excellent service.

In Figure 3 are shown two instruments recently placed on the market by the Universal Microphone Company. The smaller one includes a single vacuum tube and employs a small 22½-volt B battery for plate supply and flashlight cells for the filament supply. The microphone is one of their own make and is of the type extensively used in public-address and amateur transmitters except that it is especially adjusted.

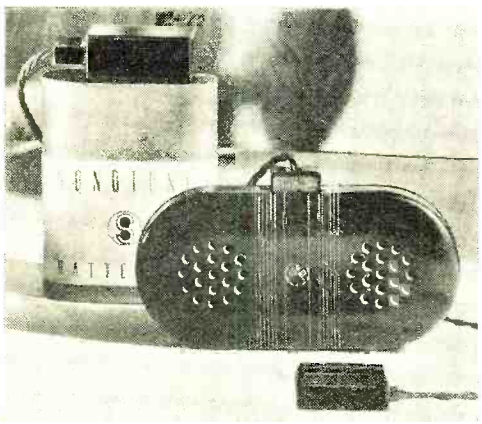
The larger aid in Figure 3 (inside view shown in Figure 7) is a 2-tube model of the same make, and employs the same microphone as the smaller model. Because of the use of two amplifier tubes, it provides sufficient output volume at the headphone to meet the requirements of persons who are extraordinarily hard of hearing. The weight of this model, complete with the self-contained batteries, is 7 pounds, as compared with 3½ pounds for the smaller model.

Both of these models are completely self-contained except for the earpiece. The Trimm Featherweight regulation size earpiece is ordinarily supplied with this equipment, but the Trimm miniature type may be used if desired. The only adjustment employed in either model is a volume-control knob which provides smooth variation of volume or sensitivity from zero to maximum.



NEW VACUUM-TUBE AIDS

Figure 3. These two units have just been placed on the market. The larger one includes a two-stage vacuum-tube amplifier and will accommodate practically any degree of hearing loss short of total deafness. The smaller one is excellent for all but extreme degrees of deafness



NEW "TELEPHONE" TYPE DEVICE

Figure 4 (left). In effectiveness this pocket-size outfit marks a tremendous advance over similar types of even a few years ago. The mechanical "booster" plugged in top of battery provides powerful amplification. Either a standard or miniature earpiece, or a bone conduction unit (in foreground), may be used

In tests conducted by RADIO NEWS, among subjects of varying degrees of hearing loss, reports on these two devices were extremely satisfactory. The reports, based on trials at home, in offices and the theatre, laid particular stress on the clarity of reproduction and the excellent volume obtainable. Even in the legitimate theatre, which constitutes one of the most severe tests for a hearing aid device when used by a person of advanced deafness, the results with the larger model were highly satisfactory to the subject, who had never before found any device which enabled him to enjoy a theatre performance.

Figure 8 shows a new vacuum-tube portable hearing aid which has been placed on the market by the Sonotone Laboratories within the past few weeks. This dispenses with batteries and draws the filament, plate and microphone current for the amplifier tube from any 110-volt lighting line, either alternating or direct current. The amplifier and power supply equipment is extremely compact and is completely inclosed in a metal shield box which is accommodated in a compartment in the leather carrying case.

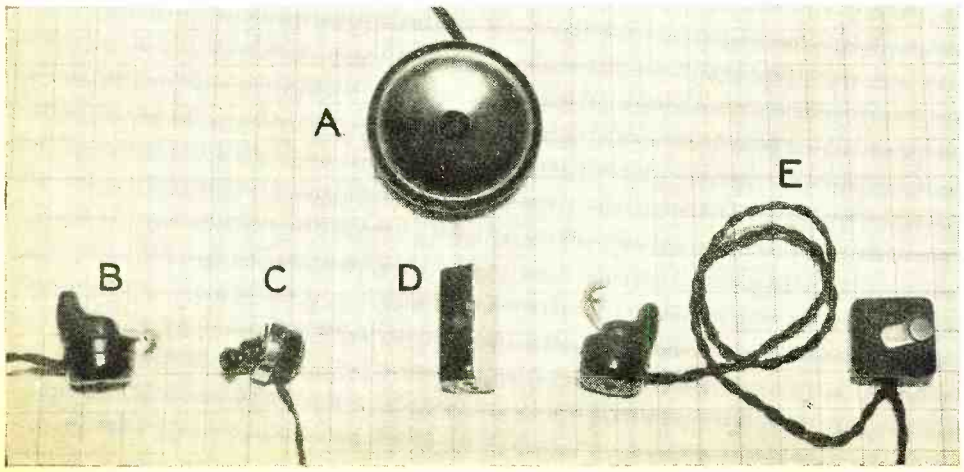
Where equipment is to be used in one place and the portability feature is not required, the same amplifier is available with a single microphone housed in an attractive desk-mounting case, of either wood or metal. Thus in an office the amplifier may be slipped in a drawer or otherwise concealed if desired, leaving only the microphone on top of the desk. Any one of the three types of Sonotone headpieces, the ordinary flat type, one of the miniature type or the new bone conduction unit, may be connected into the output of the amplifier.

This line-operated hearing aid is capable of an excellent combination of fidelity and volume. One of its outstanding features is that it requires no upkeep attention whatsoever, as it contains no batteries or other parts that wear out.

Figure 4 shows one of the latest and most highly developed of the telephone type hearing aids. This is made by the Sonotone Laboratories. As (*Continued on page 371*)

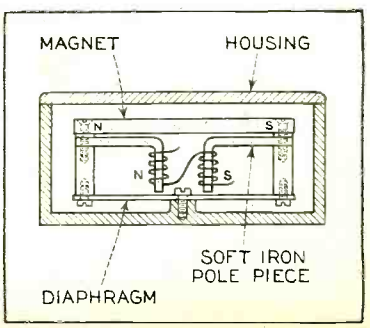
HEARING PARTS AVAILABLE

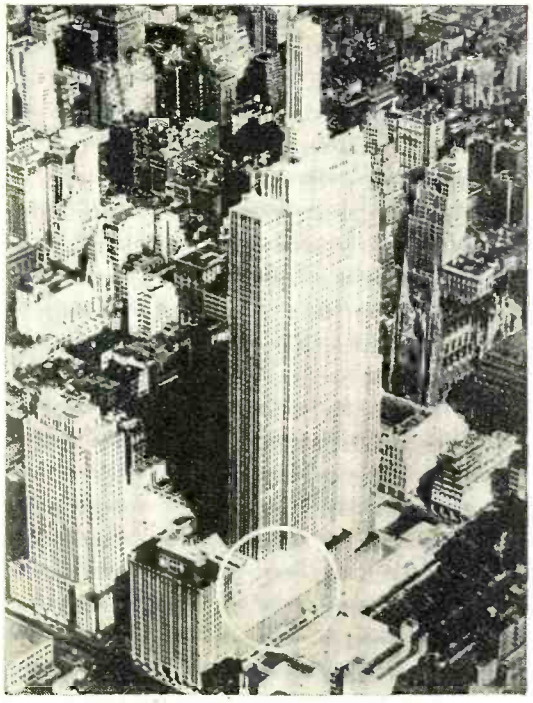
relatively high price of commercially built apparatus. Now, however, a wide variety of between $14 and $20 and the vacuum-tube type between $25 and $40. Figure 5, at the home-made pocket-battery cases are shown at (D) and (E). Figure 6, at right, shows found by comparing them with the ½-inch squares of the background



BONE CONDUCTION UNIT

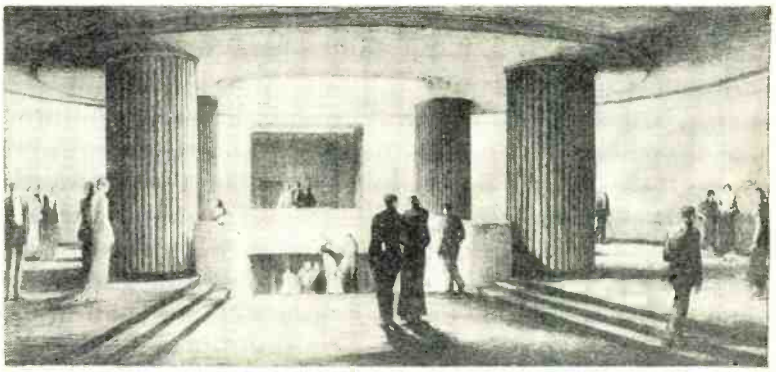
Figure 10. Drawing of the Lieber oscillator which is pictured in Figures 4 and 6 (D)





NEW HOME OF THE N. B. C.

Circled in the center foreground is the N. B. C. studio section of Radio City. The executive offices are in the tower building



ARTIST'S SKETCH OF THE GREAT RECEPTION ROTUNDA

INTERESTING PREVIEWS

BROADCAST

As this article is going to press the National the first broadcasts from its new and palatial largest and most modern project of its kind of this new center are

By Samuel

THE world's largest and most modern broadcasting studios will be opened for their inaugural broadcast on the evening of November 15, 1933, when the National Broadcasting Company officially enters the elaborate studio suite in Radio City, New York's huge realty development devoted to entertainment.

Covering some 400,000 square feet of floor space, in an 11-story wing of the RCA skyscraper, the new NBC studios embody most up-to-date broadcasting ideas. The entire world was combed by network engineers and research men for innovations that would help improve the gigantic radio headquarters from technical, decorative and practical angles.

The new studio layout far surpasses the facilities of any radio station or network in the world. Even the model Broadcasting House of the British Broadcasting Corporation in London, long considered the best studio center in the world by radio experts, is outdated in the New York project.

Until Merlin Hall Aylesworth, president of NBC and Radio-Keith-Orpheum recently took New York radio editors and columnists on a tour of the nearly completed studios, a veil of secrecy surrounded the enterprise. O. B. Hanson, NBC Manager of Plant Operation and Engineering, once delivered a paper on the studio planning before the Institute of Radio Engineers, but the finished studios were far ahead of all advance ballyhoo.

Of the thirty-five studios in the Radio City plans, sixteen will be functioning by the opening night. The remaining nineteen will be opened at later dates. The studios range in size from intimate speakers' chambers of small dimensions to a huge auditorium measuring 78 by 132 feet and three stories in height. The large studio will contain a semi-circular stage capable of accommodating a 100-piece orchestra. About 1000 guests will be able to watch the proceedings from the main floor while 250 more will be accommodated in the second floor-level balcony, which faces the stage.

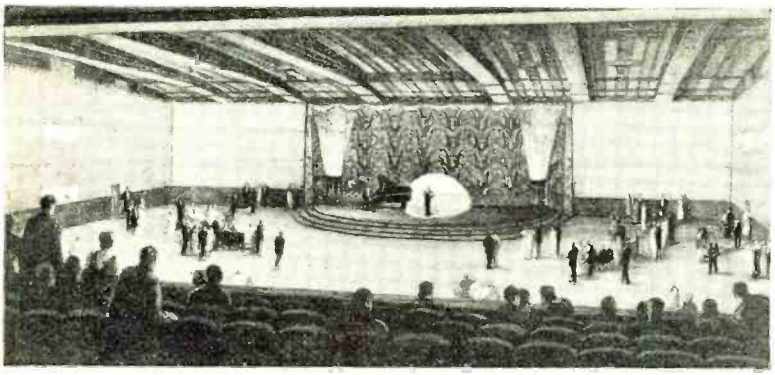
The second largest studio will be used for dramatic programs. It is two stories in height and measures 50 by 89 feet. The stage utilizes a glass-curtain similar to the one introduced in the NBC Times Square studios atop the New Amsterdam Theatre Building. When the curtain is lowered, studio visitors will hear the program over amplifiers while viewing the actors through the huge glass window. Eight additional studios are two stories in height. Two have floor measurements of 50 by 80 feet, two 25 by 40 feet, and four 30 by 50 feet. Side galleries are provided for guests who may view the programs through glass windows. Special galleries of smaller sizes are provided for clients who wish to view broadcasts, auditions or rehearsals.

One of the unusual features of the Radio City undertaking is a group of four studios built around one central control room of circular design. The control room floor consists of a giant turntable so that the equipment may be swung about mechanically to face any of the four studios.

"It is possible," Mr. Aylesworth said, in speaking of the unique studio arrangement, "that this may be of great use in the future for television broadcasting, since all that would be necessary to shift scenes would be to swing from one studio to another. For the present, it will be useful in certain types of programs, where an orchestra may be put in one studio, a speaker in another, and so forth."

PREVIEW OF THE WORLD'S LARGEST STUDIO

The huge auditorium studio as it nears completion. It is three stories in height, 132 feet long and 78 feet across. The huge balcony on the far side will allow visitors to watch and hear the programs as they are broadcast

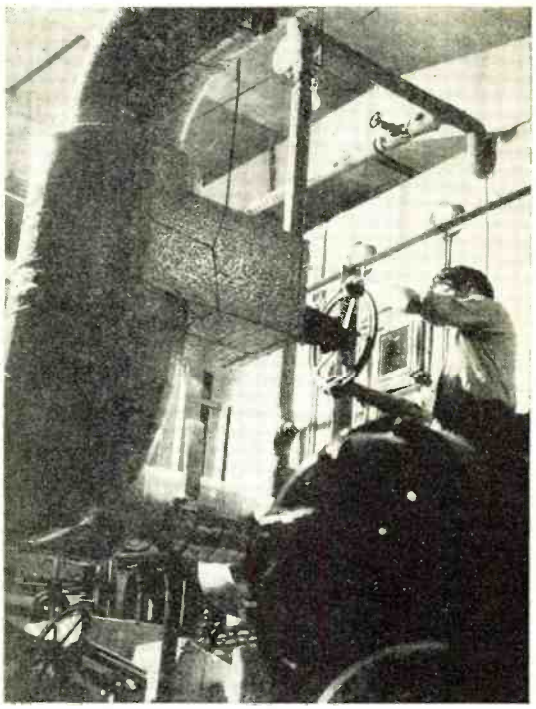


HUGE AUDITORIUM STUDIO OF RADIO CITY

OF THE WORLD'S GREATEST

METROPOLIS

Broadcasting Company plans to inaugurate broadcast center at Radio City, which is the in the world. Some of the interesting features described in this article



WASHING AIR FOR ARTISTS

A small section of the air-purifying system for the new studio building

Kaufman A special children's studio will be used for juvenile broadcasts. A separate lounge room for the youngsters adjoins the studio and both rooms are appropriately decorated.

Two of the most important engineering problems to cope with in the studios' design were air-conditioning and soundproofing. The absence of windows or direct natural ventilation in the studios necessitated the installation of the largest air-conditioning plant in the world for the NBC's use.

The air-conditioning plant occupies the greater part of the tenth floor in the NBC wing, while the refrigerators for cooling the air are in the basement. The air conditioning control board, a panel of sixty-four giant dials shows a continual graphic record of temperature in every section of the building. The operators can keep the air condition constant by observing and correcting variations due to the number of persons in the studios and other causes. At the operator's will, the air can be circulated, washed, humidified or de-humidified.

Mr. Hanson and Mr. Aylesworth explained that all of the studios, through the special soundproofing are virtually "floating" free from the building. All of the studio floors, walls and ceilings are separated and insulated from the building framework. Each studio is surrounded by tons of Rockwool, Transite and textiles. Pads of heavy felt are placed at all points of contact between the studio and the building, with enough slack to take up possible vibrations in the steel framework. A perforated composition acoustic material is used either visibly or behind decorative cloth in the studios.

Some studios have sliding-wall panels, which are operated mechanically from the control rooms to vary acoustical effects by altering the extent of hard surface exposed.

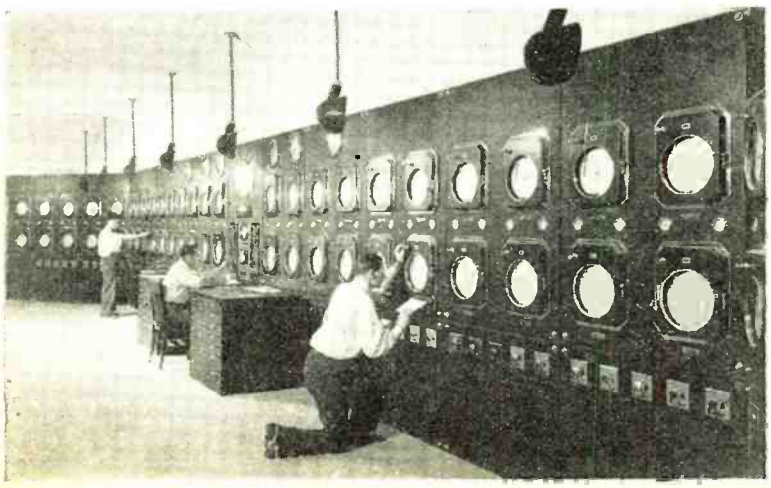
Mr. Aylesworth said that in most modern broadcasting studios, it has been the practice to place the main control room in the horizontal center and have it surrounded by the studios. Because this was not practical in a building of this sort, the principle was retained in the vertical plane with the master control located on the fifth floor and the studios laid out on lower and higher floors. In addition to the master control, the floor contains the main equipment room, power and battery rooms, technical laboratory, maintenance and operations shops, telegraph rooms and switching booths. Visitors' observation galleries run through the technical departments as well as the studios, the NBC officials believing that listeners are interested in the backstage scenes as well as the studio settings.

For special news broadcasts, where parts of programs come from such remote points as airplanes, ships, pack-transmitters on the backs of announcers, or from foreign countries, a specially designed control room has been erected to handle the setting-up of the multi-point productions. Thus, the program director can keep in touch with as many as ten different pick-up points either by wire or short waves, and to switch to any of the desired sources momentarily. The apparatus also enables the director to talk back to any or all points of program origin.

Mr. Aylesworth is of the opinion that studio decoration is especially important because of the effect it has on radio performers and speakers. As a rule, he pointed out, interior decorators are hampered when executing studio assignments on account of acoustical requirements. The chief decorative materials, due to these acoustical needs, are textiles. A long period was spent in going over specimens of wools, (*Continued on page* 365)

CONTROL ROOM FOR AIR-CONDITIONING PLANT

The studios will have the largest air-conditioning system in the world. Below is the control panel for regulation of temperatures in all studios and other parts of the building



TECHNICAL DATA AND CHARACTERISTICS ON ELEVEN NEW TUBES

Many readers have requested us to publish data of a greater number of tubes. This month we present characteristics and essential information on eleven tubes; others will follow in short order

By J. van Lienden

THE types of tubes described this month can be subdivided into several groups: duplex-diode-triodes, multi-purpose output tubes, twin Class B amplifier tubes, r.f. pentodes and a tetrode.

Duplex-diode-triodes

To this group belong the types –55, –85, –75 and –2A6. The fundamental principles of all these are the same. They differ only in the filament voltage and in the amplification factors of the triode section. All of them can be used in the same circuits. The tube consists of a full-wave rectifier, comprising a cathode and two diode plates, and a triode which utilizes the same cathode. The two sections are independent of each other.

This type of tube can be used in a variety of circuits, some of which are shown in Figure 1. In Figure 1 (A) the tube is employed as a full-wave detector, an audio amplifier and an automatic volume control, combined. The action, briefly, is as follows: the diode section acts as a full-wave rectifier and a rectified e.m.f., containing the modulation, develops across the load R1 (the grid leak). The audio component is applied to the grid of the triode and an amplified replica develops across the load in the plate circuit. Variations of this circuit are shown in Figure 1 (B, C, D and E).

The diodes can be connected in parallel, giving full-wave detection, which needs no center tap. Also, if desired, one diode plate can be used for detection and one for a.v.c. (see Figure 1, E).

The type –55 has a filament designed for 2½ volts a.c. or d.c. and the triode has a mu of 8.3. Type –85 tube is its 6.3-volt counterpart. Type –2A6 tube is similar to type –55, but the triode has an amplification factor of 100. Type –75 tube is the same as –2A6, but with a 6.3-volt heater. Characteristics of these tubes are found in the accompanying table. The base connections are shown in Figure 2. The diode plates should show a current of at least .5 ma. with a potential of 10 volts with no load.

Due to their high amplification factor, type –75 and –2A6 tubes are used as audio amplifiers (ignoring the diode section). An example of this is found in the amplifier described in RADIO NEWS for June, 1932, by Mr. I. A. Mitchell.

Multi-Purpose Output Tubes

Type –59 and –89 tubes are triple-grid amplifier tubes which can be used in three ways, depending on the connections to the grids. Let us number the grids, counting from cathode toward the plate. The tubes will work as a triode when connecting grids Nos. 2 and 3 to the plate and employing grid No. 1 as control grid. As a Class A amplifier, the –59 tube will deliver 1250 milliwatts and type –89 tube (a 6.3-volt tube) 300 mw.

When No. 3 grid is connected to the cathode, grid No. 2 is used as screen and grid No. 1 as control-grid, the tube becomes a pentode. With this arrangement the type –59 tube can deliver 3 watts and the type –89 1.5 watts. Finally, connecting grid No. 1 and No. 2 together and using them as control grids, while grid No. 3 is connected to the plate, the tube can be employed in Class B amplifiers. The maximum output for two tubes is 20 watts for the type –59 tube and 3.5 watts for the –89 tube.

Type –89 tube has a 6-prong base and has a cap connected to the control grid. Socket connections are shown in Figure 2. Type –59 tube has a 7-prong base. Its connections also are shown in Figure 2. There are two different 7-prong bases.

TYPE	E_f	I_f	E_p MAX.	E_{G2} MAX.	E_p	E_{G2}	E_{G1}	I_p	I_{G2}	μ	G_m	r_p	P_o WATTS	R_L	INTER-ELECTRODE CAPACITY G-P	G-C	P-C	% HARMONIC DISTORTION
55	2.5	1.0	250	–	250	–	–20	8	–	8.3	1100	7500	.2	20,000	–	–	–	5 (2ND.)
75	6.3	.3	250	–	250	–	–2	.8	–	100	1100	91,000	–	–	1.7	1.7	3.8	
2A6	2.5	.8	250	–	250	–	–2	.8	–	100	1100	91,000	–	–	1.7	1.7	3.8	
85	6.3	.3	250	–	250	–	–20	7	–	8.3	1000	8.3	–	–	–	–	–	–
48	30	.4	125	100	125 95	100 95	–22.5 –20	50 47	9 9	28 28	2800 2800	10,000 10,000	2.5 1.6	2000 2000				9 9
77 (AMP.)	6.3	.3	250	100	250 250	100 100	–3 –7.5	2.3 (CUT OFF POINT)	.6	1875	1250	1.5 MEG.	–	–	.007	4.4	10.6	–
77 (DET.)	6.3	.3	250	100	250	100	–6	.1	–	–	–	–	–	–	–	–	–	–
78	6.3	.3	250	125	180 250 250	75 100 125	–3 –3 –3	4 7 10.5	1 2 3	1100 1160 990	1100 1450 1650	1 MEG. .8 " .6 "			.007	4.4	10.6	–
59 CLASS A TRIODE	2.5	2.0	–	–	250	–	–28	26	–	6	2600	2400	1.25	5000	PEAK PLATE CURR. –	INPUT POWER MILLIWATTS –		5 (2ND.)
59 CLASS A PENTODE	2.5	2.0	–	–	250	250	–18	35	9	100	2500	40,000	3.0	6000	–	–		7
59 CLASS B TRIODE	2.5	2.0	–	–	300 400	– –	0 0	10 13	– –	– –	– –	– –	15 20	4600 6000	– 200	– 1500		–
89 CLASS A TRIODE	6.3	.4	–	–	160	–	–20	17	–	4.7	1570	3000	.3	7000	–	–		5 (2ND.)
89 CLASS A PENTODE	6.3	.4	–	–	163 180	163 180	–17 –18	17 20	2.5 3.0	125 135	1575 1635	79,000 82,500	1.25 1.5	9000 8000	– –	– –		– –
89 CLASS B TRIODE	6.3	.4	180	–	180	–	0	3	–	–	–	–	2.5 3.5 6 MAX.	3400 2350 –	– 75 –	– – –		5 8 –
79	6.3	.6	250	–	180 250	– –	0 0	7.5 10.5	(2 TUBES) (2 TUBES)		– –	10,000 14,000	6.25 8.0	10,000 10,000	46*	975		9.5
19	2	.26	135	–	135	– – –	0 –3 –6	10 4 1	– – –	– – –	– – –	– – –	2.1 1.9 1.6		27* 25* 22*	170 130 95		5 5 5

* AVERAGE PLATE CURRENT FOR STATED OUTPUT (2 TUBES)

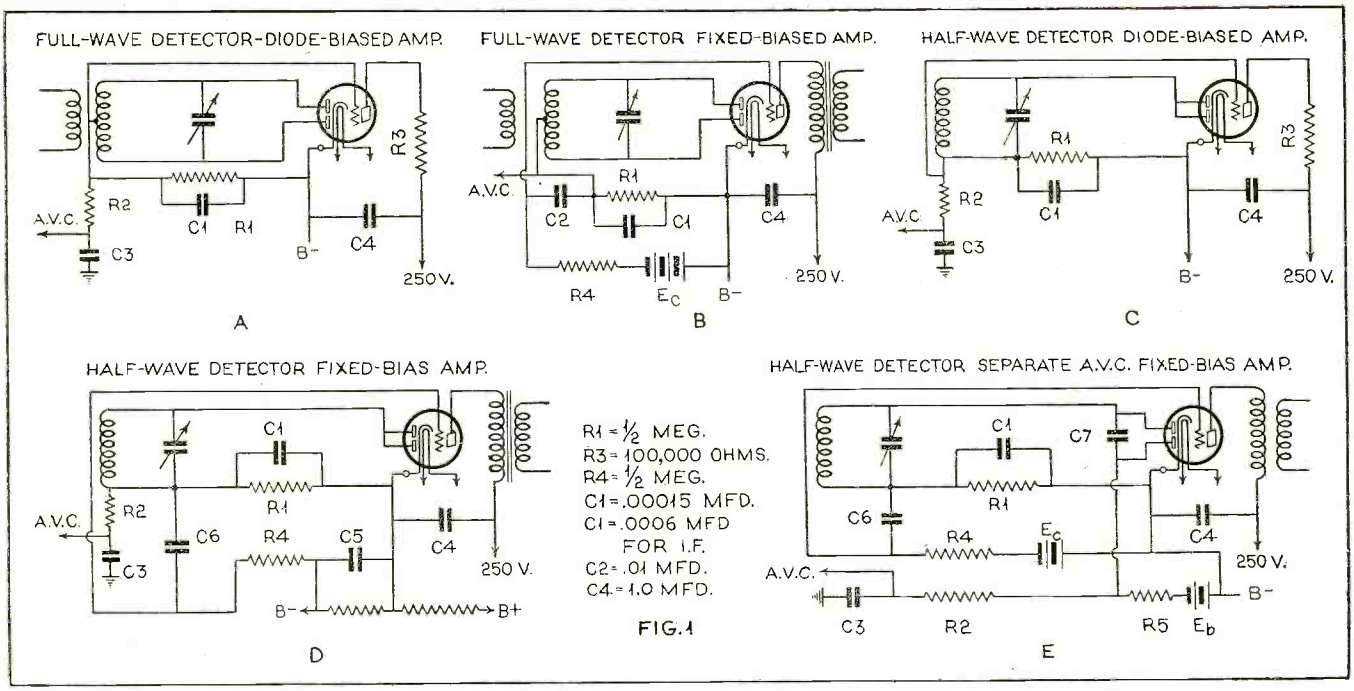


FIG. 1

The –59 tube employs the larger one of the two. The diameter of the pin circle is .855 inch. When the Class B connection is employed, a single tube of the same type will serve as a driver. The driver employs the Class A triode circuit.

Twin Class B Amplifiers

Type –79 tube consists of two Class B triodes with a common cathode. The complete Class B stage, therefore, requires but one tube. The filament requires 6.3 volts. A similar tube is available with a 2-volt heater and no cathode. A third type, with a 2.5-volt a.c. heater, has recently been introduced (type –53).

A maximum output of 8 watts can be obtained from the type –79 tube, with a plate supply of 250 volts. The driver can be a type –37 tube, with 23 volts plate potential and a 17-volt grid bias. Other tubes which are recommended as driver are types –89, –85 and –41. Characteristics for this tube are found in the table. The base fits the regular 6-inch socket. Connections are shown in Figure 2.

With the 2-volt tubes, type –19, it is possible to obtain an output of 1.6 watts, with a plate supply of 135 volts, whereas a pair of –30 type tubes in a Class B amplifier do not deliver as much as this with a 157-volt plate supply.

Using a type –30 tube as a driver, operated at 135 volts plate potential and a bias of 9 volts, the combination can deliver up to 1.25 watts. Raising the voltage on the driver tube to 180 volts will supply more power; this, however, requires a larger input signal. Type –49 tube (a 2-volt counterpart of the –46) is also recommended as driver. The base pins of the type –19 fit the standard 6-prong socket. Its connections are shown in Figure 2.

Pentodes

Type –77 and –78 tubes are r.f. pentodes, requiring a heater potential of 6.3 volts a.c. or d.c. They are similar to types –57 and –58. Slight differences exist, however; for instance, these tubes have an internal cage-like shield which is very effective in reducing the grid-plate capacity.

Type –57 tube is designed with a sharp cut-off. It is suitable for amplifier or detector use. When used as a detector, the plate resistance load can be 250,000 ohms or a 500-henry choke with a ¼-megohm resistor shunted across it. The plate current should be adjusted to about .1 ma. with no a.c. input signal.

Type –78 tube is a variable-mu tube, suitable as an amplifier or as a first detector. In the latter case the grid bias can be varied along with that of the i.f. tubes. It is advisable to limit the peak oscillator voltage to 1 volt less than the grid bias. If the screen voltage is obtained from the plate-supply tap, through a series resistor, the variation in voltage-drop across the resistor will tend to keep the screen-to-cathode voltage constant when the bias resistor is varied.

The grid leaks for either type –77 or –78 tubes should not be more than 1 megohm. Socket connections for these tubes are shown in Figure 2.

Tetrode

Type –48 tube is a power-amplifier tetrode designed for 110-volt, d.c. receivers. The tetrode has pentode characteristics at the recommended screen and plate voltages, due to the mechanical construction of the plate. It has a rib structure fastened to its inner surface. This (*Continued on page* 375)

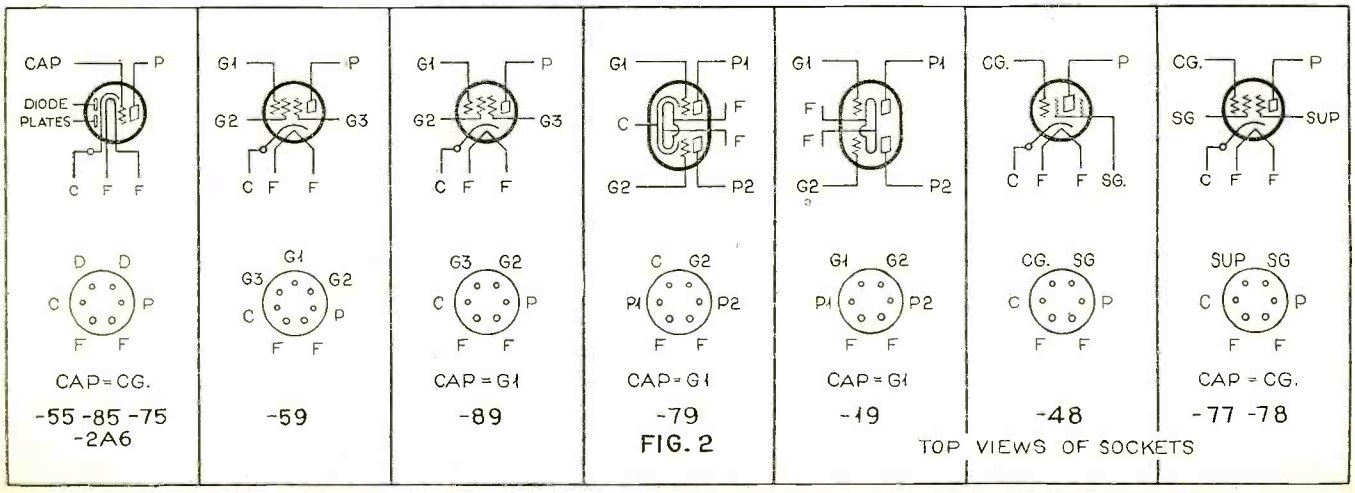


FIG. 2

TOP VIEWS OF SOCKETS

SOME INTERESTING INFORMATION ON

Magnetostriction Oscillators

The fact that a bar of iron changes its physical dimensions when magnetized forms the basis of its use as a mechanical oscillator for producing sounds of all frequencies. Some interesting effects of such an oscillator are outlined here

By Irving J. Saxl, Ph.D.

Part Two

WHILE the magnetostriction devices mention in the first part of this article, last month, concern themselves mostly with frequency stabilization, or, as in the Fessenden patent, with the generation of sound, the work of Dr. Newton Gaines of the Texas Christian University has resulted in the development of a transmitter capable of generating high but still audible frequencies (in the neighborhood of 8900 cycles per second) with considerable power.

Figure 8 shows a wiring diagram of the Gaines oscillator[1]. In this generator for high audible frequencies, a 250-watt transmitter tube of the 204A type is used. This highly efficient transmitter is so simple to construct and the experiments in this new field are so promising that its construction and perhaps further perfection will be interesting to the radio fan. In Figure 8 the following parts are used:

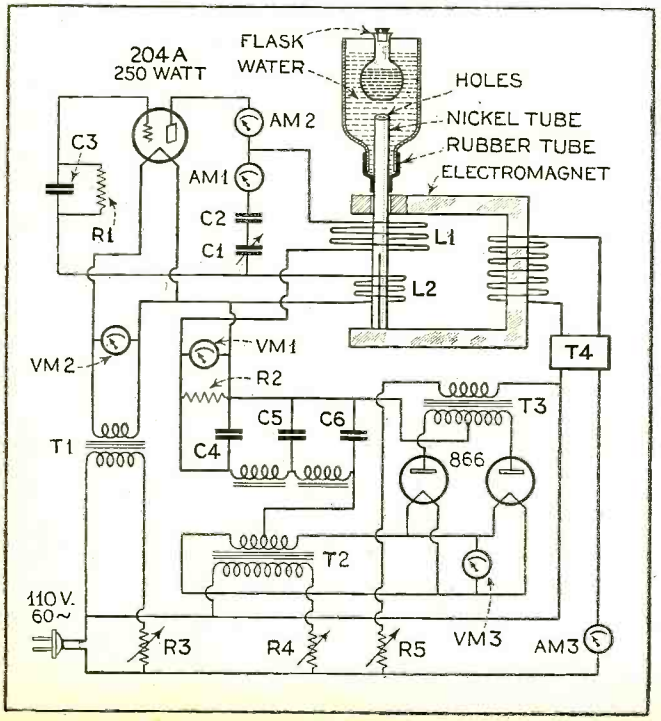
AM1—0 to 2.5-ampere high-frequency ammeter
C1—Tuning condenser of 0.004 to 0.015 mfd.
C2—1 mfd. condenser of 3000-volt breakdown voltage
C3—Grid condenser of 0.006 mfd.
R1—Grid leak of 8000 ohms
L1—has 7 ohms resistance
L2—has 3 ohms resistance
(These coils are wound with enameled, cotton-covered No. 22 copper wire. Their center holes are big enough so that the nickel rod can pass through.)
T3—Step-up transformer
C4, C5, C6—3 mfd. condensers
L3, L4—25-henry chokes
Two type 866 rectifier tubes. Their filament current is supplied by the transformer, T2, or by a small number of turns upon transformer T3
R2—High-resistance leak
VM1—2500-volt d.c. voltmeter
VM3—A.C. voltmeter
T1—A filament transformer for the tube, furnishing 11 volts to the filament
VM2—15-volt voltmeter
R3, R4, R5—Control resistances
AM2—Milliammeter for plate current
T4—Kuprox rectifier

The vibrating rod is a nickel tube ¾ inch in diameter and 10⅜ inches long. This nickel tube consists of cold-drawn unannealed material. The upper end is closed by a thick nickel plate which is welded to it. The top is pierced by thin holes so that water can enter and cool the tube during its operation. At the center portion of the tube a piece of rubber tubing is attached to an inverted flask without a bottom. The lower half of the tube has one longitudinal slit for reducing the influence of the eddy currents within this tube. Above this tube, in the container, water is poured so that the upper half of the tube is submerged. Figure 9 shows the completed assembly of this oscillator.

Under these conditions, the nickel tube vibrates at approximately a frequency of 8900 cycles per second. The device can be tuned to the natural frequency of the tube by adjusting the variable condenser, C1. Also, changes in the intensity of the current flowing through the coil of the electromagnet or changes in the plate voltage by means of the rheostat, R5, etc., influence the frequency.

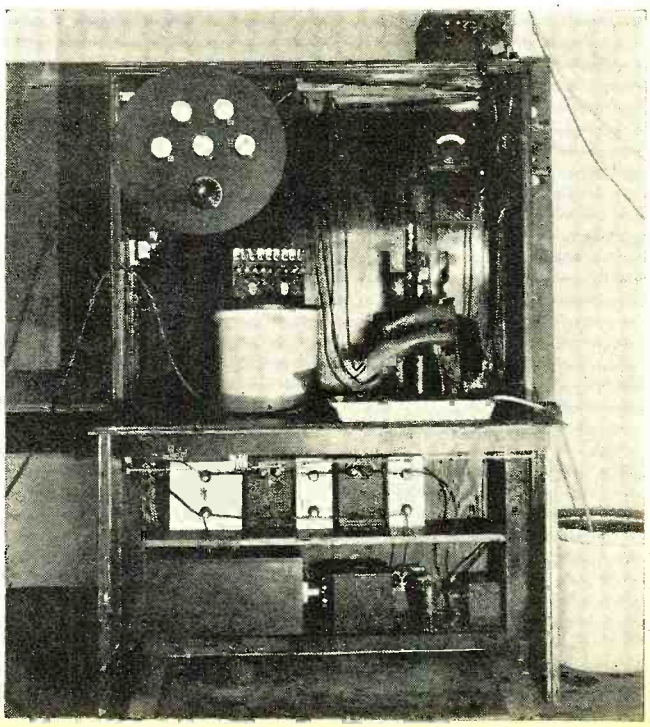
CIRCUIT DIAGRAM OF THE OSCILLATOR

Figure 8. This is the schematic diagram of the Gaines magneto-striction set-up showing the method of mounting the flask around the vibrating nickel tube



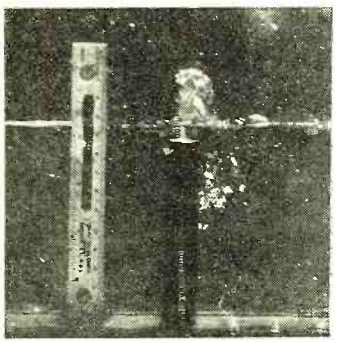
WHAT IT LOOKS LIKE

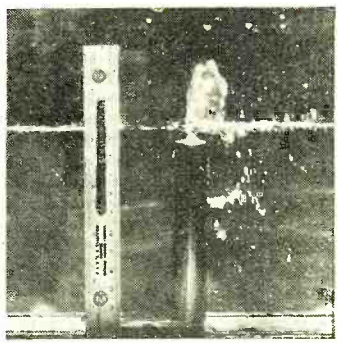
Figure 9. This is a photograph of the complete set-up showing the assembly of the Gaines Oscillator along with the various parts for power supply, etc.



Dr. Gaines has measured the amplitude of oscillation of this tube and has found it to be 0.03 millimeters when the whole tube was in air, and 0.01 millimeters when the upper half was immersed in water.

To elongate such a tube 8900 times per second to such a degree is a severe strain on the structural material. It can be calculated that it is in the dimension of 11,500 pounds. Naturally this tube does not survive long under this heavy vibration. Figure 10 shows such a nickel tube ruptured by these strains. The tube has a wall thickness of 0.81 millimeters. It takes from 15 to 90 minutes to break it in air at 8900 cycles. The material undergoes very quick fatigue, due to the many million push-and-pull motions the material is subjected to.





PRODUCING FOUNTAINS OF WATER

Figure 11, at left, shows a vertical fountain of water two inches high produced by the magnetostriction oscillator submerged in the liquid. Figure 12, at right, shows what happens when the oscillator tube is set at an angle. The fountain of water is then given a sidewise motion proving, says the author, that it is not produced by a radiation pressure

Figure 11 is a photograph showing how a fountain of water is produced above the end plate of the nickel vibrator. The lifetime of a tube partly submerged in water is considerably longer than the tube in air, shown in Figure 10, which had a lifetime of approximately 13 hours. Figure 11 shows that this fountain of water is approximately two inches high if the end of the vibrator is approximately ⅜ inch below the surface of the water. If it is submerged as low as approximately two and one-half inches below the surface of the water, the water wall is less, but still very clearly visible. According to some theories, this little fountain of water was first supposed to be due to the radiation pressure of the sound. In Figure 12, however, an experiment is shown with this vibrator that proves the fact that this little wall of water is not due to any appreciable extent to radiation pressure, but is due to a column of water moving upward, the motion of which is induced by the reciprocating action of the end plate of this nickel tube, similar to valve action. In Figure 12 this fountain of water has been moved to one side by giving the water sideways motion. If, therefore, the wall of water should be due to real radiation pressure, there should be a little fountain right on top of the oscillator, irrespective of the motion of the water, as the velocity of sound in water is such that the motion of the water should not markedly influence it. However, as no direct mound is visible except the one moved to the side, Dr. Gaines' hypothesis, that this motion of water is produced more by the reciprocating action of the vibrating tube than by radiation pressure, seems probable.

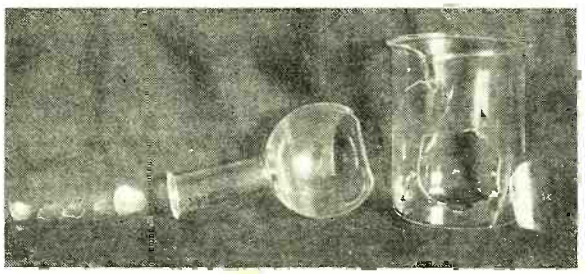
Naturally, the sound produced by this "pump" is a very intensive one. Under-water signals have been generated, in Navy experiments, which traveled over several miles, using similar apparatus. The frequency used in the latter experiments, however, was somewhat higher so as to exclude audible sounds.

The terrific strain under which these vibrators work interferes with their physical structure. In Figure 13 a picture is shown of the nickel end-plate, aften ten hours of vibration under water. It can be clearly seen that the top of the plate has distintegrated, leaving a peculiar disc type pattern. Figure 14 shows a nickel end-plate which has vibrated only three minutes under water. It seems probable to the author that these figures are due to the *crystalographic readjustment* under the great stress to which this material is put, rather than that they belong to the Chladni type of vibration pictures. In looking at these photographs, we are reminded of the figures described by A. Widmanstatten, which can be seen upon *meteoric iron* after it is cut, polished and etched with diluted nitric acid. X-ray spectrographs of the material, before and after the vibration treatment, would be able to prove that the mixture of octaedric and other crystals contained in the nickel alloy used in the construction of the tube has rearranged itself under the stress of these oscillations.

Figure 15 shows some of the mud that assembles on the bottom of the glass vessel after the nickel tube has operated for some time. Chemical and microscopic analysis shows it to consist of finely divided nickel. The picture shown in Figure 15 has been magnified fifty diameters. It should be noted that it is not only nickel that gets fatigued and "cracks up" after a certain time, but that other objects brought into the vicinity of this high-intensity sound field seem also to be subjected to the effect of fatigue to a considerable extent. For example, in Figure 16, glass vessels which have been brought near the intense audible sound are (*Continued on page* 372)

GLASSES BROKEN BY SOUND

Figure 16. Here are a few ruptures in glass vessels produced by intensive high frequency sounds

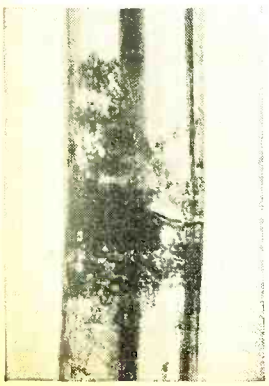


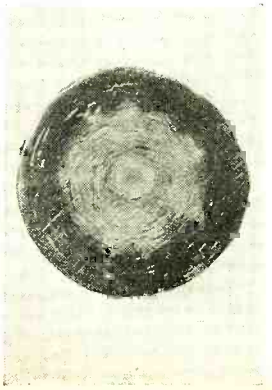
WHAT HAPPENS?

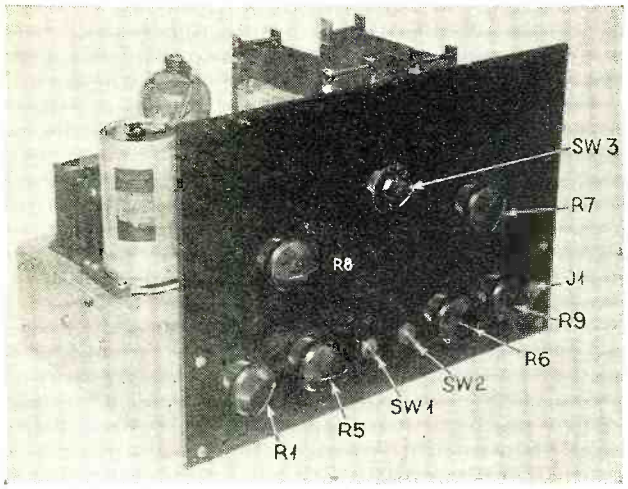
The first photograph, below, Figure 10, shows how the nickel oscillating tube breaks under the great longitudinal vibration. The next photo, Figure 13, shows the nickel end plate after ten hours vibration under water

MICRO PHOTOGRAPHS

The third photograph, below, Figure 14, shows etchings on the nickel end plate similar to those found on meteoric iron. Figure 15, below, shows the decomposed material taken from the bottom of the container







How to Build A

Cathode Ray Oscillograph

By John M. Hollywood
and Marshall P. Wilder

The oscillograph described here employs standard parts and is not difficult to construct. An article to follow will describe other applications of this device

IN the first article of this series, the cathode-ray tube was described and its applications outlined. The present article will describe a complete oscillograph circuit and power supply for the tube. This can be made by anyone, using standard parts, and with it one can use the cathode-ray tube for most important applications.

Let us make clear what an oscillograph is. All readers have seen curves of wave-forms. For instance, the wave form of the output of a broadcast station when modulated by an audio frequency is shown in Figure 1.

In wave-form curves, the voltage changes with time, and these variations are represented on paper by having the horizontal distance along the chart proportional to time. We can then see the whole situation at a glance.

The function of an oscillograph is to obtain actual wave-form curves experimentally. The voltage or current whose wave form is to be measured is connected to apparatus which moves a point of light vertically in proportion to the voltage or current. This corresponds to motion along the vertical axis of Figure 1. The point of light is also to be moved horizontally so that the distance from its original position is proportional to the time. This corresponds to movement along the horizontal axis of Figure 1. Now, if the point of light is moved in both directions at once, it will trace out the actual wave form of the current or voltage applied.

This tracing operation, if carried out only once, will not allow the eye to see the curve properly. However, if the curve repeats the same shape over and over, the apparatus may be arranged to trace the curve repeatedly, at a rate such that each new curve falls in the same place as the old curves. If it repeats in less than a fifteenth of a second, the eye will receive the impression of a solid curve, due to the after-image effect in the eye, sometimes called the persistence of vision. If the curves follow each other too slowly, the eye will not see the whole curve at once, but it can be obtained photographically.

In the cathode-ray oscillograph, the voltage to be observed is connected to deflecting plates of the cathode-ray tube, which move the beam of electrons in the tube vertically; or the current to be observed is connected through coils of which the magnetic field moves the beam vertically.

A "sweep circuit" or linear time axis is provided to move the beam horizontally at a constant speed, repeating its sweep in step with the the repetitions of shape occurring in the wave form observed. Where the electron beam strikes the fluorescent screen, a spot of light is produced, and the beam movements can be seen by the eye. An elementary circuit used is shown in Figure 2.

The electron gun structure in the cathode-ray tube shoots a narrow beam of electrons from the anode to the fluorescent screen. On passing through plates P1-P2 it is deflected vertically according to the voltage being observed. On passing through plates P3-P4 it is deflected horizontally in proportion to the time. The wave-form curve produced is seen on the screen.

The tube V2 is a pentode, such as a −57 or −58, for which the plate current is almost constant regardless of plate voltage. This constant current flows through condenser C, charging it so that its voltage is proportional to time. This voltage is then impressed on plates P3-P4, where the time deflection is produced.

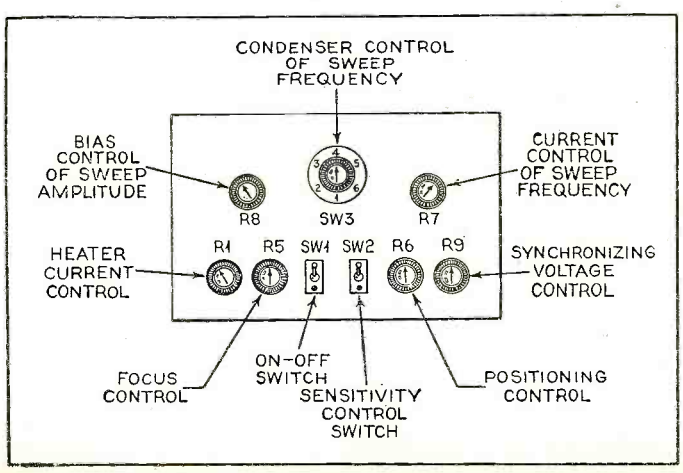
When condenser C reaches a certain voltage, the Thyratron V1 ionizes and discharges the condenser instantly. The condenser can then charge again and repeat the cycle of sweeping out the time axis. The voltage at which the Thyratron discharges is controlled by its grid bias. The transformer T is also in series with the grid bias, and delivers voltage corresponding to the voltage being observed. This causes the Thyratron to discharge the condenser when the voltage observed is at its peak value, so that the discharge always occurs at the same part of the cycle of the observed voltage, and the image seen is apparently a solid, stationary curve.

Considerations in regard to a power supply for the cathode-ray tube have been treated in the previous article. Briefly, the power supply must deliver a high voltage of about 2000 volts, and a voltage of half this value, at a current of much less than a milliampere; and also a heater voltage of 2.5 volts at 3 amperes. This is for our particular tube.

Figure 3 illustrates a

THE PANEL ARRANGEMENT

Figure 4. Here is shown the function of each of the various controls included on the front panel



complete circuit for the power supply and a sweep circuit.

A panel layout which has been found quite convenient is shown in one of the photographs and also in Figure 4. The three upper controls are the most important. The four lower knobs will usually be set once and left alone.

The upper section of Figure 3 is the power supply for the cathode-ray tube. The switch SW2 changes the high-voltage output in a two-to-one ratio, and also has an off position. When the voltage is low, the spot brilliancy on the tube screen is low, but the deflection sensitivity is high, and vice versa. Resistors R3 and potentiometer R6 make up a voltage divider with which the correct voltage can be applied to the focusing electrode to make the spot small. The ratio between the focusing and anode voltages will not be affected by the sensitivity switch SW2, so the focus will not be affected. Rheostat R1 varies the heater current of the cathode-ray tube. This is not critical in our tube. The current drawn from the high-voltage supply is so small that the simple condenser filter will be adequate. The seven-wire cable and socket is a convenient arrangment for mounting the tube, as the tube must be placed far from magnetic fields around transformers, which may distort curves.

Great caution is necessary with 2000-volt circuits. It should be made impossible to come in contact with the high voltage, which is dangerous to life. This is especially important in regard to connections coming directly from the high-voltage transformer. The positive high voltage terminal should be grounded as shown, and if this is done the connections to the deflecting plates will be near ground potential and can be touched without receiving the high voltage. The *heater* and *cathode* connections will be at high voltage with respect to ground and *should not be touched* with the high voltage on. The knob on rheostat R1 should be insulated from the rheostat. The focusing potential is also large with respect to ground. The resistor R2 is in series with the high voltage and is not large enough to affect the operation of the tube, but will prevent serious injury if the operator should accidentally touch the high-voltage connections to the tube. Nevertheless, the high voltage should not be trifled with.

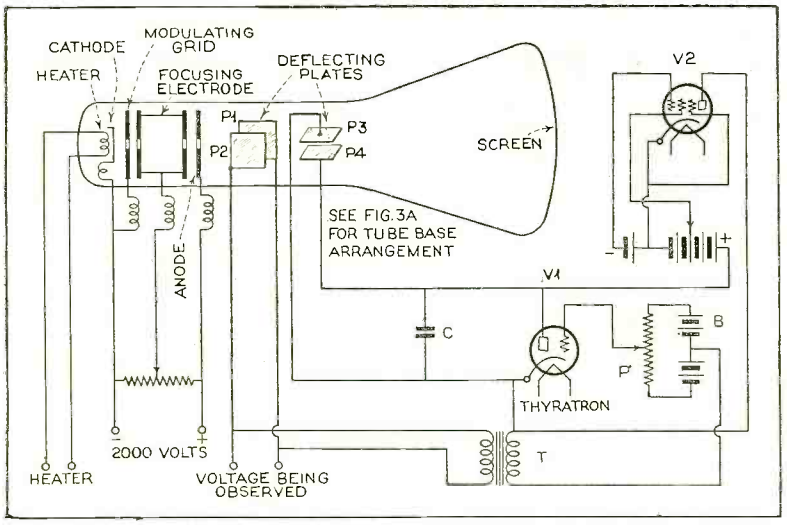


FIGURE 2. THE FUNDAMENTAL CIRCUIT

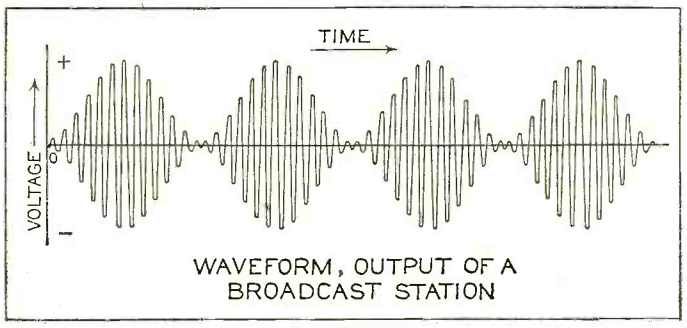


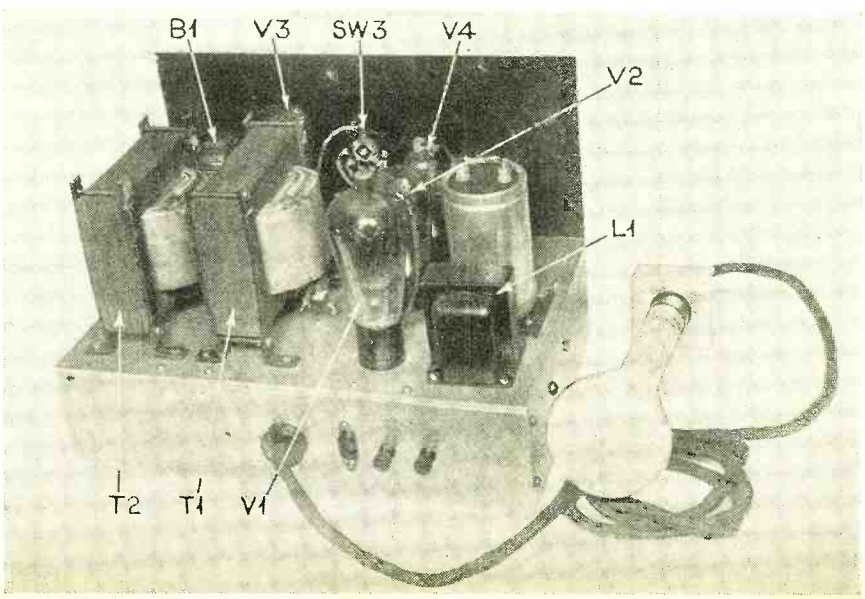
FIGURE 1

The lower section of Figure 3 shows the sweep circuit and its power supply. The voltage between points (a) and (b) is about 500 volts. The voltage across the condenser C2, 3, 4, 5 or 6 is applied to one set of deflecting plates of the cathode-ray tube. This condenser is charged by a constant current delivered through the plate circuit of a –58 tube, V4. The voltage is therefore proportional to time. When it reaches a certain limit, the Thyratron V3 ionizes and discharges the condenser instantly. The charging cycle is repeated and the spot of light moves across the screen repeatedly at a constant speed. The voltage at which the Thyratron discharges is controlled by the grid bias potentiometer R8. This varies the amplitude of the sweep across the screen.

The frequency at which the discharge occurs may be controlled independently of the amplitude in two ways. The best is vary the size of the condenser, but space and cost do not permit a variable condenser, so it is varied in steps by the switch SW3. If the condenser is made larger, it will take longer to charge, and the discharge frequency will be slower. Or, if the constant charging current is decreased, the condenser will charge more slowly and the discharge frequency will be slower. When using a pentode to supply the constant current, its value may be regulated conveniently by a variable grid bias resistance R7. Increasing this resistance decreases the frequency. The current will be most nearly constant at some one setting of the resistance. Best results may therefore be had by controlling the frequency roughly with the condenser switch, and for finer control, with the resistor R7. Neither control affects the amplitude of the sweep. Unfortunately, the amplitude control will affect the frequency. Screen-grid voltage for the pentode is obtained from tap (c) on voltage divider R4. This is to be adjusted for a screen voltage of 100 volts; the amount of resistance included between (c) and (b) should be one fifth of the total.

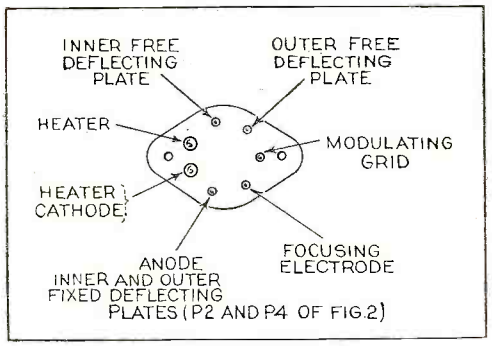
The transformer T3 is to be connected to a voltage of the same

THE COMPLETE OSCILLOGRAPH



frequency as the voltage whose wave form is to be observed. This is done through the jack J1, and the amount of "synchronizing voltage" is adjusted by potentiometer R9. The transformer is in series with the Thyratron grid bias and makes the Thyratron discharge always when the synchronizing voltage is at a peak. This makes the sweep frequency equal to the frequency of the wave form being observed, or multiplied or divided by an integral number. This makes the curves obtained on the cathode-ray tube stand still.

The remaining control is a "positioning" control, R6. This potentiometer connects a portion of the sweep circuit power supply voltage in series with the horizontal deflecting plates. This will slide the curve horizontally on the screen so that the center of the line swept out on the screen can be made to fall at the center of the screen. The series d.c. voltage on the deflecting plates will not have to be over 200 volts, so tap (d) on the voltage divider R4 is adjusted to give 200 volts between (a) and (d). Two-fifths of the divider resistance should be included between these points. There is no provision for vertical positioning; if this is desired it may be obtained by connecting B batteries in series with the observed voltage connected across the vertical deflecting plates.



TUBE CONNECTIONS

Figure 3a. Bottom view of socket, indicating terminal arrangement of cathode-ray tube

Operating Instructions

The voltage whose wave form is to be observed is connected between the two binding posts, one of which is to be connected also to a ground, such as a cold-water pipe. A resistor of 1 megohm may be connected in parallel with these two posts, being necessary if the voltage source is of high d.c. resistance. This prevents a charge accumulating on the deflecting plates.

To set this unit into operation, plug the 110-volt a.c. cord into the receptacle on the unit and into a light socket. Connect the cathode-ray tube to the unit through the cable and socket. Connect the ground to its binding post, and short-circuit the two binding posts. Adjust the heater rheostat for maximum current. Set the condenser switch on its short-circuit position. Set the positioning control for least series voltage. Set the sensitivity switch at its off position. Turn on the off-on switch. When the tubes have warmed up, set the sensitivity switch at the half voltage position. A spot of light should appear on the screen. Focus it to minimum size with the focusing control. If it is to one side of the screen, adjust the positioning control. For more brilliancy, shift the sensitivity switch to the full voltage position. The heater rheostat can now be adjusted to give the least current that gives satisfactory brilliancy, and left alone thereafter. Excessive current makes the spot broad.

To start the spot sweeping across the screen, set the condenser switch on any point except short-circuit. Set the Thyratron bias at zero. Vary the current control of frequency until the spot moves repeatedly across the screen, possibly so fast that it appears to be a line.

To observe the wave form of any current, make a pair of coils to be placed near the deflecting plates of the cathode-ray tube, with their axis horizontal and perpendicular to the length of the tube. Send the current through the coils, and a vertical deflection corresponding to the current will be obtained. Leave the two binding posts for the vertical deflecting plates shorted.

To observe the wave form of any voltage, connect the two binding posts for the vertical deflecting plates to the unknown voltage, shunting a 1-megohm resistor across the posts if the voltage source has high d.c. resistance.

The wave form obtained in either case will not be stationary on the screen, and the number of cycles shown may be too great or too small. by adjusting the condenser and current frequency controls, any desired number of cycles can be obtained, and the curve made almost stationary. To make it perfectly stationary, connect a voltage of the same frequency as the desired wave form to a 'phone plug and insert it in the jack J1. This voltage should be from 5 to 200 volts. Turn up the synchronizing voltage control until the curve is stationary. This control has some effect on the Thyratron bias and should not be turned up so high that the sweep amplitude is greatly reduced.

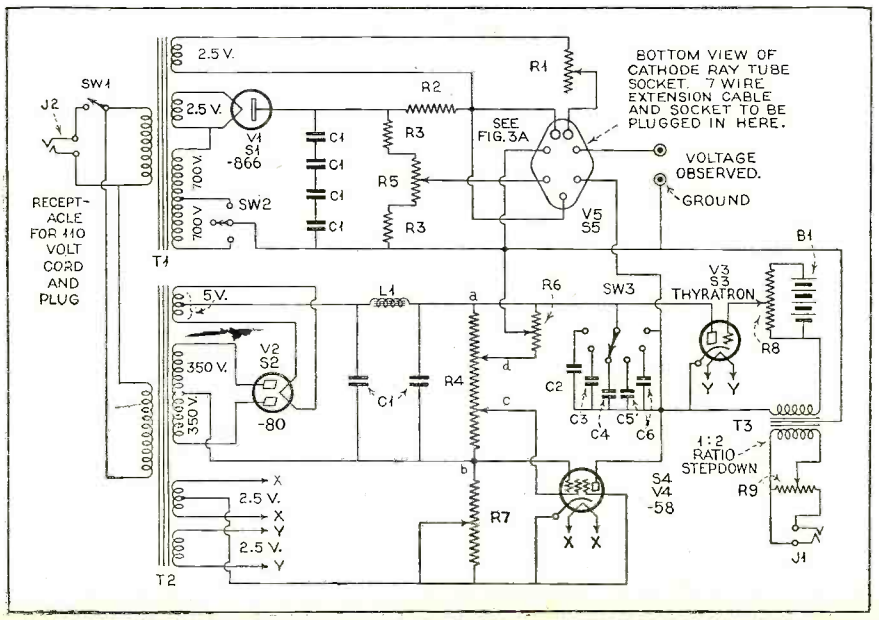
If the sweep amplitude is too small, increase the negative bias on the Thyratron. This will also affect the sweep frequency, which may have to be readjusted. If the time scale is found to be irregular, faulty insulation of the sweep circuit condensers, sockets, tubes or switch may be the cause.

To use the instrument as a combined voltmeter and wave-form indicator, calibrate it by observing the deflection upon applying known voltages. This calibration will stay constant as long as the a.c. line voltage is constant, and will be affected in proportion to the line voltage variation. The calibration scale will be multiplied by two when the anode voltage is doubled with the sensitivity switch.

The instrument can be calibrated for use as an ammeter in the same way, by using coils instead of deflecting plates and observing deflections obtained upon applying known currents. For voltage or current, one calibrated point is enough, because the deflection is proportional to the voltage or current applied.

This article has given sufficient information for anyone to make a cathode-ray oscillograph and apply it in observing wave forms, or use it as a very high-resistance voltmeter or an ammeter. The next article will deal with applications of interest to servicemen, experimenters and engineers. The last will discuss its use in television.

FIGURE 3. THE COMPLETE SCHEMATIC CIRCUIT



Parts List

B1—C battery, 4.5 volts (See diagram for connections)

C1—Electrolytic condensers, 8 mfd. 500 volts. (8 required)

C2—.5 mfd. condenser

C3—.1 mfd. condenser

C4—.02 mfd. condenser

C5—.004 mfd. condenser

C6—.001 mfd. condenser

(Condensers with very good insulation, 1000-volt rating or higher. Mica preferred for C4, C5 and C6)

J1—Jack for 'phone plug

J2—Midget flush-mounting receptacle and plug for 110 volts.

(*C't'd on page 375*)

Mixing Circuits for Public Address Systems

This article completes the general discussion of impedance matching, sound sources and lines started in the November issue. Articles to follow will go into greater detail on these subjects

Part Two

[*By* George E. Fleming]

RADIO receivers used for p.a. system input are standard in every respect with the exception that it is seldom that any audio amplification in the receiver is necessary. The output from a power detector is usually far more than sufficient to serve as an input to the main amplifiers. In fact, it is in this circuit that fixed loss pads are most frequently used. There is one precaution, however, that must be taken. The hum output from the detector must be low, or else when amplified it will be of objectionable magnitude. Some expedients will of necessity be used to reduce the hum from standard tuners, such as a resistance capacity filter in the plate circuit of the detector or further filtration of the power supply. If the hum cannot be reduced to a reasonable extent, the use of fixed loss pads in the line between the tuner and the input to the main amplifier will permit the volume control on the receiver to be fairly well advanced, thus increasing the ratio of signal to hum.

As a radio receiver is almost always placed at some distance from the main amplifiers, it will be desirable to use a step-down transformer in the plate circuit of the detector tube to permit the use of a low-impedance line, using one with a primary impedance of approximately 20,000 ohms and a secondary impedance of 500 ohms, for instance.

Under the heading of "lines," we may consider any conductor bringing a signal to the main amplifiers from a relatively remote point as being a line. In the planning of a line, certain few facts must be borne in mind. Since one side of a line is almost invariably at ground potential unless a balanced H-pad is used so that the center of the line is at ground potential, one side will be at considerably higher impedance to ground than the other. If this is the case, hum and stray noises may very readily be picked up by such a line to the extent that they will be objectionable in the output of the system. For this reason it is customary to use lines of low impedance somewhat in the order of 200 to 600 ohms, 500 ohms being considered as standard. This is usually accomplished by using a transformer at the signal source with a 500-ohm secondary which, in turn, will work into a 500-ohm primary at the mixing panel. If the line is extremely long, its direct-current resistance, its inductance and its capacity may enter into the computations, but as this is rarely the case in public-address work, we will neglect these factors. For broadcast station work, of course, they become of importance, since many sources of signal originate miles away from the control room, but this is almost never the case in public-address work. If a volume control anywhere in the line is desirable, it must be of either the T or H type so that no distortion will be introduced by upsetting impedance relations.

The matter of sources of signal is dealt with only sketchily here, as it is our intention to cover this subject in detail in the next article of this series.

In Figures 7, 8 and 9 we give three typical circuits that are frequently used in public-address work. Figure 7 is probably the most desirable of these, as it is the simplest circuit to use where it is possible to work directly into the grid of the tube. The two inputs shown are phonograph pick-up and microphone transformer, respectively.

In a circuit of this nature, the matching of impedances is extremely simple, for it is only necessary to use potentiometers across the sources that are equal in impedance to the source. For instance, if the phonograph pick-up is 2000 ohms, a 2000-ohm potentiometer should be used. Since the grid of the tube is of such high impedance, the shunting effect is entirely negligible and constant impedances are maintained regardless of volume-control settings. It is possible to use a microphone transformer with a respectable step-up ratio, say, from 500 to 20,000 ohms, and use an appropriate potentiometer across it. It is best to use impedances that are relatively low in a circuit of this nature, and the mixing panel must be in close proximity to the input of the amplifier to prevent long leads from picking up strays and hum. We are not limited to two inputs in this circuit but may go to four or five, provided the above precautions are observed.

It is the belief of the writer that this is the most satisfactory mixing circuit that can be evolved from a standpoint of simplicity and expense and all-around satisfaction, and is used almost invariably by him even though occasionally an additional stage of amplification must be used to render it practical.

Figure 8 shows another type of circuit that has been widely used. This circuit is not nearly so good as the previous one, due to the fact that constant impedances are not maintained, as the shunting effect of the transformer is of definite and finite value. For this reason the transformer primary is usually made somewhat higher in impedance than the total of the input circuits to minimize this effect. The only advantage of a circuit of this nature is that the secondary impedance of the mixing transformer may be varied to suit conditions. For instance, if a line of any length is used on the secondary side, a step-down ratio may be used, keeping the impedance of the line low. If the mixing circuit is close to the amplifier, a step-up ratio may be used which will give us some amplification. This circuit is not considered a very satisfactory one, and (*Continued on page* 374)

MIXING CIRCUITS

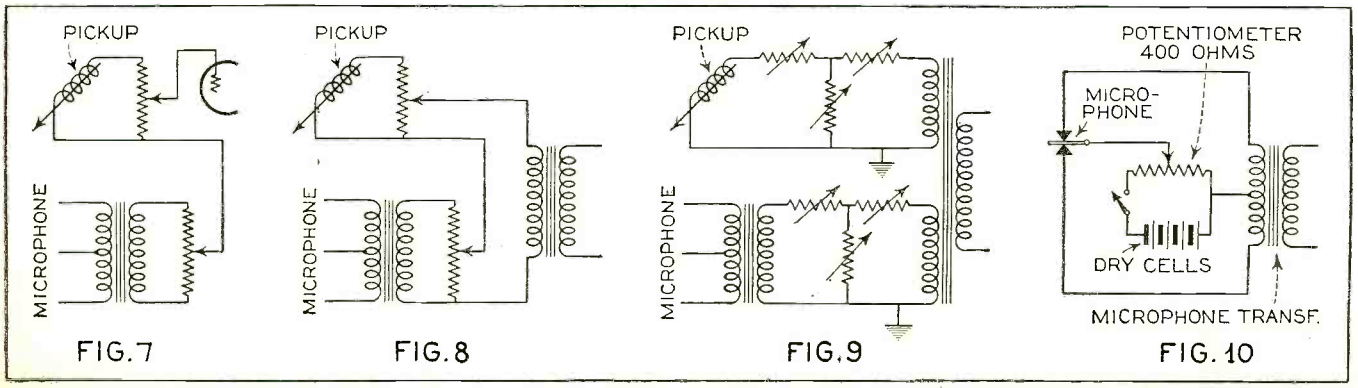


FIG. 7 FIG. 8 FIG. 9 FIG. 10

The DX Corner *for* Broadcast Waves

Building Up the Log

The Federal Radio Commission in its routine of regularly checking frequencies of all U. S. broadcast stations finds it necessary in the case of low-power, distant stations, to arrange a test schedule so that each station can be checked monthly without interference. This provides an excellent opportunity for DX fans to log numerous stations which would otherwise never be heard due to blanketing by nearby stations operating on the same frequencies. These special schedules are in effect during the early morning hours of the first seven days of each month. Each scheduled station is on the air for 20 minutes and announces its call every 3 minutes.

Space allows for publication of the schedules for only five days in this issue. The Monday and Tuesday schedules will therefore appear next month. All times shown are morning hours, and each test runs for 20 minutes, beginning at the times shown.

E.S.T. (a.m.)	*Frequency (Kc.)*	*Call*	*Location*	*Power (Watts)*
First Wednesday Each Month				
2:00	1310	**WEBR**	Buffalo, N. Y.	100
2:10	1200	**WNBW**	Carbondale, Pa.	10
2:20	1310	**WSAJ**	Grove City, Pa.	100
2:30	1410	**WHIS**	Bluefield, W. Va.	250
2:40	1310	**WFBG**	Altoona. Pa.	100
2.50	1200	**WPHR**	Petersburg, Va.	100
3:00	1310	**WKBB**	E. Dubuque, Ill.	100
	1290	**WEBC**	Superior, Wisc.	1000
3:10	1410	**WRBX**	Roanoke, Va.	250
	1200	**WHBC**	Canton, O.	100
	1420	**KGIW**	Trinidad, Colo.	100
3:20	1210	**WBBL**	Richmond, Va.	100
	1310	**WTRC**	Elkhart, Ind.	50
	1370	**KICA**	Clovis, N. M.	100
3:30	1350	**WEHC**	Charlottesville, Va.	500
	1410	**WBCM**	Bay City, Mich.	500
	1200	**KGHI**	Little Rock, Ark.	100
3:40	1420	**KIDW**	Lamar, Colo.	100
3:50	1210	**WOCL**	Jamestown, N. Y.	50
	1410	**KFLV**	Rockford, Ill.	500
	1200	**KBTM**	Paragould, Ark.	100
4:00	1310	**WBOW**	Terre Haute, Ind.	100
	1500	**KGKY**	Scottsbluff, Nebr.	100
4:10	1410	**WHBL**	Sheboygan, Wisc.	500
	1370	**KGFL**	Roswell, N. M.	100
4:20	1310	**WBEO**	Marquette, Mich.	100
	1200	**WBBZ**	Ponca City, Okla.	100
4:30	1120	**WHAD**	Milwaukee, Wis.	250
	1250	**WCAL**	Northfield, Minn.	1000
4:40	1070	**WCAZ**	Carthage, Ill.	50
	1200	**KFJB**	Marshalltown, Ia.	100
4:50	1120	**WISN**	Milwaukee, Wis.	250
	1420	**WACO**	Waco, Tex.	100
5:00	1070	**WDZ**	Tuscola, Ill.	100
	1200	**KGDE**	Fergus Falls, Minn.	100
5:10	900	**WLBL**	Stevens Pt., Wis.	2500
	1250	**WLB**	Minneapolis, Minn.	1000
5:20	940	**WHA**	Madison, Wis.	1000
	1200	**WIL**	St. Louis, Mo.	100
5:30	1040	**WKAR**	E. Lansing, Mich.	1000
	1320	**KGHF**	Pueblo, Colo.	250
5:40	920	**WAAF**	Chicago, Ill.	500
First Thursday Each Month				
2:00	1210	**WSOC**	Charlotte, N. C.	100
2:10	1420	**WSPA**	Spartanburg, S. C.	100
2:20	1200	**WFBC**	Greenville, S. C.	100
2:30	1310	**WKBC**	Birmingham, Ala.	100
2:40	1420	**WJBO**	Baton Rouge, La.	100
2:50	1210	**WGCM**	Mississippi City, Miss.	100
3:00	1500	**WRDW**	Augusta, Ga.	100
	1200	**WHBY**	Green Bay, Wis.	100
	1310	**WDAH**	El Paso, Tex.	100
3:10	1240	**WKAQ**	San Juan, P. R.	1000
	1420	**WJMS**	Ironwood, Mich.	100
	1370	**KLUF**	Galveston, Tex.	100
3:20	1360	**WCSC**	Charleston, S. C.	500
	1210	**WEDC**	Chicago, Ill.	100
	1310	**KTSM**	El Paso, Tex.	100
3:30	1440	**WBIG**	Greensboro, N. C.	500
	1420	**WHFC**	Cicero, Ill.	100
	1420	**WKBI**	Cicero, Ill.	100
	1420	**WEHS**	Cicero, Ill.	100
	1370	**KGKL**	San Angelo, Tex.	100
3:40	1340	**WCOA**	Pensacola, Fla.	500
	1210	**WSBC**	Chicago, Ill.	100
	1310	**KFPM**	Greensville, Tex.	15
3:50	1360	**WQBC**	Vicksburg, Miss.	500
	1420	**KFIZ**	Fond du Lac, Wis.	100
	1370	**KMAC**	San Antonio, Tex.	100
4:00	580	**WDBO**	Orlando, Fla.	250
	1210	**WEBQ**	Harrisburg, Ill.	100
	1310	**KFYO**	Lubbock, Tex.	100
4:10	1430	**WNBR**	Memphis, Tenn.	500
	1500	**WMPC**	Lapeer, Mich.	100
	1370	**KONO**	San Antonio, Tex.	100
4:20	560	**WQAM**	Miami, Fla.	1000
	1210	**WHBF**	Rock Island, Ill.	100
	1310	**KFGQ**	Boone, Ia.	100
4:30	1220	**WDAE**	Tampa, Fla.	1000
	1500	**WKBZ**	Ludington, Mich.	100
	1370	**KFJM**	Grand Forks, N. D.	100
4:40	990	**WJEM**	Tupelo, Miss.	500
	1210	**WCBS**	Springfield, Ill.	100
	1310	**WIAS**	Ottumwa, Ia.	100
4:50	880	**WCOC**	Meridian, Miss.	500
	1500	**WKBV**	Connersville, Ind.	100
5:00	1410	**WODX**	Mobile, Ala.	500
	1210	**WTAX**	Springfield, Ill.	100
	1310	**KGBX**	Springfield, Mo.	100
5:10	1260	**WTOC**	Savannah, Ga.	500
	1370	**WHBD**	Mt. Orab, O.	100
	1420	**KCMC**	Texarkana, Ark.	100
5:20	1210	**WHBU**	Anderson, Ind.	100
	1310	**KGFW**	Kearney, Nebr.	100
5:30	1370	**WIBM**	Jackson, Mich.	100
	1420	**KGFF**	Shawnee, Okla.	100
5:40	1210	**WOMT**	Manitowoc, Wis.	100
	1500	**KNOW**	Austin, Tex.	100

Attention! Broadcast DX'ers

BROADCAST-BAND DX fans have been urging an extension of the DX Corner to cover *their* interests as well as those of short-wave listeners. In response to this demand this new section of the DX Corner is being presented this month on a trial basis. If the response from readers, and their support, is such as to warrant its continuance, it will be established as a permanent monthly feature. It is felt that this new department will best serve the interests of broadcast-band DX fans if it functions as a meeting ground for the exchange of interesting DX information. With this idea in mind readers are urged to send in items which they feel are informative and interesting to their brother DX'ers. Information concerning station changes, new stations and special DX transmissions will be of interest—as will also short items on kinks that improve DX reception, such as novel antennas, antenna tuning circuits, better grounds, "hopping up" standard receivers, etc. Lists of distant stations best received and hours when the hard-to-get foreign stations are heard are of course extremely important. Later, when this section is permanently adopted, it is proposed to select Official Broadcast-band Listening Posts from among readers throughout the world who demonstrate their qualifications for such appointments by the type of material submitted during the next few months. Be sure to write to the Broadcast DX Editor if you want to see this department continued, as the decision will be based entirely on the response received from readers.

(*Continued on page* 379)

Lists of China and Norway

Charles A. Morrison, president of the International DX'ers Alliance of Bloomington, Ill., favors us with a letter with which he encloses two lists of foreign broadcast stations, which are given below. Both lists are new and official, having been supplied to Mr. Morrison by the governments concerned within the past few months.

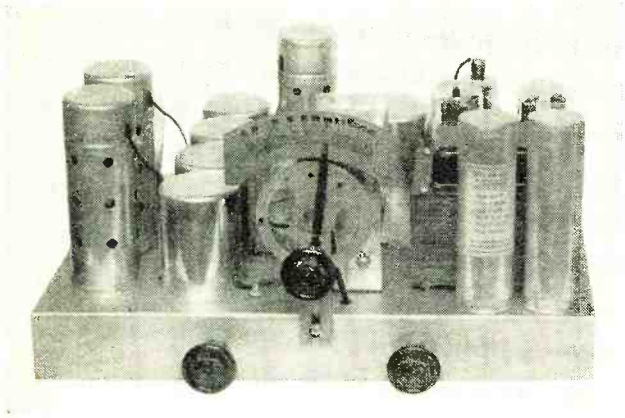
Call	*Location*	*Wavelengths*	*Frequency*	*Power*
Broadcast Stations of China				
XCBL	Shanghai	235.3	1275	400
XGCU	Shanghai	236.1	1270	100
XGKO	Shanghai	365.8	820	100
XGLS	Soochow	243.9	1230	100
XGOA	Nanking	440	681.8	75,000
XGOD	Hangchow	305	977.5	1000
XGOY	Yunnan	429.7	698	500
XHHA	Shanghai	429.5	700	100
XHHE	Shanghai	319.1	940	100
XHHF	Shanghai	312.5	960	100
XHHG	Shanghai	294.1	1020	100
XHHH	Shanghai	288.4	1040	100
XHHI	Shanghai	283	1060	100
XHHK	Shanghai	281.6	1065	100
XHHM	Shanghai	254.6	1180	100
XHHN	Shanghai	250	1200	100
XGHHS	Shanghai	272.7	1100	100
XHHU	Shanghai	258.6	1160	500
XOPP	Peiping	314.1	952.3	100
XOST	Tsinan	348.8	857.1	500
XQHD	Shanghai	220.5	1360	100
COTN	Tientsin	480	625	500
CMB	Kwangchow	355.8	843	100
Broadcast Stations of Norway				
LKA	Aalesund	447.1	670	300
LKB	Bergen	364	824	1000
LKF	Fredriksstad	358.1	837	700
LKH	Hamar	587.1	510	700
LKK	Kristiansand	235.5	1275	500
LKM	Tromso	453.2	661	100
LKN	Notodden	447.1	670	90
LKO	Oslow	1082	277	75,000
LKP	Porsgrund	453.2	661	700
LKR	Rjukan	447.1	670	170
LKS	Stavanger	240.6	1245	500
LKT	Trondelag	493.4	608	1350
	Bodo	453	662	500

Autumn DX Indicates a Good Season Ahead

An interesting letter, dated September 14th, has been received from C. H. Long of Winston, Mo. Mr. Long will be remembered as the author of a series of articles describing the construction of his unusual home-built broadcast-band DX receiver, which appeared in the issues of March to June, inclusive, of this year. The following is quoted from his letter:

"The season for broadcast-band DX is just beginning to open here now. The more powerful Australian and New Zealand stations are being received fairly well. Monday morning I listened to a very interesting detective play from 5CK, but, unfortunately, just as the most interesting part of the situation was reached, an American on 630 kilocycles came on the air and blotted out further reception. At present the Australian stations are received best from a half to a quarter hour before sunrise. The Australian stations now being received well enough to pay to listen to them are: 2CO (560), 3AR (610), 5CK (635), 4QG (760), 3LO (800), 2BL (855), 2GB (950), and 4BC (1145). These stations broadcast daily. 2YA (720) of the New Zealand stations is heard fairly well just before signing off at 5:30 a.m. Monday, Friday and Saturday. JOHK (770) is being heard faintly. Reception for all stations will improve as cool weather sets

(*Continued on page* 381)



Build This LOW COST "Superhet"

This receiver, although it is surprisingly inexpensive to build, demonstrated a high degree of sensitivity in the R. N. laboratory tests

By H. L. Shortt

THE receiver described here has many features to recommend it to set builders, not the least of which is the surprisingly low kit cost. Although it employs some of the newest tubes, such as the 2A6 and the 2A5, it is not a "hurry-up" job, put out to exploit new tube numbers which happen to arouse public interest. Instead, it is a carefully engineered receiver, worked out over a period of four years, with worth-while improvements added from time to time and with faults eliminated as soon as these became apparent in actual usage.

Many designers fail to recognize the importance of correct coil design, as reflected in the operation of a superheterodyne. Nevertheless, the coils can "make" or "break" a superhet. For this reason, attention has been concentrated on improving and refining the coil design of the "Air Marshall," and its performance justifies the time thus expended.

Smooth Operation

In operating this receiver for the first time, one is impressed with a feeling of controlled power and certainty of performance which can best be characterized by the word "smoothness." It brings in one station after another as the dial is turned, and some of the distant stations sound very nearly like the locals.

An examination of the set, both above and below the chassis, discloses the fact that performance in this set goes hand in hand with simplicity. The bottom view proves this point. Most seven-tube sets look quite simple when viewed from above the chassis. Underneath, however, the wiring forms a veritable mystic maze. But this is not the case with the "Air Marshall." Every part has its predetermined place and wiring has been reduced to an absolute minimum through careful placement and design.

The receiver employs a super-heterodyne circuit using the best of the newer tubes and includes practically all the worth-while features developed during recent years. Then, as explained above, it uses antennna, oscillator, and 175 kc. i.f. coils developed through intensive research specifically for use in this receiver. Finally, all parts are arranged in a precise and orderly fashion, so that unwanted interaction between various portions of the circuit becomes impossible. These things, considered separately, may appear relatively unimportant, but combined in the aggregate, they produce a thoroughly satisfactory receiver.

Getting down to technicalities, for the benefit of those who know their amperes and ohms, the circuit consists of a pre-selector r.f. stage using a −58 tube, a first detector and an i.f. stage, both using −58 tubes, an oscillator employing a −56 tube, a second detector using a 2A6 diode-triode and an output audio stage using the new 2A5 pentode. A full-wave 80-type rectifier is used.

The new 2A6 diode-triode is a diode detector having an amplification factor of 100. The use of this tube permits the inclusion of automatic volume control in the circuit, and here is a feature which, as applied in this receiver, deserves special commendation. The manual volume control, R12, is set to the desired volume level. Thereafter, the automatic volume control is unusually effective in preventing fading and interstation blasting, and in holding the output closely to the predetermined level.

The output tube, resistively coupled to the second detector, is a 2A5 pentode. This tube (which is interchangeable with the −95) is somewhat similar to the older type −59 pentode. However, instead of having an undistorted power output of only 1250 milliwatts, this tube has an output of 3 watts, which is more than ample power for any normal conditions.

Tone control is also incorporated in the circuit. This feature, although not startling or new, is generally included in well-designed modern receivers. A "phono" jack and switches are also provided so that the audio system of this set may be utilized if desired in connection with an electric phonograph or for home recording. Another convenient feature consists of a built-in antenna of the condenser type. This may be connected to the antenna post when the set is to be used in locations where it is impossible or inconvenient to erect a conventional antenna.

The −80 type full-wave rectifier has been retained, since it has been found to perform efficiently and consistently over very long periods, and hence there is no logical reason to supplant it with a newer type. The filter system employed is unusually effective, and the power transformer is oversize and will not become unduly warm.

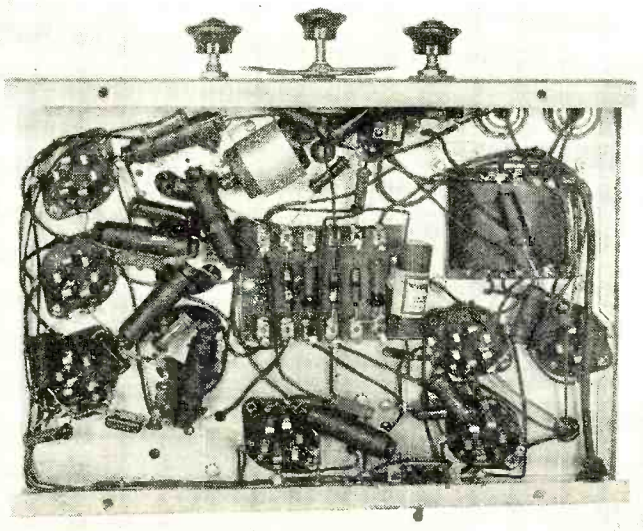
An illuminated full-vision, high-ratio dial permits one to tune in distant stations with great ease. A glance at the top view illustration shows the completeness of the shielding. All coils are shielded and also the three −58 tubes. In addition, the metal chassis itself acts as a shield.

A dynamic speaker having a 2500-ohm field is employed, and an output

(*Continued on page* 376)

A WIRING VIEW

The layout is such as to greatly simplify wiring. The chassis furnished with the kit is drilled not only for all mounting screws, but for wiring as well



How To Build A

Five Meter Transmitter

This extremely simple 56-megacycle band transmitter will provide much fun and valuable knowledge to the experimenter who wants to learn first hand of the wonders of the 5-meter band

By Garo W. Ray*

IN the October, 1933, issue was described a 56-megacycle band receiver which goes to make an excellent radiophone installation for "short haul" work when used in connection with a 56-megacycle transmitter. Such a transmitter is herewith described. This transmitter represents simplicity itself, in spite of the fact that the results and power derived from such an outfit are entirely adequate and satisfactory for any work the average experimenter wishes to do with it. It may be said at the outset that the use of higher power tubes than those originally intended for this set, namely, a couple of –10's seems to offer little advantage. The same circuit, adapted to 75-watt tubes, gave little or no additional signal strength at the short distance over which the test signals were being received. Under the proper conditions, however, higher rated tubes can probably justify their use. No changes in the circuit other than the grid-bias resistor and plate voltage values are necessary to adapt this oscillator for any size tube desired.

Constructional Data

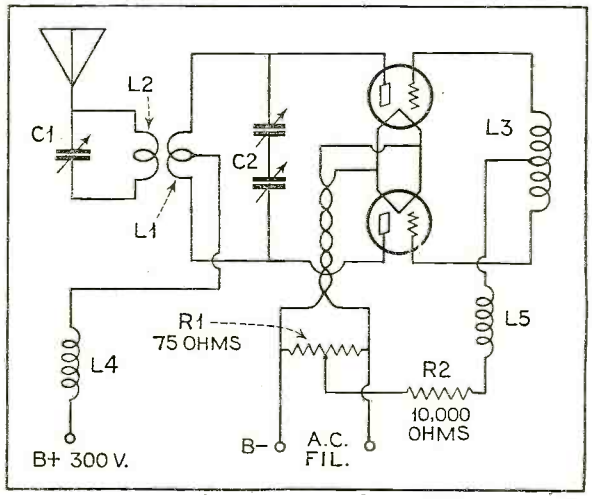
The oscillator was assembled in bread-board fashion, and it was found so efficient in that form that no effort was made to alter it.

It will be noted that all "hot" circuits are insulated with isolantite, including the variable condensers, chokes and tubes. For the latter purpose Hammarlund type S-4 isolantite sockets are used to provide the best possible ultra-high-frequency insulation—not only for the tubes, but for the grid coil which is mounted directly on the grid terminals of these sockets.

The grid and plate coils are wound with No. 8 soft-drawn copper wire. The size of wire has little effect in the working of the set, so that any wire capable of handling the relatively high radio-frequency currents may be used. The main requisite for both the grid and the plate inductances is that they must remain rigid under operating conditions.

The grid coil is aperiodic and is wound with 4 turns of wire, on a diameter of about 1 inch, spaced approximately ¼ inch between turns. The two ends are connected as directly as possible to the grid terminals of the 2 tube sockets. The plate inductance, in conjunction with a plate tuning condenser, tunes the oscillator to the particular frequency desired in the 5-meter band. This inductance is wound with 2 turns of wire, on a diameter of approximately 2½ inches, with a spacing of ⅛ of an inch between each of the adjacent turns.

THE TRANSMITTER CIRCUIT

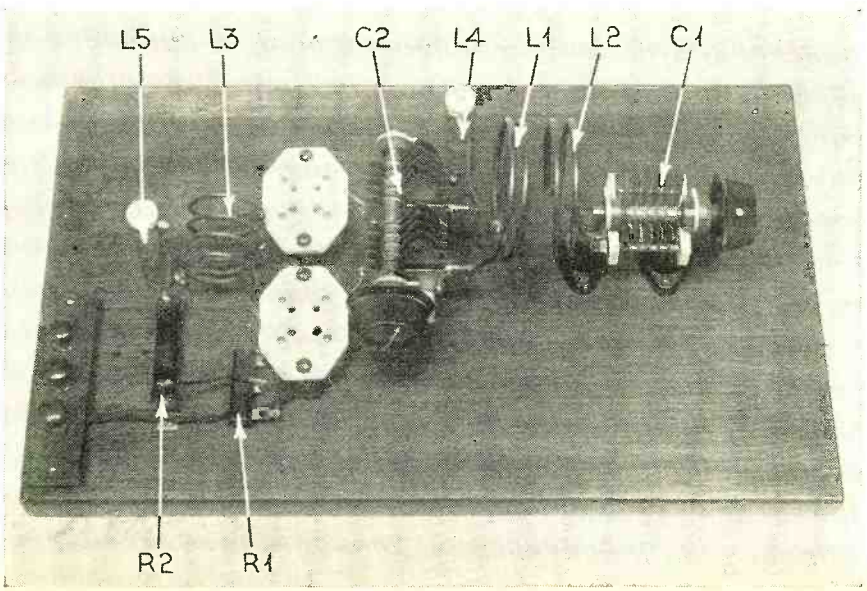


The type MCD-35-X Hammarlund condenser (C2) used for tuning this inductance is especially designed for ultra-short wave use and is an ideal piece of apparatus for the purpose of this circuit. It is a dual condenser (33 mfd. each section) with the 2 rotor sections mounted on the same shaft, but with the stators insulated from each other. The plates are double spaced, contributing to stability and high voltage insulations. The isolantite mounting keeps losses to a minimum, an extremely important factor when operating at such high frequencies. The location of stator lugs is such as to provide direct support for the plate inductance, thus eliminating long leads in the tuned circuit and helping to concentrate the inductance in the coil, where it belongs. This condenser is mounted on a small stand-off insulator in order to keep the tuned circuits well up in the clear.

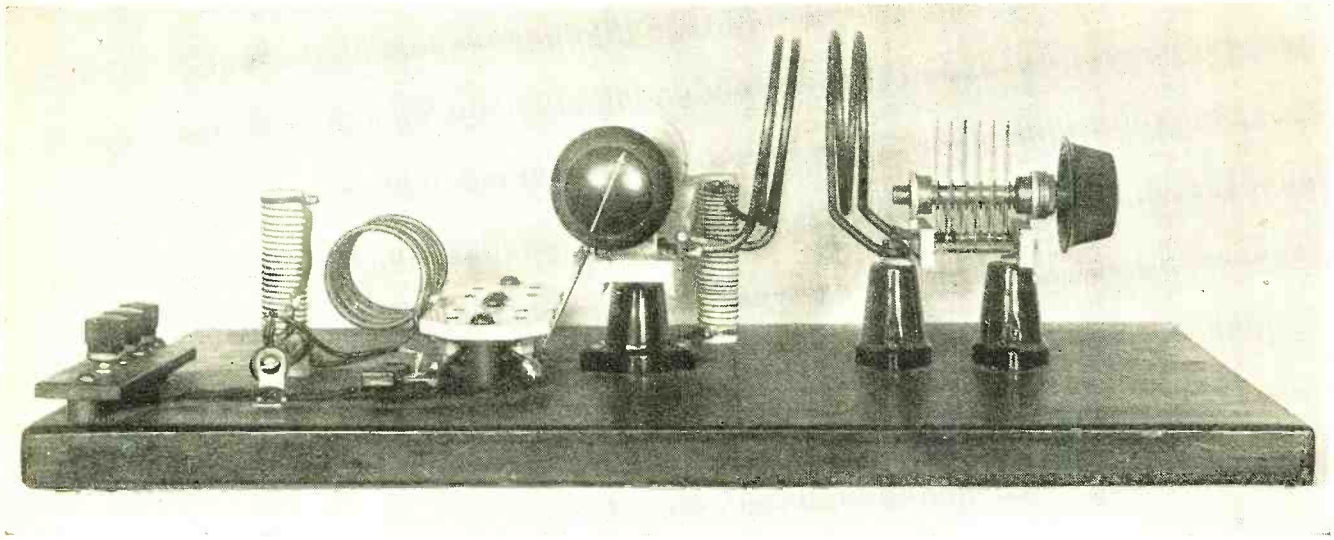
Two radio-frequency chokes are necessary—one for the grid circuit and the other for the plate circuit. These are wound on isolantite insulating pillars, ½ inch in diameter and 2½ inches long. To make an excellent job, a collar of bare copper wire was wound around each of these pillars, so that after soldering the loose ends together, a neat

A BIRD'S-EYE VIEW

Here the detailed layout is shown, making it a simple job for those who wish to duplicate this little transmitter



* Chief Engineer, Broadcast Station WICC



THE COMPLETED TRANSMITTER

The layout is planned to keep the tuned circuits up in the open and to eliminate unnecessarily long leads. Insulation throughout is as nearly perfect as it can be made, to keep r.f. losses to a minimum

ring was formed. Between these two rings of copper wire, one on each end of the form, 25 turns of No. 24 wire were wound, spaced to fill the form. The number of turns, which is not critical, may be anywhere between 20 and 30 and the efficiency of these radio-frequency chokes may be best determined after the set is put into actual operation. The object, of course, is to see that no radio frequency is present along the windings farthest from the inductance which they feed. The plate and grid radio-frequency chokes are connected directly to the electrical center of the respective plate and grid inductances.

The Antenna

For all ordinary purposes, it is possible to clip a short antenna wire, about 8 feet in length, on to the plate inductance, but much more stable operation was obtained by using a coil and condenser combination as an antenna tank circuit. The coil is identical to the plate inductance, and is tuned by a Hammarlund type MC-35-X, 11-plate midget variable condenser. This is identical with the one described above, except that it has only a single section. A wire approximately 8 feet long is connected to each terminal of the condenser, making it possible for the radio frequency to hop off into space in great style. In addition to the 8-foot wire advocated, the writer tried an antenna some 150 feet in length, with excellent results. However, due to the presence of numerous standing waves on an antenna arrangement of this type, the circuit becomes somewhat difficult to manage, and for all ordinary purposes provides no advantage over a short piece of wire strung from one side of the room to the other.

The filaments of the tubes are lighted from a transformer delivering the proper voltage. A center-tapped resistor of 75 ohms is placed directly across the filament terminals of the tube sockets. The filaments of the two tubes are wired in multiple. The grid biasing resistor has a resistance of 10,000 ohms, and is connected between the radio-frequency choke of the grid inductance and the center-tap of the filament resistor.

The Power Supply

The plate voltage is fed directly to the midtap of the plate coil, through the radio-frequency choke already described. This voltage may be in the order of 300 volts, derived from a suitable B supply unit. Approximately 180 volts may be derived from ordinary B batteries, if one wishes to operate with a pair of type -71A tubes, which gave excellent results in the tests.

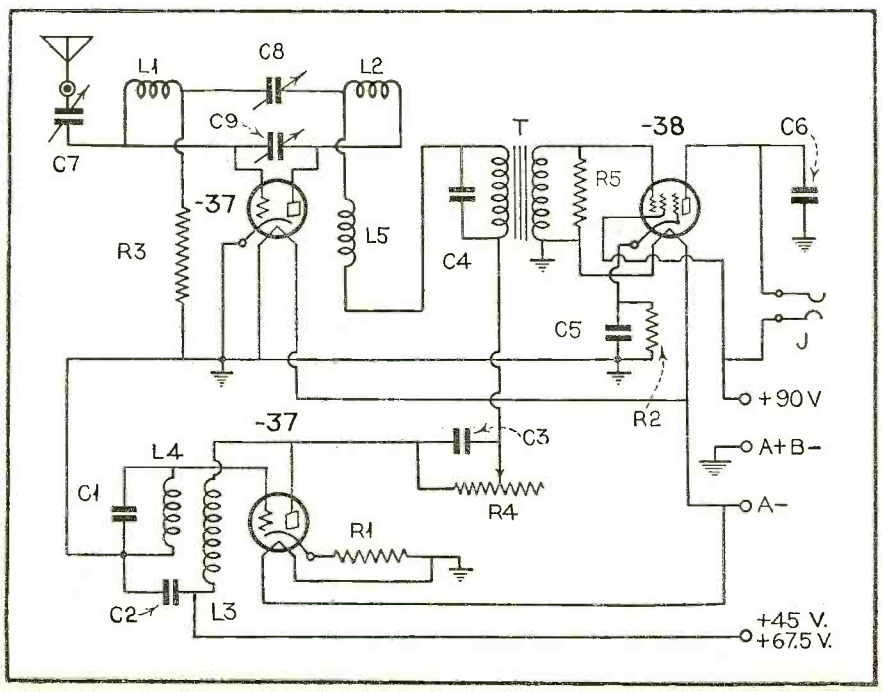
The modulating system for this transmitter may consist of the well-known Heising system, using proportionate tubes—i.e., if a pair -10's are used in the oscillator, a pair of -50 tubes either in push-pull or parallel, should be used as modulators. Using a pair of -71A tubes as oscillators, one would prefer a pair of -45 type tubes as modulators.

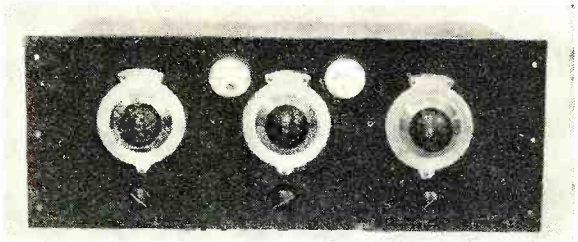
In tuning up this oscillator, all one need do is tune in a reliable signal operating in the 5-meter band and then tune the transmitter to emit a signal somewhere in the proximity of this signal. Actual frequency measurements at such high frequencies are somewhat difficult and are beyond our point of discussion, for which reasons they are not dealt with.

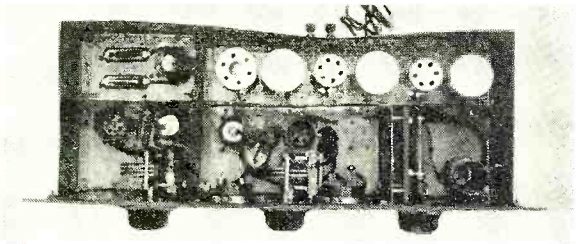
With a combination of this transmitter and the receiver previously described for this 5-meter band, all (*Continued on page 376*)

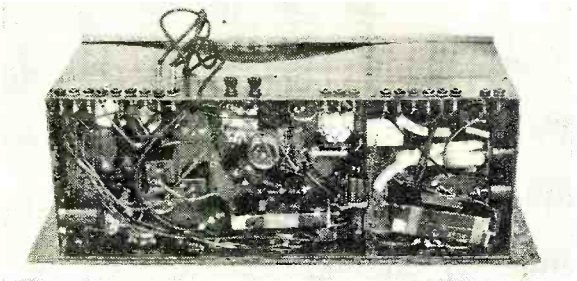
CORRECTED CIRCUIT OF THE 5-METER RECEIVER

Rather obvious errors appeared in the circuit of the receiver, published on page 207 of the October issue. The diagram shown here is correct









THE OSCILLATOR SECTION

These photos do not show this section exactly as described for the reason that the author for his own purposes has included a 465-kc. amplifier for special service. This is seen in the long rear section. The crystal oscillator and harmonic amplifier pertaining to the present article are shown in the front, left and center. At the rear (left) is shown the a.v.c. stage. Figure 17 shows the author's suggested panel arrangement for this section

BELOW: DETAILS OF R.F. CHASSIS

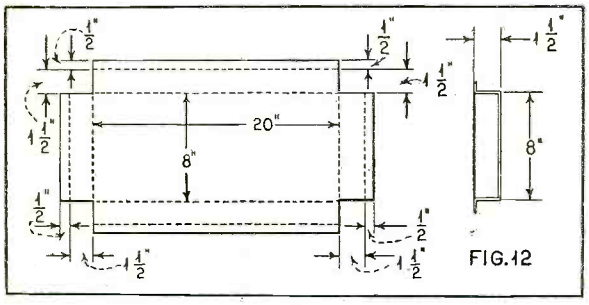


FIG.12

A Crystal Controlled Short-Wave SUPER

In the October and November issues the author analyzed his new circuit design, described special and highly effective short-wave antenna systems and made a start on the constructional description of the receiver. In the present article he covers the construction of the r.f. amplifier and oscillator sections

By Frank H. Jones

Part Three

THE base and shield cans for this push-pull input signal amplifier are made up with dimensions as shown in Figures 8, 9 and 10. Note how the coil sockets are mounted vertically on the bakelite upright pieces shown in Figures 9 and 10. These bakelite upright supports furnish a place to mount the .0001 mfd. grid coupling condensers and also the grid resistors and allow very short leads from ends of grid coils to control-grid caps on top of the −58 tubes.

The two by-pass condensers are on the floor of the shield. R3 and R8 are below the shield floor. The 500-ohm wire-wound resistors R9 and R10 are in the lower right front corners of their respective shield cans. The r.f. chokes 1, 2, 3 and 5 are inside the shield can and all screen-grid by-pass condensers are also inside the cans.

Connect all the high r.f. potential sides of all r.f. chokes and condensers close to the points in the circuit they are to by-pass or choke. Chokes 4 and 6 are below shield floor. Grid resistors are in the cans and the de-coupling resistors are below the floor.

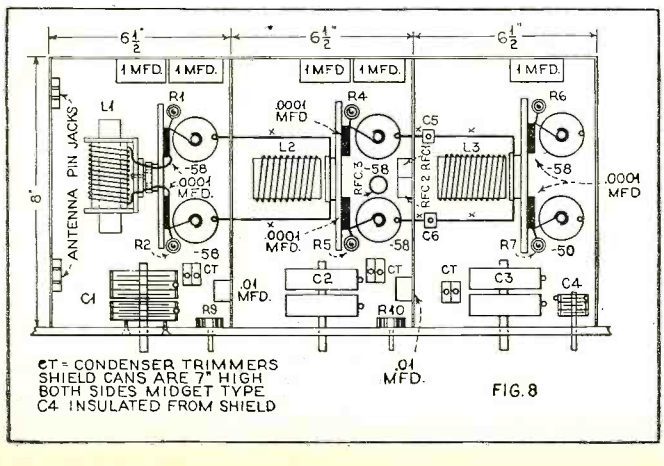
Plate leads "X" should be stiff and lie about ⅜ inch above floor of shield boxes up to the point where they turn up to connect on coil socket terminals.

I think that the wiring and placement of parts for this push-pull set is now clear, and I shall assume that you have this whole section wired and ready for test, so let's set about testing it and then we will know that part is okay when we come to try out the other parts of the complete receiver. Also, testing this section will be a welcome diversion from the mechanical work and wiring you have just done.

Take the B eliminator that you have probably already planned to use and connect it up with the correct voltages on tube filaments and plate circuits.

Temporarily disconnect the two detector plate leads and join the

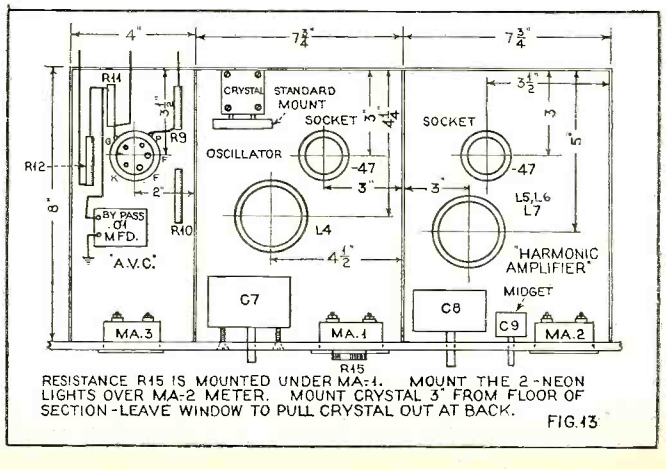
LAYOUT OF THE R.F. SECTION



CT = CONDENSER TRIMMERS
SHIELD CANS ARE 7" HIGH
BOTH SIDES MIDGET TYPE
C4 INSULATED FROM SHIELD

FIG.8

LAYOUT OF OSCILLATOR SECTION



RESISTANCE R15 IS MOUNTED UNDER MA-1. MOUNT THE 2-NEON LIGHTS OVER MA-2 METER. MOUNT CRYSTAL 3" FROM FLOOR OF SECTION - LEAVE WINDOW TO PULL CRYSTAL OUT AT BACK.

FIG.13

two plate leads together through an r.f. choke (and by-pass to ground) through a pair of 3000-ohm headphones to 250 volts plus B on the eliminator. Watch out in handling the 'phones with this high voltage in them that you don't get a shock.

Connect the de-coupling resistors R3 and R8 to negative side of 3-volt dry cells, grounding the positive side to the shield, which is the negative side of the B current. The detector test connection is as shown in Figure 11.

If you have an 0-50 scale d.c. milliammeter, put it in the common 250-volt lead going to the r.f. chokes 3 and 5. You should get a reading of about 24 milliamperes. Now with a short antenna (anything in the house will do), and the set turned on and all condensers C1, C2 and C3 set about the same, *turn on some all-wave interference.*

What is this?

Getting a Good Balance

Well, Junior's toy a.c. or d.c. universal motor, the kind with a commutator, will do, especially if it is in "bad" shape and sparks a-plenty. Put this running somewhere near the antenna (and of course have all the shield cans closed). If all the connections are correct, you are sure to hear a racket in the 'phones. Now move the toy motor away farther from the antenna till you just hear a moderate noise and then tune each condenser for maximum response. This test will show you how your coil windings may have to be juggled a bit if you insist on nice uniform tracking of all the condensers. Fix to suit your taste, and then make a record of the various dial settings at 8 or 10 points for future use when you come to line the complete receiver.

If everything is okay you can very likely hear plenty of stations with this rig alone. For extra nice tracking and more especially for nice push-pull balance we have two single Hammarlund 50 mmfd. trimmers bridged across each half of all the variable tuning condensers. Use these for final exact balance when complete receiver is finally tested. These little trimmers are right on the floor at each side of their corresponding tuning condensers.

If you have a tube tester, pick out pairs of tubes of identical characteristics for each stage, and this applies to screen grid current as well as plate current. Wire the tube sockets so the suppressor grids are joined to the cathodes when tubes are in the sockets.

As you will see from Figure 8 we require a metal base shield 20 inches long by 8 inches wide. Make it a little longer for convenience, and also wider.

Procure a piece of 3/32 inch copper, brass or aluminum sheet 25 inches long by 13 inches wide. Cut and bend it as in Figure 12.

Make the shield cans of 1/32 inch copper or brass. These cans may have ½ inch flanges turned in at the bottom and the cans may then be fastened to the chassis base with small machine screws. The covers for these cans may be in a single piece of stiff brass provided it fits snug down and level on each can, and no large cracks. While the foregoing is very convenient, it is much better to make individual covers to fit down over each can. The overall dimensions and the spacing of the parts is all clearly shown in Figure 8, and we will assume that second "B" is completed and start consideration of section "C".

The Oscillator Section

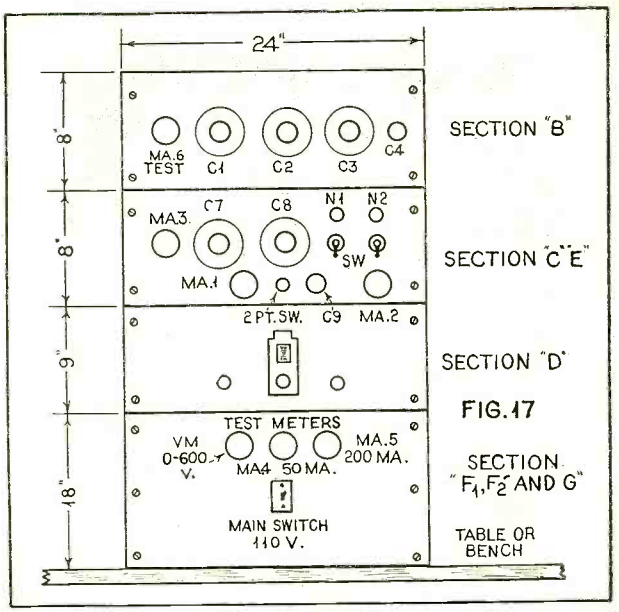
This section contains the crystal oscillator and harmonic amplifier and also the automatic carrier wave leveler (a.v.c.).

If you are familiar with oscillating circuits and frequency multipliers in transmitters, you won't find anything here to worry you. If not, maybe you had better read up a bit on crystal controlled oscillators and "electron coupled" circuits, but if you follow directions it can't help working.

Usually with half a chance you can hardly prevent tubes from generating oscillations. They are always trying their best to do it. In amplifiers you have to keep them from oscillating, but in the oscillating stage you can let them do their dirty work.

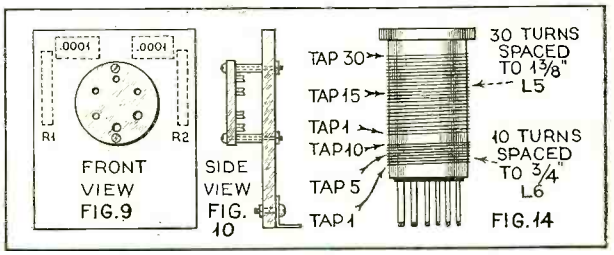
The type –47 tubes will appear large, and they really are. However, they are fine actors with crystals, and will quadruple, quintuple, sextuple, septuple and octuple in great shape and far easier and better than most other types of tubes.

Remember, this section "C" is to go in the main panel frame under the section "B". For uniformity in design and mounting, make a floor base just the same as you did for section "B". This section will have three can compartments divided and dimensioned as shown in Figure 13. We know that section "D" which is the tunable i.r.f. amplifier, will have its output end at the left from the front and so we have (*Continued on page* 373)

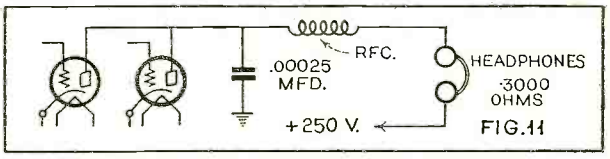


THE PANEL LAYOUTS AND RACK

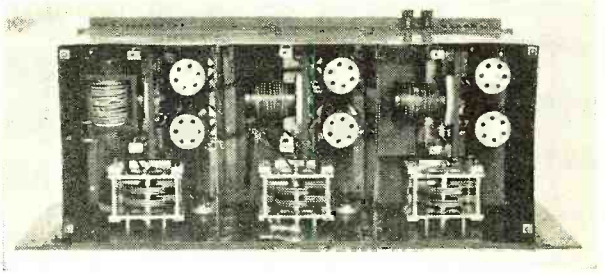
Suggestion for panel layouts and assembly rack



THE R.F. COIL MOUNTS AND DETAIL OF HARMONIC AMPLIFIER COIL

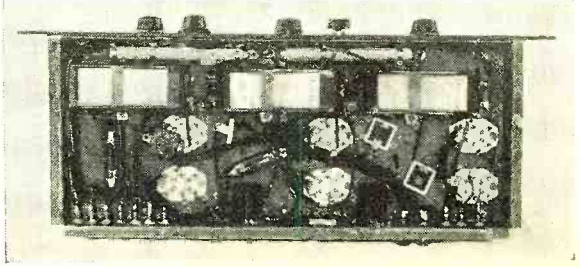


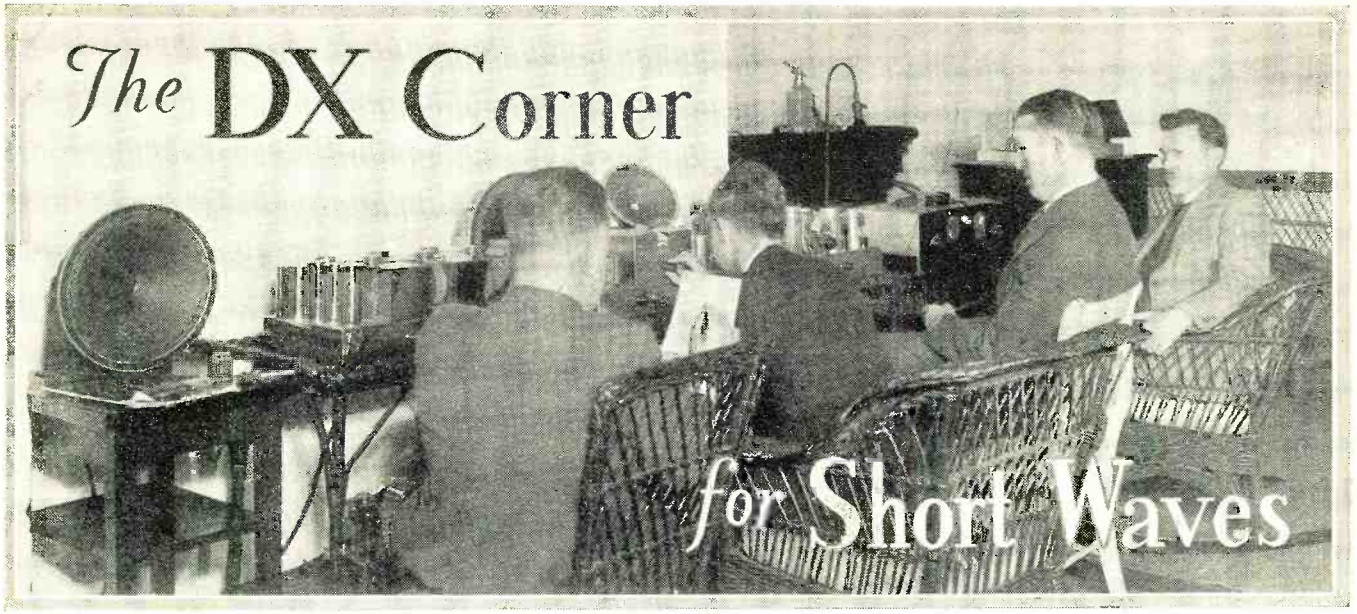
CIRCUIT FOR TESTING R.F. SECTION



THE PUSH-PULL R.F. AMPLIFIER

These are the inside top and bottom views of the r.f. amplifier, consisting of 2 r.f. stages and detector, all push-pull. The front view was shown in the complete assembly, just below the loudspeaker panel, in the October issue





IN this ninth installment of the DX Corner we have listed a time schedule of Short-Wave Best Bets, a list of stations logged during the past month at the RADIO NEWS Short-Wave Listening Post in Westchester County, New York. The schedule includes only the best received stations, hourly, from 5 o'clock in the morning to 12 midnight, E.S.T. Space has been left for filling in local time. Space has also been left opposite the call letters for your own dial settings for each station you pick up. Unless otherwise noted, stations are heard daily.

Short-Wave "Best Bets"

Wavelengths in Meters	*Call Letters*	*Dial Settings*
10 G.M.T. 5 A.M. E.S.T.		**Local Time**
19.8+	HVJ	
30.5	J1AA	
31.2+ Sun.	VK2ME	
31.5 Wed., Sat.	VK3ME	
70.2	RV15	
11 G.M.T. 6 A.M. E.S.T.		**Local Time**
19.7	DJB	
25.5	DJD	
30.5	J1AA	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.5 Wed., Sat.	VK3ME	
49.4+ Irregular	W8XAL	
70.2	RV15	
12 G.M.T. 7 A.M. E.S.T.		**Local Time**
13.9+	W8XK	
16.8+ Irregular	PHI	
16.9	GSG	
19.6	FYA	
19.7	DJB	
23.3+ Sun.	RABAT	
25.3	GSE	
25.5	DJD	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
49.4+ Irregular	W8XAL	
70.2	RV15	
13 G.M.T. 8 A.M. E.S.T.		**Local Time**
13.9+	W8XK	
16.8+ Irregular	PHI	
16.9	GSG	
19.6	FYA	
19.7	DJB	
23.3+ Sun.	RABAT	
25.3	GSE	
25.5	DJD	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.8+	PLV	
35.5 Irregular	PRAG	
49.2	VE9GW	
49.4+ Irregular	W8XAL	
49.9+	VE9DR	
70.2	RV15	
14 G.M.T. 9 A.M. E.S.T.		**Local Time**
13.9+	W8XK	
16.8+ Irregular	PHI	
19.6	FYA	
19.7	DJB	
19.8	GSF	
25.3	GSE	
25.5	DJD	
25.6 Except Sun.	VE9JR	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.8+	PLV	
35.5 Irregular	PRAG	
39.4	X26A	
49.0 Except Sat.Sun	VE9HX	
49.1+ Sun.	YV1BC	
49.2	VE9GW	
49.4+ Irregular	W8XAL	
49.9+	VE9DR	
15 G.M.T. 10 A.M. E.S.T.		**Local Time**
13.9+	W8XK	
16.8+ Irregular	PHI	
19.6	FYA	
19.6+	W2XE	
19.7	W8XK	
19.7	DJB	
19.8	GSF	
25.3	GSE	
25.5	DJD	
26.8+ Sun.	CT3AQ	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.5+	YV3BC	
31.8+	PLV	
49.0+ Ex. Sat., Sun	VE9HX	
49.1+ Sun.	YV1BC	
49.2	VE9GW	
49.4+ Irregular	W8XAL	
49.9+	VE9DR	
16 G.M.T. 11 A.M. E.S.T.		**Local Time**
13.9+	W8XK	
19.6+	W2XE	
19.7	W8XK	
19.7	DJB	
25.2	FYA	
25.3	GSE	
25.4	I2RO	
25.5 Irregular	DJD	
25.6 Except Sun.	VE9JR	
26.8+ Sun.	CT3AQ	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.5+	GSB	
31.5+	YV3BC	
40.5 Except Sun.	HJ3ABD	
49.0+Exc.Sat.,Sun.	VE9HX	
49.1+	YV1BC	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.9	VE9BJ	
49.9+ Except Sun.	VE9DR	
17 G.M.T. 12 Noon E.S.T.		**Local Time**
13.9+	W8XK	
19.6+	W2XE	
19.7	W8XK	
19.7	DJB	
25.2	FYA	
25.3	GSE	
25.4	I2RO	
25.5 Irregular	DJD	
25.6 Sat.	VE9JR	
31.2+	W3XAU	
31.2+ Sun.	VK2ME	
31.3+	W1XAZ	
31.5+	GSB	
31.5+	YV3BC	
40.5 Ex. Sun.	HJ3ABD	
49.0+ Ex.Sat.,Sun.	VE9HX	
49.1+ Except Sun.	YV1BC	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.9	VE9BJ	
49.9+	VE9DR	
18 G.M.T. 1 P.M. E.S.T.		**Local Time**
13.9+	W8XK	
16.8 Except Sat.	W3XAL	
19.7	W8XK	
19.7	DJB	
25.2	FYA	
25.5 Irregular	DJD	
25.5	GSD	
25.6 Sat.	VE9JR	
30.4 Sat.	EAQ	
31.2+	W3XAU	
31.3+	W1XAZ	
31.5	GSB	
31.5+	YV3BC	
49.1+ Exc. Sun.	YV1BC	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.5 Temporary	OXY	
49.9+	VE9DR	
19 G.M.T. 2 P.M. E.S.T.		**Local Time**
16.8 Except Sat.	W3XAL	
19.5 Sun.	W2XAD	
19.7	W8XK	
19.7	DJB	
25.2	FYA	
25.3	I2RO	
25.3+ ~	W2XE	
25.5 Irregular	DJD	
25.5	GSD	
25.6 Ex.Sat.,Sun	VE9JR	
30.4 Sat.	EAQ	
31.2+	XETE	
31.3	HBL (code)	
31.3+	W1XAZ	
31.5+	GSB	
31.5+	YV3BC	
37.4+ Sun.	RABAT	
49.1+ Sun.	YV1BC	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.5	W3XAU	
49.5 Temporary	OXY	
49.9+	VE9DR	
50.2+	HVJ	
20 G.M.T. 3 P.M. E S.T.		**Local Time**
16.8 Except Sat.	W3XAL	
19.5+Ex.Tu.Th.Sat	X2XAD	
19.7	W8XK	
19.7	DJB	
25.3+	W2XE	
25.4	I2RO	
25.5 Irregular	DJD	
25.5	GSD	
25.6	FYA	
25.6 Ex. Sat., Sun.	VE9JR	
30.4 Sat.	EAQ	
31.2+	XETE	
31.3+	W1XAZ	
31.5+	GSB	
31.5+	YV3BC	
37.3 Sun.	RABAT	
45.3+ (chimes)	REN	
49.1+ Sun.	YV1BC	
49.1+ Sat.	W3XAL	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.5	W3XAU	
49.5 Temporary	OXY	
49.6+ Sun.	W1XAL	
49.9	VE9DR	
50.0	RV59	
21 G.M.T. 4 P.M. E.S.T.		**Local Time**
16.8 Except Sat.	W3XAL	
19.7	W8XK	
19.7	DJB	
25.2	W8XK	
25.3+	W2XE	
25.4	I2RO	
25.5	DJD	
25.5	GSD	
25.6	FYA	
31.2+	XETE	
31.3+	W1XAZ	
31.5+	GSB	
37.3 Sun.	RABAT	
46.7 Fri.	W3XL	
48.8+	W8XK	
49.1+ Sun.	YV1BC	
49.1+ Sat.	W3XAL	
49.1 Except Sat.	W9XF	

49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+ Irregular	W8XAL	
49.5	W3XAU	
49.5 Temporary	OXY	
49.9+	VE9DR	
50.0	RV59	
22 G.M.T. 5 P.M. E.S.T.		**Local Time**
16.8 Except Sat.	W3XAL	
25.2	W8XK	
25.3+	W2XE	
25.4	I2RO	
25.5	GSD	
25.5	DJD	
26.8+ Tues., Thurs.	CT3AQ	
30.4	EAQ	
31.2+ Tues., Fri.	CT1AA	
31.2+	XETE	
31.3 Sat.	HBL	
31.3+	W1XAZ	
31.3+	DJA	
31.5+	GSB	
38.4+ Sat.	HBP	
45.0+ Sun.	HC2RL	
46.7 Fri.	W3XL	
48.7	YV3BC	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+	YV1BC	
49.1+ Sat.	W3XAL	
49.1+ Except Sat.	W9XF	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+	W8XAL	
49.5	W3XAU	
49.5 Temporary	OXY	
49.9	VE9DR	
50.0	RV59	
50.6 Irregular	HJ4ABE	
23 G.M.T. 6 P.M. E.S.T.		**Local Time**
25.2	W8XK	
25.5	GSD	
25.6	FYA	
26.8+ Tues., Thurs.	CT3AQ	
30.4	EAQ	
31.2+ Tues., Fri.	CT1AA	
31.2+	XETE	
31.3 Sat.	HBL	
31.3+	W1XAZ	
31.3+ Irregular	DJA	
31.4+	W2XAF	
31.5+	GSB	
38.4+ Sat.	HBP	
45.0+ Sun.	HC2RL	
46.7 Fri.	W3XL	
48.7	YV3BC	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+	YV1BC	
49.1+ Sat.	W3XAL	
49.1+ Except Sat.	W9XF	
49.2	VE9GW	
49.3+	W9XAA	
49.4+ Sun.	W8XAL	
49.5 Temporary	OXY	
49.9+	VE9DR	
50.6 Tu., Th., Sat.	HJ4ABE	
00 G.M.T. 7 P.M. E.S.T.		**Local Time**
25.2	W8XK	
25.5	GSD	
25.6 Except Sun.	VE9JR	
25.6	FYA	
31.2+	XETE	
31.3+	W1XAZ	
31.3+	DJA	
31.4+	W2XAF	
31.5+	GSB	
45.0+ Sun.	HC2RL	
46.7 Fri.	W3XL	
48.5	TGW	
48.7	YV3BC	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+ Sat.	W3XAL	
49.1+ Ex. Sat., Sun	W9XF	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+	W8XAL	
49.5	W3XAU	
49.8	DJC	
49.9	VE9DR	
50.4 Irregular	HJ2ABA	
50.6 Except Sun.	HJ4ABE	
01 G.M.T. 8 P.M. E.S.T.		**Local Time**
25.2	W8XK	
25.6	FYA	
25.6 Except Sun.	VE9JR	
31.2+	XETE	
31.3+	W1XAZ	
31.3+	DJA	
31.4+	W2XAF	
40.5+ Except Sun.	HJ3ABD	
45.0+ Sun.	HC2RL	
46.7 Fri.	W3XL	
48.5+	TGW	
48.7	YV3BC	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+	YV1BC	
49.1+ Sat.	W3XAL	
49.1 Except Sat.	W9XF	
49.2	VE9GW	
49.3+ Sun.	W9XAA	
49.4+	W8XAL	
49.5	W3XAU	
49.8	DJC	
49.9+	VE9DR	
50.4 Irregular	HJ2ABA	
50.5	HJ1ABB	
50.6 Except Sun.	HJ4ABE	
73.0+ Except Mon.	HCJB	
02 G.M.T. 9 P.M. E.S.T.		**Local Time**
25.2	W8XK	
25.6	FYA	
25.6	VE9JR	
31.2+	XETE	
31.3+ Irregular	DJA	
31.3+	W1XAZ	
31.4+	W2XAF	
40.5+ Except Sun.	HJ3ABD	
45.0+ Tues., Sun	HC2RL	
45.2+	Quito	
45.3 Thurs.	Prado	
46.7 Fri.	W3XL	
48.5+	TGW	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+	YV1BC	
49.1+ Sat.	W3XAL	
49.1+ Except Sat.	W9XF	
49.2 Except Sun.	VE9GW	
49.3+ Sun.	W9XAA	
49.4	CP5	
49.4+	W8XAL	
49.5	W3XAU	
49.8 Irregular	DJC	
49.9+	VE9DR	
50.4 Irregular	HJ2ABA	
50.5	HJ1ABB	
50.6 Mon.Wed.Fri.	HJ4ABE	
73.0 Except Mon.	HCJB	
03 G.M.T. 10 P.M. E.S.T.		**Local Time**
25.5	FYA	
25.6 Sat.	VE9JR	
31.0	T14NRH	
31.2+	XETE	
31.3+	W1XAZ	
40.5+ Except Sun.	HJ3ABD	
45.0+ Sun.	HC2RL	
45.2	Quito	
45.3 Thurs.	PRADO	
46.7 Fri	W3XL	
48.5	TGW	
48.8+	W8XK	
49.0	W2XE	
49.0+ Sat., Sun.	VE9HX	
49.1+ Sat.	W3XAL	
49.1+	YV1BC	
49.1+ Except Sat.	W9XF	
49.2 Except Sun.	VE9GW	
49.4	CP5	
49.4+	W8XAL	
49.5	W3XAU	
49.9+	VE9DR	
50.5 Thurs.	HJ1ABB	
50.6 Mon.Wed.Fri.	HJ4ABE	
04 G.M.T. 11 P.M. E.S.T.		**Local Time**
25.6	FYA	
25.6 Sat.	VE9JR	
31.2+	XETE	
31.3+	W1XAZ	
45.0 Fri.	TGW	
45.0+ Sun.	HC2RL	
45i5	QUITO	
46.7 Fri.	W3XL	
48.8+	W8XK	
49.1+ Sat.	W3XAL	
49.1+ Except Sat.	W9XF	
49.2 Except Sun.	VE9GW	
49.4+	W8XAL	
49.5	W3XAU	
49.9+	VE9DR	

Station Locations

Wavelength	*Call Letters*	*Location*
13.9+	W8XK	Pittsburgh, Pa.
16.8+	W3XAL	Bound Brook, N. J.
16.8+	PHI	Huizen, Holland
16.9	GSG	Daventry, England
19.5	W2XAD	Schenectady, N. Y.
19.6	FYA	Pontoise, France
19.6+	W2XE	New York, N. Y.
19.7	W8XK	Pittsburgh, Pa.
19.7	DJB	Zeesen, Germany
19.8	GSF	Daventry, England
19.8	HVJ	Vatican City
23.3		Rabat, Morocco
25.2	FYA	Pontoise, France
24.2	W8XK	Pittsburgh, Pa.
25.3	GSE	Daventry, England
25.3+	W2XE	New York, N. Y.
25.4	I2RO	Rome, Italy
25.5	GSD	Daventry, England
25.5	DJD	Zeesen, Germany
25.6	FYA	Pontoise, France
25.6	VE9JR	Winnipeg, Canada
26.8+	CT3AQ	Funchal, Madeira
30.4	EAQ	Madrid, Spain
31.0	T14NRH	Heredia, Costa Rica
31.2+	XETE	Mexico City
31.2+	W3XAU	Philadelphia, Pa.
31.2+	VK2ME	Sydney, Australia
31.2+	CT1AA	Lisbon, Portugal
31.3	HBL	Geneva, Switzerland
31.3	GSC	Daventry, England
31.3+	W1XAZ	Springfield, Mass.
31.3+	DJA	Zeesen, Germany
31.3+	W2XAF	Schenectady, N. Y.
31.5	VK3ME	Melbourne, Australia
31.5+	YV3BC	Caracas, Venezuela
31.5+	GSB	Daventry, England
31.8+	PLV	Bandoent, Java
32.3		Rabat, Morocco
35.5	PRAG	Porto Alegre, Brazil
38.4+	HBP	Geneva, Switzerland
39.4	X26A	Nuevo Laredo, Mexico
40.5+	HJ3ABD	Bogota, Col.
45.0+	HC2RL	Quayaquit, Ecuador
45.2		Quito, Ecuador
45.3	PRADO	Riobamba, Ecuador
45.3+	REN	Moscow, U. S. S. R.
46.7	W3XL	Bound Brook, N. J.
48.5	TGW	Guatemala
48.7	YV3BC	Caracas, Venezuela
48.8+	W8XK	Pittsburgh, Pa.
49.0	W2XE	New York, N. Y.
49.0+	VE9HX	Halifax, N. S.
49.1+	YV1BC	Caracas, Venezuela
49.1+	W3XAL	Bound Brook, N. J.
49.1+	W9XF	Chicago, Ill.
49.2	VE9GW	Bowmanville, Can.
49.3+	W9XAA	Chicago, Ill.
49.4	CP5	La Paz, Bolivia
49.4+	W8XAL	Cincinnati, Ohio
49.5	W3XAU	Philadelphia, Pa.
49.5	OXY	Skamleback, Denmark
49.6	GSA	Daventry, England
49.6+	W1XAL	Boston, Mass.
49.8	DJC	Zeesen, Germany
49.9	VE9BJ	New Brunswick, Can.
49.9+	VE9DR	Montreal, Can.
50.0	RV59	Moscow, U. S. S. R.
50.0+	HVJ	Vatican City
50.4	HJ2ABA	Tunja, Colombia
50.5	HJ1ABB	Barranquilla, Colombia
50.6+	HJ4ABE	Medellin, Colombia
70.2	RV15	Khabarovsk, Siberia
73.0	HCJB	Quito, Ecuador

Official Radio News Listening Post Observer Appointments

Listed below by states are the Official Radio News Listening Post Observers for short-wave reception. These Observers are serving conscientiously in helping expand the usefulness of the DX Corner. They are making monthly logs of actual reception which are used to check and augment the results already obtained in our Westchester Listening Post.

Alabama
J. E. Brooks

California
C. H. Canning

Florida
E. M. Law
James F. Dechert

Georgia
C. H. Armstrong

Indiana
J. R. Flannigan

Maine
R. I. Keeler

Massachusetts
Arthur Hamilton
Roy Sanders

Mississippi
Dr. J. P. Watson

Missouri
C. H. Long

New Jersey
William Dixon
R. H. Schiller
William F. Buhl

New York
Donald E. Barne
I. H. Kattell

North Carolina
H. O. Murdoch, Jr
W. C. Couch

Ohio
C. H. Skatzes

Pennsylvania
K. A. Staats
C. T. Sheaks
George Lilley
John A. Leininger
F. L. Stitzinger

Tennessee
Adrian Smith

Virginia
D. W. Parsons

Washington
Chas. G. Payne

Wisconsin
William M. Hardell

Canada
A. G. Taggart
W. H. Fraser
Douglas Wood
Cuba
Frank H. Kydd
England
Donald Burns

Applications for Official Listening Posts in the remaining states 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.

Short-Wave Reception Conditions

Short-wave reception during the last month has been very spotty. The 16 and 19 meter bands have been good during the mornings until noon time. On two separate weeks during the last month, however, reception on the 25 and 31 meter bands were almost entirely obliterated. These times correspond to the hurricane conditions along the Atlantic coast and the Gulf of Mexico and this leads us to think that these conditions may have also had some effect on either the magnetic phenomena surrounding the earth or the ionization clouds in the atmosphere which interfered with these waves. This was not true, however, regarding reception from South America which came through fine even during these periods. On the remaining two weeks of the last month, reception conditions from East and West, on the 25 and 31 meter bands, were almost up to normal. The 48-meter band improved considerably, again, with the exception of one of the weeks heretofore mentioned, when even KDKA was barely audible. Reception on all bands during the last few days preceding this writing has improved, however, and normal conditions seem to be restored. The outstanding reception during the past month was on the short 19-meter waves and from Australia and Japan, in the Eastern United States.

HVJ Transmissions

An official communication from station HVJ at Vatican City states that they will be on the air daily on 19.8 meters from 5 to 5:15 a.m., E. S. T. and on 50.2 meters daily except Sunday, from 2 to 2:15 p.m. The transmitter used has an output power of 10 kw. and the station can be recognized by the clock ticking in the studio.

Radio Coloniale Transmissions

An official communication from Radio Coloniale (FYA) states that they will be on the air on 19.6 meters daily from 8 to 11 a.m. and on 25.2 meters daily from 11:15 a.m. to 1:15 p.m., as well as from 3 p.m. to 5 p.m. and on 25.6 meters from 6 p.m. to 8:30 p.m. Also they will be on the air from 9 to 11:30 p.m. and then from 3 to 4 a.m.

Rabat Transmissions

An official communication from the radio station in Rabat (Morocco) states that they will be on the air on 23.3 meters from 7:30 to 9 a.m. daily and on 37.3 meters from 2:45 to 5 p.m. Their announcements may be recognized as follows: "Ici Radio-Maroc, station de l'Office Chérifien des Postes, des Télégraphes et des Téléphones." They close their transmissions by playing "La Marseillaise."

W8XK Transmissions

An official communication from radio station W8XK at Pittsburgh states that they will be on the air on 48.86 meters from 4:30 p.m. to sign off. They will be on the air on 25.2 meters daily from 4:30 to 10 p.m. They will be on the air on 19.7 meters daily from 10 a.m. to 4:15 p.m. and also on 13.9 meters daily from 7 a.m. to 2 p.m. All times listed are E. S. T.

OXY Transmissions

An official communication from station OXY at Shamleback, Denmark, follows: "We beg to inform you that, by way of experiment, the OXY short-wave transmitter is at present broadcasting on a wavelength of 49.5 meters instead of 31.51 meters with a power of ½ kw. This station was inaugurated on November 13, 1928, and broadcasts from 6 to 11:30 p.m., G. M. T., transmitting the same programs as the Kalundborg and Copenhagen stations."

TI4NRH Transmissions

An official communication from station TI4NRH follows: "Due to the interference given us by XETE, YV3BC and the German and English stations, we have changed our broadcasting as follows: We shall be on the air on 31 meters only between the hours of 10 and 11 p.m., E. S. T., daily. We have dropped all other waves for experiments for the moment and shall continue under this schedule from August 23 last. Please note that our call is TI4NRH and not TI4NRH, as many make this mistake."

FAIRFIELD LISTENING POST
Official RADIO NEWS *listening post of S. Gordon Taylor at Fairfield, Conn.*

W1XAZ Transmissions

Sometime ago we ran a note stating that station W1XAZ would be off the air during a period for rebuilding the transmitter. But we ran their call in our lists because the time period when they would be off was indefinite. We are now in receipt of the following official communication from this station at Springfield, Massachusetts: "W1XAZ will be on the air again about October 1 with a power of 10 kw. on a frequency of 9570 kc. from 7 a.m. to 1 a.m. the next day, E. S. T."

YV1BC Transmissions

We have received the following official communication from station YV1BC at Caracas stating that they will be on the air on 49.1 meters from 11 a.m. to 1:30 p.m. and from 5:45 to 10:30 p.m. daily except Sundays. They are on the air on Sundays on the same wavelength from 9 a.m. to 11:30 a.m. and from 2 p.m. to 6:30 p.m., and from 7:30 p.m. to 10:30 p.m.

W3XL Transmissions

"Station W3XL notifies me although they do not operate in accordance with any regular schedule and are only experimental, they have been relaying WJZ programs from 5 p.m. to 1 a.m., E. S. T., on Fridays recently."—Ray La Rocque, Worcester, Mass.

HJ3ABD Transmissions

An official communication from station HJ3ABD at Bogota, Colombia, states that their station will be on the air on 40.5 meters daily except Sundays from 11:30 a.m. to 1 p.m. and from 8 p.m. to 11 p.m. Their announcement is "Colombia Broadcasting." The power used by the station is 200 watts.

The British Empire Transmissions

An official communication from British Broadcasting station states that their program for the coming month will be as shown in best bets. Substitutions of stations may be made as follows without further notice: GSE may be substituted for GSD, or vice versa, GSC may be substituted for GSB.

Best Bets in California

Eugene S. Allen of Reedley, California, sends in the following best bets in his location. W1XAL, W1XAZ, W2XAF, W2XAD, W2XE, W3XAL, W3XAU, VE9JR, VE9GW, W8XK, W8XAL, VE9CS, GSE, FYA, XETE, VK2ME, VK3ME, W9XF, W9XAA, RV15, J1AA and HJB. On amateur 'phone he reports having heard K4SA, OA1B, K6BAZ, K6CIB, K6CRW, XIG, X3B. He uses a 6-tube home-made super.

Opera from Quito

The following paragraph is from a letter of Dr. J. P. Watson of Hazlehurst Mississippi: "Last night, Tuesday, September 19, 1933, 9 to 11:15 p.m., E. S. T., I chanced to hear a good opera, a new feature from South America. The station, Quito, Ecuador is on 6625 kc. The announcer stated this station would be on Sundays at 5:45 p.m. and on Tuesdays from 9 to 11:15 p.m. I may not have the frequency exact but near enough for DX listeners to find the station I am certain. Reception in this location generally on all frequencies has been very unsatisfactory recently due to storms and static."

The Vatican Station

Mr. George Moraldi of Rome, Italy, says that besides the normal schedule of HVJ, they may be heard on 'phone daily, except holidays, from 3 to 3:30 p.m., G. M. T., on a wavelength of 19.84 meters. He states that announcements are often given during the transmission in Italian, French, English, German and Spanish. They ought to be heard in America from 10 to 10:30 a.m., E. S. T.

Report from Tennessee

Mr. Adrian Smith of Dyersburg, Tennessee, writes: "In enclosing my log this month you will notice there is a break of about twelve days during which period the weather changed and DX was impossible for anything outside the United States and Canada. The Europeans came through the first week in September and then failed at once.

"I notice that one writer states he received EAQ on 38 meters. This has also happened to me on a super. (It is the upper setting. Editor.) The stations that have come in best here recently are EAQ, XETE, W2XAF, WEF, WCG, W8XK, W2XE, GSA, GSD, DJD, DJA, DJC, GSE, W3XAU, VE9GW." He states that station TI4NRH faded badly. This is also true of VE9DR and FYA.

Have You Heard This Station?

Mr. Robert L. Weber of West McHenry, Illinois, a member of the International DX'er's Alliance, reports that there is a

(*Continued on next page*)

Radio Call Book Section

Television and Aircraft Stations in the U. S.

Television Stations

1600-1700 kc.

W2XR	Radio Pictures, Inc.	Long Island City, N. Y.	1
W8XAN	Sparks Withington Co.	Jackson, Mich.	.1
2000-2100 kc.			
W6XAH	Pioneer Mercantile Co.	Bakersfield, Calif.	1
W9XK	State University of Iowa	Iowa City, Iowa	.1
W9XAO	Western Television Research Co.	Chicago, Ill.	.5
2100-2200 kc.			
W6XS	Don Lee Bdg. System	Los Angeles, Calif.	1
W9XAK	Kansas State College of Agriculture and Applied Science	Manhattan, Kansas	.125
W2XBS	National Broadcasting Co.	New York, N. Y.	5
W3XAK	National Broadcasting Co.	Portable—initial location Bound Brook, N. J.	5
W9XAP	National Broadcasting Co.	Chicago, Ill.	2.5
2200-2300 kc.			
W9XAL	First Nat. Television Corp.	Kansas City, Mo.	.5
2750-2850 kc.			
W2XAB	Atlantic Broadcasting Corp.	New York, N. Y.	.5
W9XG	Purdue University	West Lafayette, Ind.	1.5

43-46, 48.5-50.3, 60-80 megacycles

W2XAK	Atlantic Broadcasting Corp.	New York, N. Y.	.05
W6XAO	Don Lee Broadcasting Sys.	Los Angeles, Calif.	.15
W9XD	The Journal Co.	Milwaukee, Wis.	.5
W2XBT	National Broadcasting Co.	Portable	.75
W2XF	National Broadcasting Co.	New York, N. Y.	5
W3XE	Philadelphia Storage Battery Company	Philadelphia, Penna.	1.5
W2XR	Radio Pictures, Inc.	Long Island City, N. Y.	1
W3XAD	R. C. A. Victor Co.	Camden, N. J.	2
W1OXX	R. C. A. Victor Co.	Portable and mobile vicinity of Camden, N. J.	.05
W1XG	Shortwave and Television Corporation	Portable	.2
W8XAN	Sparks Withington Co.	Jackson, Mich.	.1
W9XE	U. S. Radio and Television Corporation	Marion, Ind.	1
W8XL	The WGAR Broadcasting Co. (CP)	Cuyahoga Heights Village, Ohio	.2
W8XF	WJR, The Goodwill Station, Inc. (CP)	Pontiac, Mich.	.25
W9XAT	Dr. George W. Young (CP)	Minneapolis, Minn.	.5

Aircraft Stations

120.1 m—2378 kc; 102.66 m—2930 kc; 101.83 m—2942 kc; 100.46 m—2984 kc; 72.11 m—4158 kc; 63.22 m—4742 kc; 53.07 m—5650 kc; 45.52 m—6735 kc; 45.45 m—6596 kc.

KIFM	Fairbanks, Alaska
WEEB	Baltimore, Md.
WEEC	Charleston, S. C.
WEEF	Spartanburg, S. C.
WEEG	Greensboro, N. C.
WEEH	McRae, Ga.
WEEJ	Jacksonville, Ga.
WEEN	Linden, N. J.
WEEM	Miami, Fla.
WEEO	Orlando, Fla.
WEEQ	Atlantic City, N. J.
WEER	Richmond, Va.

129.63 m—2312 kc; 127.33 m—2354 kc; 86.52 m—3465 kc; 63.29 m—4737 kc; 45.87 m—6536 kc; 45.80 m—6546 kc; 45.73 m—6556 kc; 37.45 m—8006 kc.

KGUS	Blythe, Calif.

112.44 m—2667 kc; 112.27 m—2670 kc; 105.11 m—2853 kc; 99.83 m—3338 kc; 55.79 m—5374 kc.

KNWA	St. Paul, Minn.
KNWB	Fargo, N. D.
KNWC	Penbia, N. D.
WAEH	Milwaukee, Wis.
WSDL	Duluth, Minn.
WSDR	Madison, Wis.
WSDS	Chicago, Ill.

111.19 m—2675 kc; 102.10 m—2036 kc; 51.50 m—5822 kc.

WAEI	Detroit, Mich.

110.29 m—2694 kc; 109.81 m—2731 kc; 103.23 m—2905 kc; 97.64 m—3071 kc; 97.15 m—3086 kc; 72.99 m—4107 kc; 60.39 m—4965 kc; 60.15m—4985 kc; 54.45 m—5506 kc; 54.15 m—5537 kc; 52.89 m—5669 kc; 52.70 m—5689 kc; 46.08 m—6507 kc; 46.01 m—6517 kc; 45.94 m—6526 kc; 37.43 m—8011 kc.

KGSP	Denver, Colo.
KGSR	Pueblo, Colo.
KGTH	Salt Lake City, Utah
KGTJ	Las Vegas, Nev.

103.23 m—2905 kc; 97.63 m—3071 kc; 97.15 m—3086 kc; 60.39 m—4965 kc; 60.15 m—4985 kc; 54.45 m—5506 kc; 52.45 m—5717 kc; 52.88 m—5670 kc; 52.70 m—5689 kc.

KGTA	Winslow, Ariz.
KGTD	Wichita, Kansas
KGTL	Kingman, Ariz.
KGTN	Las Vegas, Nev.
KGTQ	Springfield, Mo.
KGTR	Robertson, Mo.
KGTX	Pocatello, Idaho
KGTY	Butte, Mont.
KGSB	Alameda, Calif.
KGSI	Kansas City, Kansas
KSI	Burbank, Calif.
KST	Kansas City, Mo.
KSX	Albuquerque, N. M.
KSY	Tulsa, Okla.
WAEC	Pittsburgh, Pa.
WAED	Harrisburg, Penna.
WAEE	Camden, N. J.
WAEF	Newark, N. J.
WAEG	Cresson, Penna.
WHG	Columbus, Ohio
WHM	Indianapolis, Ind.

95.91 m—3126 kc; 93.09 m—3220 kc; 92.80 m—3231 kc; 92.52 m—3240 kc; 92.09 m—3255 kc; 87.02 m—3445 kc; 86.77 m—3455 kc; 86.52 m—3465 kc; 86.08 m—3483 kc; 61.01 m—4914 kc; 53.55 m—5599 kc; 53.45 m—5610 kc; 53.26 m—5630 kc.

KGCN	Douglas, Ariz.
KGQZ	San Diego, Calif.
KGSH	Portable
KGTB	Texarkana, Tex.
KGTU	Lake Charles, La.
KGTV	Beaumont, Tex.
KGUA	El Paso, Texas
KGUB	Houston, Tex.
KGUD	San Antonio, Tex.
KGUE	Brownsville, Tex.
KGUF	Dallas, Tex.
KGUG	Big Spring, Tex.
KGUH	Waco, Tex.
KGUK	Shreveport, La.
KGUO	Tucson, Ariz.
KGUP	Phoenix, Ariz.
KGUQ	Indio, Calif.
KGUR	Burbank, Calif.
KGUT	Robertson, Mo.
KGUU	Little Rock, Ark.
WAEJ	Springfield, Ill.
WAEK	Mobile, Ala.
WAEN	Evansville, Ind.
WAEP	Portable
WAEQ	Elmira, N. Y.
WDSE	Birmingham, Ala.
WQDP	Atlanta, Ga.
WQDQ	New Orleans, La.
WSDB	Jackson, Miss.
WSDC	Newark, N. J.
WSDD	Boston, Mass.
WSDF	Louisville, Ky.
WSDG	Chicago, Ill.
WSDH	Nashville, Tenn.
WSDI	Cincinnati, Ohio
WSDK	Memphis, Tenn.
WSDO	Buffalo, N. Y.
WSDP	Columbus, Ohio
WSDQ	Berea, Ohio
WSDZ	Indianapolis, Ind.
	Abilene, Tex.

95.31 m—3146 kc; 94.86 m—3161 kc; 90.29m—3320 kc; 58.57 m—5119 kc; 53.84 m—5568 kc; 53.64 m—5590 kc; 52.98 m—5659 kc.

KEU	Burbank, Calif.
KFM	Sacramento, Calif.
KFO	Oakland, Calif.
KGE	Medford, Ore.
KGQZ	San Diego, Calif.
KGT	Fresno, Calif.
KGTE	Wichita, Kansas
KGTZ	Spokane, Wash.
KGUC	Fort Worth, Tex.
KGUZ	Ponca City, Okla.
KKO	Elko, Nev.
KMP	Omaha, Nebr.
KMR	North Platte, Nebr.
KNAS	Kansas City, Mo.
KNAT	Dallas, Tex.
KNAU	Tulsa, Okla.
KNAV	Oklahoma City, Okla.
KOE	Cheyenne, Wyo.
KQC	Rock Spring, Wyo.
KQD	Salt Lake City, Utah
KQM	Des Moines, Iowa
KQQ	Iowa City, Iowa
KQX	Bakersfield, Calif.
KRA	Boise, Idaho
KRD	Pasco, Wash.
KRF	Lincoln, Nebr.
KTU	Redding, Calif.
KVO	Portland, Ore.
KZJ	Seattle, Wash.
WNAK	Cleveland, Ohio
WNAL	Brooksville, Penna.
WNAM	Bellefonte, Penna.
WNAT	Orlando Township, Ill.
WUCG	Chicago, Ill.

(Continued from preceding page)

station HC2RL at Guayaquil, Ecuador, broadcasting on 45 meters on Tuesday nights from 9:15 to 11:15 p.m. and on Sunday nights they begin to broadcast at 5:25 p.m., E. S. T. These are the only two days on which they are on the air at present. The address of this station is Post Office Box 759, Guayaquil, Ecuador.

England, France, Germany Without Antenna

Mr. Russell J. Keeler of West Scarboro, Maine, says he can hear stations GSF, HJB and FYA on 19 meters without using his antenna.

Best DX at Asheville

Mr. Henry Pugh of Asheville, North Carolina, reports that he has the best consistent reception in his location from stations EAQ, TI4NRH, GSB, GSG, GBK, GSD, DJA, DJB, DJD, DJC, FYA, 12RO, VE9JR, VE9GW, CMCI, PDK, J1AA, W8XK, W2XE, W9XAA, W3XAL. He uses a Midwest all-wave eight tube super.

Hurricane Interference

Mr. R. A. Miller of Morganton, North Carolina, writes us enclosing his valuable log for the last months. He uses a Stewart Warner converter with a 1931 model 725 Silver-Marshall set. He states: "I keep the local weather station here. A hurricane has been blowing in the Gulf of Mexico regions for the past few days. This weather would not permit reception of any volume—only a whisper last night. England has had bad weather and interference for the past several days."

A Spanish Speaking Station

"I wish to report a Spanish-speaking station coming in just below W8XK on the dial. The announcer has mentioned Caracas several times but as yet I have not been able to determine the station call letters exactly." Donald E. Barne, Copaigue, New York. (Any of our readers identifying this

(*Continued on page* 377)

RADIO PROGRAM FEATURES

AN OFFICIAL PROGRAM SERVICE

THE radio receiver is worth only what it receives. One of the main difficulties in broadcast listening is to determine just when the more popular programs are on the air. Most listeners miss as much as 50 percent of the worth-while programs for this reason. RADIO NEWS is therefore presenting this seventh instalment of a monthly broadcast schedule, listing day by day what is felt to be the most noteworthy programs on the air in the evenings, on Saturday afternoons and all day Sunday. The programs have been chosen by a committee of art, music and educational critics, as well as representative listeners. The programs listed are for the period of November 10th-December 10th inclusive. The listings include the name of the program, the time the program is on the air, the type of program, the name of the sponsor, the chain and the national stations through which it is transmitted. To use the lists one should refer to the day of the week and then run down the hours, marking off those programs you wish to listen to. If you want to find the time for a given program, the name of the program is shown in bold face and is easily picked out. The list is correct up to the day of going to press. Programs are sustaining, unless otherwise noted. All listings are in Eastern Standard Time. Deduct one hour for Central Standard Time, two hours for Mountain Standard Time, and three hours for Pacific Standard Time. All time is p.m. unless otherwise noted.

Compiled by

Samuel Kaufman

MONDAYS

5:00—SKIPPY. Drama. Sponsor: Sterling Products, Inc. CBS. WABC, WOKO, WCAO, WAAB, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WEAN, WFBL, WSPD, WJSV, WHEC, CFRB. **Also, 6:00**—WBBM, KMBC, WHAS, KMOX, WCCO.

5:30—THE SINGING LADY. Nursery jingles, songs and stories. Sponsor: Kellogg Co. NBC. WJZ, WHAM, KDKA, WJR, WGAR, WLW, WBAL, WBZ, WBZA. **Also, 6:30**—WENR.

5:30—JACK ARMSTRONG, ALL-AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WOWO, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30**—WBBM, KMOX, WCCO.

5:30—ADVENTURES OF TOM MIX AND HIS RALSTON STRAIGHT SHOOTERS. Drama. Sponsor: Ralston Purina Co. NBC. WEAF, WEEI, WTIC, WJAR, WTAG, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WCSH, WFBR.

5:45—WIZARD OF OZ. Drama. Sponsor: General Foods Corp. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOW, WDAF, WTMJ, KSTP, WIBA, WEBC, WDAY, KFYR.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor. Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, CRCT, CFCF, WLW, WHAM, WGAR, WJR, WRVA, WWNC, WIS, WJAX, WFLA, WPTF. **Also, 6:45**—WREN, KOIL, KWCR, KPRC, WOAI, WFAA, KTBS, WKY, KSTP, WEBC, WDAY, WBAP, KFYR.

6:00—BUCK ROGERS IN THE 25TH CENTURY. Drama. Sponsor: R. B Davis Co. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, WCAU, WEAN, WJSV, WBT. **Also, 7:30**—WBBM, WKRC, WFBM, WHAS, KMOX, WCCO.

6:15—H-BAR-O RANGERS. Drama. Sponsor: Hecker H-O Co. CBS. WABC, WOKO, WAAB, WGR, WHK, WDRC, WCAU, WEAN, WFBL, WLBZ, WHEC, WORC, WMAS. **Also, 9:00**—KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBZA, WHAM, WSYR, CRCT, WGAR, WBAL, WBZ, KDKA, WLW, WJR, WJAX, WIOD, WFLA.

6:45—GEORGE SCHERBAN'S RUSSIAN GYPSY ORCHESTRA. CBS. WADC, WOKO, WCAO, WAAB, WKBW, WBBM, WHK, CKLW, WFBM, KMBC, WHAS, WFBL, WSPD, WQAM, WLBZ, WBT, WDOD, KVOR, KRLD, KLZ, WTAQ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, CFRB, WACO, WMT, WSJS, WKBN.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WGAR, WMAL, CRCT, WRVA, WPTF, WIOD, WFLA. **Also, 11:00**—WMAQ. WENR, KWK, WREN, KOIL, KSTP, WSM, WMC, WSB, WSMB, KTHS, KDYL, WKY, WOAI, KOA, KGO, KFI, KGW, KOMO, KHQ, KPRC, WDAF, WHAM, WJR, WFAA, WCKY, WTMJ, WKY..

7:00—MYRT AND MARGE. Drama. Sponsor: Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WBT, KRLD, WSFA, WTOC, WWVA. **Also, 10:45**—WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, KLZ, KTRH, KLRA, WREC, WCCO, WODX, WLAC, WDSU, KOMA, KSL.

7:00—MOLLE SHOW. Charles Leland, comedian. Sponsor: Molle Co. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, KSD, WOC, WHO, WOW, WDAF.

7:15—BILLY BACHELOR. Drama. Sponsor: Wheatena Corp. NBC. WEAF.

7:15—JUST PLAIN BILL. Drama. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WCAU, WJSV, CFRB.

7:30—LUM AND ABNER. Sketch. Sponsor: Ford Dealers. NBC. WEAF, WFBR, WBEN, WGY, WTAM, WLW, WTAG, WEEI, WJAR, WCSH, WRC, WCAE, WKBF. **Also, 11:15**—WLIT, KSD, WOC, WHO, WDAF, WTMJ, KFYR, WIBA, WDAY, WOW, WENR.

7:30—RICHFIELD COUNTRY CLUB. With Grantland Rice, Betty Barthell, Mary McCoy, Double Quartet and Jack Golden's Orchestra. Sponsor: Richfield Oil Co. of N. Y. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, KDKA, CRCT, WMAL, WSYR.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WEEI, WSAI, WENR, WOW, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WDAF.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, WCAU, WJAS, WBT, WJSV, CKLW.

8:00—HAPPY BAKERS. Vocal trio and Harriet Lee. Sponsor: Continental Baking Corp. CBS. WABC, WADC, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, WSPD, WJSV, WICC, WCAH, WMBG, WHEC, WWVA, WORC, WMAS.

8:00—SOCONYLAND SKETCHES. Drama. Sponsor: Standard Oil Co. of N. Y. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WGY, WBEN.

8:15—EDWIN C. HILL. "The Human Side of the News." Sponsor: Barbasol Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO.

8:30—FLOYD GIBBONS AND VICTOR YOUNG'S ORCHESTRA. Sponsor: Johns-Manville Co. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WTAM, WWJ, WLW, WMAQ, KSD, WOC, WHO, WOW, WDAF, WRVA, WIS, WJAX, WIOD, KPRC, KOA, KDYL, WSMB, WSB, WFLA, WSM, WMC.

8:30—POTASH AND PERLMUTTER. Drama. Sponsor: Health Products Co. NBC. WJZ, WBAL, WMAL, WGAR, WCKY, WLS, WJR, WHAM, KDKA, WSYR.

8:45—RED DAVIS. Drama. Sponsor: Beech-Nut Packing Co. NBC. WJZ, WBAL, WBZ, WBZA, WSYR, WHAM, KDKA, WLS, WJR.

9:00—A. & P. GYPSIES. Sponsor: Great Atlantic & Pacific Tea Co. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WHO, WCSH, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WOW, WDAF.

9:00—SINCLAIR GREATER MINSTRELS. Sponsor: Sinclair Refining Co. NBC. WJZ, WGAR, WSB, WLS, KWK, WREN, KWCR, KSTP, WEBC, WDAY, KFYR, WFAA, WRVA, WWNC, WIS, WJAX, WIOD, WMC, WFLA, WSM, WSMB, WJDX, WBZ, KPRC, WOAI, KTBS, WKY, KOIL, WBZA, WHAM, KDKA, WLW, KSO, WTMJ, WIBA, WBAL, KOA, WPTF, KVOO, WJR.

9:00—KATE SMITH. Songs. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, KOMA, WMBD, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, WIBW, CFRB, WACO, KFH, WSJS, WORC.

9:15—AN EVENING IN PARIS. Sponsor: Bourjois, Inc. CBS. WABC, WCAO, WNAC, WGN, WHK, CKLW, KMBC, WCAU, WJAS, WEAN, KMOX, WJSV, WGST, KLZ, WCCO, WDSU, KOMA.

9:30—JACK FROST MELODY MOMENTS, Sponsor: National Sugar Refining Co. NBC. WJZ, WBAL, WHAM, KDKA, WGAR, WLW, WJR, WENR.

9:30—THE BIG SHOW. Lulu McConnell, Gertrude Niesen and Isham Jones' Orchestra. Sponsor: Ex-Lax Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBK, WBBM, WKRC, WHK, CKLW, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WICC, WBT, WCAH, KRLD, KLZ, WREC, WCCO, WLAC, WDSU, WTAR, KSL, CFRB.

9:30—DEL MONTE SHIP OF JOY. Sponsor: California Packing Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WRVA, WWNC, WIS, WJAX, WIOD, WFLA, KVOO, WKY, KTBS, WFAA, KPRC, WOAI, KOA, KDYL, WKBF, WEBC, WTMJ, KSTP.

9:45—THE WITCH'S TALE. Drama and music. WOR.

10:00—THE HOUR GLASS. Chorus and soloists. Orchestra directed by Harold Sanford. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WSYR, WHAM, WCKY, KWCR, KSO, KOIL, WREN, CFCF, WRVA, WWNC, WIS, WJAX, WFLA, (WIBA, KSTP, WEBC, KFYR, WSM, WSB, WJDX, WSMB, KVOO, WKY, WFAA, KPRC, KTBS. WOAI, KDYL, KGO, KFSD. off 10:30).

10:00—CONTENTED PROGRAM. Sponsor: Carnation Milk Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WEBC, KSTP, KFYR, CFCF, CRCT, WSM, WMC, WSB,

KPRC, WOAI, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, WMAQ.

10:00—ANDRE KOSTELANETZ PRESENTS. Orchestra and vocal soloists. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KRLD, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WCCO, WODX, WLAC, WDSU, KOMA, WMBD, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, WIBW, CFRB, WACO, WMT, WSJS, WORC, WKBN, WREC.

TUESDAYS

5:00—SKIPPY. Drama. Sponsor: Sterling Products, Inc. CBS. WABC, WOKO, WCAO, WAAB, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WEAN, WFBL, WSPD, WJSV, WHEC, CFRB. **Also, 6:00—**WBBM, KMBC, WHAS, KMOX, WCCO.

5:30—SINGING LADY. Nursery jingles, songs and stories. Sponsor: Kellogg Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, WJR, WLW, KDKA, WGAR.

5:30—JACK ARMSTRONG, ALL-AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30—**WBBM, KMOX, WCCO.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, CRCT, CFCF, WLW, WHAM, WGAR, WJR, WRVA, WWNC, WIS, WJAX, WFLA, WPTF. **Also, 6:45—**WREN, WBAP, KOIL, KWCR, KPRC, WOAI, WFAA, KTBS, WKY, KSTP, WEBC, WDAY, KFYR.

6:00—BUCK ROGERS IN THE 25TH CENTURY. Drama. Sponsor: R. B. Davis Co. CBS WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, WCAU, WEAN, WJSV, WBT **Also, 7:30—**WBBM, WKRC, WFBM, WHAS, KMOX, WCCO.

6:15—H-BAR-O RANGERS. Drama. Sponsor: Hecker H-O Co. CBS. WABC, WOKO, WAAB, WGR, WHK, WDRC, WCAU, WEAN, WFBL, WLBZ, WHEC, WORC, WMAS.

6:30—MID-WEEK HYMN SING. Vocal soloists and organist. NBC. WEAF, WGY, WMAQ, WIS, KVOO, WOAI, WWNC, WIBA, KTBS, WSAI, KGIR, WJDX, KPO, KFYR, WDAY, KPRC, KDYL, KTHS, WFI, WTAG, WRC, WOC, WHO, WJAX, WFAA, WWNC.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBZ, WBZA, CRCT, WJR, WBAL, KDKA, WGAR, WHAM, WLW, WSYR, WJAX, WIOD, WFLA.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WMAL, CRCT, WIOD, WFLA, WRVA, WPTF, WGAR, WHAM. **Also, 11:00—**WMAQ, KDYL, WDAF, KOIL, KSTP, WSM, WFAA, WJR, WMC, WSB, WSMB, KTBS, WCKY, KPRC, WOAI, WKY, KOA, KGO, KFI, WREN, KGW, KOMO, KHQ, WENR, KWK.

7:00—MYRT AND MARGE. Drama. Sponsor. Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WBT, KRLD, WSFA, WTOC, WWVA. **Also, 10:45—**WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, KLZ, KTRH, KLRA, WREC, WCCO, WODX, WLAC, WDSU, KOMA, KSL.

7:15—BILLY BACHELOR. Drama. Sponsor: Wheatena Corp. NBC. WEAF.

7:15—JUST PLAIN BILL. Drama. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WCAU, WJSV, CFRB.

7:30—LUM AND ABNER. Sketch. Sponsor: Ford Dealers. NBC. WEAF, WFBR, WGY, WBEN, WTAM, WTAG, WKBF, WLW, WRC, WEEI, WJAR, WCSH, WCAE. **Also, 11:15—**WFI, WENR, KSD, WOC, WHO, WOW, WTMJ, WDAF, WKBF, WIBA.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WEEI, WJAR, WFI, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WCSH, WFBR, WSAI, WENR, WOW, WDAF.

7:45—DON CARNEY'S DOG STORIES. Sponsor: Spratt's Patent, Ltd. NBC. WJZ, WMAL, WMAQ, KDKA, WBZ, WBZA, WGAR, WSYR, WHAM, WJR, WCKY.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, WCAU, WJAS, WJSV, WBT, CKLW.

8:00—BLACKSTONE PLANTATION. JULIA SANDERSON AND FRANK CRUMIT. Sponsor: Waitt & Bond Co., NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WRC, WGY, WBEN, WCAE, WTAM, WWJ.

8:00—ENO CRIME CLUES. Mystery drama. Sponsor: Harold S. Ritchie & Co. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WHAM, KDKA, WGAR, WLW, WMAQ, KWK, WREN, WJR.

8:00—MILLS BROTHERS. Songs. CBS. WABC, WADC, WOKO, WCAO, WGR, WHK, CKLW, WDRC, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KLZ, WTAQ, WHP, WLBW, WBIG, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, WIBW, CFRB, WACO, WMT, WWVA, KFH, WSJS, WORC, WKBN.

8:15—SINGIN' SAM. Sponsor: Barbasol Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO.

8:30—WAYNE KING'S ORCHESTRA. Sponsor: Lady Esther. NBC. WEAF, WCAE, WTMJ, WEEI, WJAR, WCSH, WFI, WRC, WGY, WTAM, WWJ, WTAG, WSAI, KSD, WOC, WHO, WOW, WBEN, KSTP, WMAQ, WDAF, WKY, KPRC, WOAI, WSM, WSB, WMC, WFAA, WKBF, WSMB.

8:30 — HORLICK'S ADVENTURES IN HEALTH. Talk by Dr. Herman Bundesen. Sponsor: Horlick's Malted Milk Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, KDKA, WLS, KOIL, WREN, CRCT, WLW, WGAR, WJR, KWK. **Also, 11:45—**KGO, KOA KGW, KOMO, KHQ, KDYL, KFI, KFSD, KTAR.

8:30—VOICE OF EXPERIENCE. Psychologist. Sponsor: Wasey Products, Inc. CBS. WABC, WCAO, WNAC, WGR, WBBM, WKRC, WHK, CKLW, WDRC, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WJSV, WBT. **Also, 11:45—**KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, KSL.

8:45—TRADE AND MARK. Billy Hillpot and Scrappy Lambert. Vocal duo. Sponsor: Smith Bros. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WSYR, WHAM, KDKA, WGAR, WJR, WLW, WLS, KWCR, KSO, KWK, WREN, KOIL.

8:45—KATE SMITH. Songs. CBS. WABC, WADC, WOKO, WCAO, WGR, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KLZ, WTAQ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC, WKBN.

9:00—BEN BERNIE'S BLUE RIBBON ORCHESTRA. Sponsor: Premier Pabst Sales Co. NBC. WEAF, WBAP, WTMJ, WTAG, WEEI, WJAR, WCSH, KOA, KSD, WRC, WFBR, WFI, WGY, WBEN, WTAM, WCAE, WLS, WWJ, WOC, WHO, WLW, WOW, KSTP, WDAY, KFYR, WSM, WMC, WSMB, WKY, WOAI, KPRC, WRVA.

9:00—HOUSEHOLD MUSICAL MEMORIES. Edgar A. Guest, poet. Vocalists and Josef Koestner's Orchestra. Sponsor: Household Finance Corp. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, KDKA, WKBF, WJR, WREN, KSO, WSYR, KWK, WKBF, WLS.

9:30—TEXACO FIRE CHIEF PROGRAM. Comedians, vocalists, orchestra. Sponsor: Texas Co. NBC. WEAF, WCSH, WFI, WJDX, WSMB, WRC, WFBR, WGY, WBEN, WJAR, WWJ, WEEI, WCAE, WTAM, WTAG, WMAQ, KDYL, KSD, WOW, WHO, WOC, WLW, WDAF, WIBA, KSTP, WEBC, WDAY, KFYR, WIS, WFLA, WRVA, WWNC, KFSD, WJAX, WIOD, KVOO, WMC, WKY, WOAI, KOA, KGIR, KGHL, KTAR, KTBS, KGO, KFI, KGW, KOMO, KHQ, WBAP, KPRC, WSM, WTMJ, WPTF, WSB.

9:30—NINO MARTINI. Songs. Music by Howard Barlow's Symphony Orchestra. CBS. WABC, WADC, WOKO, WCAO, WKBW, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KRLD, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, KOMA, WMBD, WMBG, WDBJ, WHEC, KTSA, KSL, WTOC, WIBW, CFRB, WACO, WMT, WSJS, WORC, WKBN, KFH.

10:00—LIVES AT STAKE. Dramatic Sketch and Orchestra. Sponsor: General Tire & Rubber Co. NBC. WEAF, WTAG, WJAR, WCSH, WFI, KHQ, WRVA, WFBR, WRC, WGY, WBEN, WTAM, WLW, WCAE, WWJ, KSD, WOC, WMAQ, WHO, WDAF, WSB, WMC, WJDX, WKY, KOMO, WSMB, WBAP, KPRC, KTPS, KOA, KTHS, WOAI, KDYL, KGO, KFI, KGW, KVOO, WOW, WSM, WEEI, WKBF.

10:30—MADAME SYLVIA OF HOLLYWOOD. Sponsor: Ralston Purina Co. NBC. WEAF, WEEI, WTAG, WRC, WGY, WBEN, WWJ, WMAQ, KSD, WOC, WHO, KOA, KDYL, WTMJ, WIBA, WEBC, KSTP, KGO, KFI, KGW, KOMO, KHQ.

WEDNESDAYS

5:00—SKIPPY. Drama. Sponsor: Sterling Products, Inc. CBS. WABC, WOKO, WCAO, WAAB, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WEAN, WFBL, WSPD, WJSV, WHEC, CFRB. **Also, 6:00—**WBBM, KMBC, WHAS, KMOX, WCCO.

5:30—SINGING LADY. Nursery jingles, songs and stories. Sponsor: Kellogg Co. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, WJR, KDKA, WGAR, WLW.

5:30—JACK ARMSTRONG, ALL AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30—**WBBM, KMOX, WHEC.

5:30—ADVENTURES OF TOM MIX AND HIS RALSTON STRAIGHT SHOOTERS. Drama. Sponsor: Ralston Purina Co. NBC. WEAF, WEEI, WTIC, WJAR, WTAG, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WCSH, WFBR.

5:45—WIZARD OF OZ. Drama. Sponsor: General Foods Corp. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOW, WDAF, WTMJ, KSTP, WIBA, WEBC, WDAY, KFYR.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, CRCT, CFCF, WLW, WHAM, WGAR, WJR, WRVA, WWNC, WIS, WJAX, WFLA, WPTF, KWK. **Also, 6:45—**WREN, KOIL, KWCR, KPRC, WOAI, WFAA, KTBS, WKY, KSTP, WEBC, WDAY, WBAP, KFYR.

6:00—BUCK ROGERS IN THE 25TH CENTURY. Drama. Sponsor: R. B. Davis Co. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, WCAU, WEAN, WJSV, WBT. **Also, 7:30—**WBBM, WKRC, WFBM, WHAS, KMOX, WCCO.

6:15—H-BAR-O RANGERS. Drama. Sponsor: Hecker H-O Co. CBS. WABC, WOKO, WAAB, WGR, WHK, WDRC, WCAU, WJAS, WEAN, WFBL, WLBZ, WHEC, WORC, WMAS. **Also, 9:00—**KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI.

6:30—BACK OF THE NEWS IN WASHINGTON. Political news comment by William Hard. NBC. WEAF, WJAR, WFBR, WRC, WWJ, WOC, WHO, KDYL, KFYR, WSM, WFAA, WIS, WWNC, WIBA, WDAY, WSAI, WGY, WSB, WJDX, KVOO, KPO, WMAQ, KTHS, KPRC, KTBS, KOA, WOAI, KGHL, KGIR.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBZ, WBZA, KDKA, WGAR, WHAM, WSYR, WLW, WBAL, WJR, CRCT, WJAX, WIOD, WFLA.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, CRCT, WMAL, WRVA, WPTF, WIOD, WGAR, WFLA, WHAM. **Also, 11:00—**WMAQ, WENR, KWK, WREN, WDAF, KOIL, KSTP, WSM, WMC, WSB, WSBM, KTHS, KPRC, WOAI, WKY, KOA, KGO, WJR, KGW, KFI, KHQ, KDYL, KOMO, WFAA, WCKY.

7:00—MOLLE SHOW. Charles Leland, comedian. Sponsor: Molle Co. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, KSD, WOC, WHO, WOW, WDAF.

7:00—MYRT AND MARGE. Drama. Sponsor: Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBD, WDAE, WBT, KRLD, WSFA, WTOC, WWVA. **Also, 10:45—**WBBM, WFBM, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, KLZ, KTRH, KLRA, WREC, WCCO, WODX, WLAC, WDSU, KOMA, KSL.

7:15—BILLY BACHELOR. Drama. Sponsor: Wheatena Corp. NBC. WEAF.

7:15—JUST PLAIN BILL. Drama. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WCAU, WJSV, CFRB.

7:30—LUM AND ABNER. Sketch. Sponsor: Ford Dealers. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFBR, WRC, WGY, WBEN, WTAM, WCAE, WKBF. **Also, 11:15—**WLIT, WENR, KSD, WOC, WHO, WDAF, WTMJ, WKBF, WIBA, WDAY, KFYR.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WSAI, WEEI, WJAR, WCSH, WFBR, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WENR, WOW, WDAF.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, WCAU, WJAS, WJSV, WBT, CKLW.

8:00—BERT LAHR AND GEORGE OLSEN'S ORCHESTRA. Sponsor: Standard Brands, Inc. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WLS, KSD, WOW, WDAF, WOC, WHO, WCKY, CFCF, CRCT.

8:00—ENO CRIME CLUES. Mystery drama. Sponsor: Harold S. Ritchie & Co. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WHAM, KDKA, WGAR, WLW, WMAQ, KWK, WREN, WJR.

8:00—HAPPY BAKERS. Sponsor: Continental Baking Co. CBS. WABC, WADC, WNAC, WGR, WGN, WHK, CKLW, WDRC, WFBM, WSPD, WJSV, WICC, WCAH, WMBG, WHEC, WWVA, WORC, WMAS.

8:15—EDWIN C. HILL. "The Human Side of the News." Sponsor: Barbasol Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO. **Also, 11:30—**KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, KSL.

8:30—POTASH AND PERLMUTTER. Drama. Sponsor: Health Products Co. NBC. WJZ, WBAL, WMAL, WHAM, KDKA, WGAR, WCKY, WLS, WJR, WSYR.

9:00—IPANA TROUBADOURS. Sponsor: Bristol-Myers Co. NBC. WEAF, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF, WRVA, WIS, WJAX, WIOD, WSM, WMC, WSB, WAPI, WSMB, KVOO, WKY, WFAA, WBAP, KPRC, WOAI, KTBS, KTHS, WTMJ, KSTP, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ.

9:00—WARDEN LAWES IN "20,000 YEARS IN SING SING." Sponsor: William R. Warner Co. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WSYR, WHAM, KDKA, WGAR, WJR, WCKY, WLS, KWCR, KSO, KWK, WREN, KOIL.

9:00—IRVIN S. COBB AND AL GOODMAN'S ORCHESTRA. Sponsor: Gulf Refining Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WKRC, WHK, CKLW, WOWO, WDRC, WHAS, WCAU, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WLBZ, WBRC, WICC, WBT, WDOD, WCAH, KRLD, WBIG, KTRH, KLRA, WFEA, WREC, WSFA, WLAC, WDSU, WTAR, WMBG, WDBJ, KTSA, WTOC, WMAS, WGLE, WJAS, WACO, WORC.

9:15—KATE SMITH. Songs. CBS. WABC, WADC, WOKO, WCAO, WKBW, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WJAS, WFBL, WSPD, WJSV, WQAM, WLBZ, WDOD, KVOR, KLZ, WLBW, WBIG, WHP, KTRH, KLAR, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, KOMA, WMBD, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, WIBW, CFRB, WACO, WMT, KFH, WSJS, WORC.

9:30—LEO REISMAN'S ORCHESTRA AND CONRAD THIBAULT, BARITONE. Sponsor: Philip Morris & Co. NBC. WEAF, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOW, WDAF, WTMJ, KSTP.

9:30—WHITE OWL PROGRAM. Burns and Allen; Guy Lombardo's Orchestra. Sponsor: General Cigar Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, CKLW, WOWO, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WBT, KRLD, KLZ, KTRH, WCCO, KOMA, KSL, KTSA, WORC.

10:00—CORN COB PIPE CLUB. Sponsor: Larus & Bros. Co. NBC. WEAF, WTIC, WTAG, WCSH, WRC, WFBR, WLIT, WGY, WWJ, WBEN, WTAM, WCAE, WENR, WLW, KSD, WOC, WHO, WOW, WDAF, KOA, KGIR, KGHL, KGO, KFI, KGW, KOMO, WEEI, WJAR, KHQ, KDYL, WTMJ, KSTP, WIBA, WEBC, WDAY, KFYR.

10:00—OLD GOLD PROGRAM. Fred Waring's Pennsylvanians. Songs and comedy. Sponsor: P. Lorillard Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WGN, WKRC, WHK, CKLW, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WPG, WLBZ, WBRC, WICC, WBT, WDOD, KVOR, WCAH, KRLD, KLZ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WLAC, WDSU, WTAR, KOMA, WMBD, KOH, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WIBW, WACO, WMT, WORC, WMAS, WNAX, WKBH, KFOR.

THURSDAYS

5:00—SKIPPY. Drama. Sponsor: Sterling Products, Inc. CBS. WABC, WOKO, WCAO, WAAB, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WEAN, WFBL, WSPD, WJSV, WHEC, CFRB. **Also, 6:00—**WBBM, KMBC, WHAS, KMOX, WCCO.

5:30—SINGING LADY. Nursery jingles, songs and stories. Sponsor: Kellogg Co. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, WLW, KDKA, WGAR, WJR.

5:30—JACK ARMSTRONG, ALL AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30—**WBBM, KMOX, WCCO.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, CFCF, KDKA, CRCT, WLW, WHAM, WGAR, WJR, WRVA, WIS, WWNC, WJAX, WFLA, WPTF. **Also, 6:45—**WREN, KOIL, KWCR, KPRC, WBAP, WOAI, WFAA, KTBS, WKY, KSTP, WEBC, WDAY.

6:00—BUCK ROGERS IN THE 25TH CENTURY. Drama. Sponsor: R. B. Davis Co. CBS. WABC, WADC, WOKO, WCAO, WAAB, WKBW, WHK, CKLW, WDRC, WCAU, WEAN, WBT. **Also, 7:30—**WBBM, WKRC, WFBM, WHAS, KMOX, WCCO.

6:15—H-BAR-O RANGERS. Drama. Sponsor: Hecker H-O Co. CBS. WABC, WOKO, WAAB, WGR, WHK, WDRC, WCAU, WEAN, WFBL, WLBZ, WHEC, WORC, WMAS.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WBAL, WBZ, WBZA, WJR, WSYR, KDKA, WGAR, WLW, CRCT, WHAM, WJAX, WIOD, WFLA.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WLW, WMAL, WRVA, WPTF, WIOD, WFLA, WGAR, CRCT, WHAM. **Also, 11:00—**WMAQ, WENR, KWK, WREN, WDAF, KOIL, KTHS, KOA, KPRC, WOAI, WKY, WFAA, WCKY, WJR, KDYL, KGO, KFI, KGW, KOMO, KHQ, WSMB, KSTP, WSM, WMC, WSB.

7:00—MYRT AND MARGE. Drama. Sponsor. Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, KRLD, WBT, WSFA, WTOC, CFRB, WWVA. **Also, 10:45—**WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, KLZ, KTRH, KLRA, WREC, WCCO, WODX, WLAC, WDSU, KOMA, KSL.

7:15—BILLY BACHELOR. Drama. Sponsor: Wheatena Corp. NBC. WEAF.

7:30—LUM AND ABNER. Sketch. Sponsor: Ford Dealers. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFBR, WRC, WGY, WBEN, WTAM, WLW, WCAE, WKBF. **Also, 11:15—**WFI, KSD, WOC, WHO, WTMJ, WDAF, WENR, WOW, WIBA, WDAY, KFYR.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WENR, WOW, WDAF.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, WCAU, WJAS, WJSV, WBT, CKLW.

8:00—FLEISCHMANN HOUR—RUDY VALLEE AND GUEST STARS. Sponsor: Standard Brands, Inc. NBC. WEAF, WTAG, WEEI, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, KSD, WOC, KDYL, WDAF, WHO, WOW, CRCT, CFCF, KSTP, WEBC, WDAY, WSM, WIOD, WJAX, WFLA, WMC, WAPI, WJDX, WJAR, WRVA, WSMB, WOAI, WKY, KOA, KFI, KGO, KGW, KOMO, WBAP, (WTMJ on 8:30), KTHS, KHQ, WPTF, WLW, WSB, KTAR, KFYR, KPRC.

8:00—CAPTAIN DIAMOND'S ADVENTURES. Dramatic sea story. Sponsor: General Foods Corp. NBC. WJZ, WBZ, WBZA, KDKA.

8:15—SINGIN' SAM. Sponsor: Barbasol Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO. **Also, 11:30—**KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI.

8:30—HORLICK'S ADVENTURES IN HEALTH. Talk by Dr. Herman Bundesen. Sponsor: Horlick's Malted Milk Co. NBC. WJZ, WBAL, KDKA, WLS, KOIL, WREN.

9:00—CAPTAIN HENRY'S MAXWELL HOUSE SHOW BOAT. Charles Winniger, Lanny Ross, Annette Hanshaw, others. Sponsor: General Foods Corp. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF, WTMJ, WRVA, WWNC, WIS, WJAX, WIOD, WFLA, WJDX, WMC, WSB, WAPI, WSMB, KTBS, WKY, KPRC, WOAI, WSM, WBAP, WCKY, KSTP, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR, KOA, KDYL.

9:00—DEATH VALLEY DAYS. Drama. Sponsor: Pacific Coast Borax Co. NBC. WJZ, WBZ, WBZA, WJR, WLW, WLS, KOIL, WREN, KDKA, WBAL, WHAM, WGAR, KWK.

10:00—AL JOLSON. Songs and comedy. Paul Whiteman's Orchestra, vocal specialties. Sponsor: Kraft-Phenix Cheese Corp. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WLW, KSD, WMAQ, WOC, WHO, WOW, WDAF, WTMJ, WIBA, KSTP, WEBC, WDAY, WIS, WJAX, WIOD, WFLA, WMC, WSB, WAPI, WJDX, WSBM, WKY, KTHS, WSM, WBAP, KTBS, KPRC, WOAI, KOMO, KOA, KDYL, KGO, KFI, KGW, KHQ, KFYR, WRVA, WWNC.

FRIDAYS

5:00—SKIPPY. Drama. Sponsor: Sterling Products, Inc. CBS. WABC, WOKO, WCAO, WAAB, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WEAN, WFBL, WSPD, WJSV, WHEC, CFRB. **Also, 6:00—**WBBM, KMBC, WHAS, KMOX, WCCO.

5:30 — SINGING LADY. Nursery jingles, songs and stories. Sponsor: Kellogg Co. NBC. WJZ, WBZ, WBZA, WBAL, WHAM, WJR, KDKA, WGAR, WLW.

5:30 — JACK ARMSTRONG, ALL-AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30—**WBBM, KMOX, WCCO.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, WHAM, WLW, WJR. **Also, 6:45—**WREN, KOIL, KWCR, KPRC, WOAI, KTBS, WKY, KSTP, WEBC, WDAY, KFYR, WBAP.

6:15—H-BAR-O RANGERS. Drama. Sponsor: Hecker H-O Co. CBS. WABC, WOKO, WAAB, WGR, WHK, WDRC, WCAU, WEAN, WFBL, WLBZ, WHEC, WORC, WMAS. **Also, 9:00—**KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI.

6:45—LOWELL THOMAS. News. Sponsor: Sun Oil Co. NBC. WJZ, WLW, WHAM, CRCT, WSYR, WGAR, WBZ, WBZA, KDKA, WJAX, WIOD, WFLA, WJR, WBAL.

7:00—AMOS 'N' ANDY. Drama. Sponsor: Pepsodent Co. NBC. WJZ, WBZ, WBZA, WBAL, KDKA, WLW, CRCT, WRVA, WPTF, WMAL, WFLA, WIOD, WGAR, WHAM. **Also, 11:00—**WMAQ, WENR, KWK, WREN, WDAF, KOIL, KDYL, KSTP, WSM, WMC, WSB, WSMB, WFAA, KTHS, WCKY, KPRC, WOAI, KHQ, WKY, KOA, KGO, KFI, KGW, KOMO, WJR.

7:00—MOLLE SHOW. Charles Leland, comedian. Sponsor: Molle Co. NBC. WEAF, WEEI, WTIC, WJAR, WTAG, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, KSD, WOC, WHO, WOW, WDAF.

7:00—MYRT AND MARGE. Drama. Sponsor: Wm. Wrigley, Jr., Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, KRLD, WBT, WSFA, WTOC, WWVA. **Also, 10:45—**WBBM, WFBM, KMBC, WHAS, KMOX, KERN, KMJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBRC, KLZ, KTRH,

KLRA, WREC, WCCO, WODX, WLAC, WDSU, KOMA, KSL.

7:15—BILLY BACHELOR. Drama. Sponsor: Wheatena Corp. NBC. WEAF.

7:15—JUST PLAIN BILL. Drama. Sponsor: Kolynos Sales Co. CBS. WABC, WCAO, WNAC, WGR, WKRC, WHK, CKLW, WCAU, WJSV, CFRB.

7:45—THE GOLDBERGS. Drama. Sponsor: Pepsodent Co. NBC. WEAF, WTAG, WENR, WOW, WEEI, WJAR, WCSH, WLIT, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WDAF, WFBR.

7:45—BOAKE CARTER. News. Sponsor: Philco Radio & Television. CBS. WABC, WCAO, WNAC, WGR, WBBM, WHK, WCAU, WJAS, WJSV, WBT, CKLW.

8:00—JESSICA DRAGONETTE AND THE CAVALIERS. Sponsor: Cities Service Co. NBC. WEAF, WTIC, WFAA, (WGY off 8:30). WDAF, WBEN, WTAG, WOAI, WTAM, WWJ, WSAI, KYW, KSD, WOC, WHO, WOW, CRCT, KOA, KPRC, KTBS, (WTMJ on 8:30), WEBC, WKY, WRVA, WEEI, KDYL, WJAR, KTHS, WCSH, WCAE, WLIT, WFBR, WRC.

8:00—NESTLE'S CHOCOLATEERS. Ethel Shutta, Walter O'Keefe and Don Bestor's Orchestra. Sponsor: Lamont Corliss & Co. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WSYR, KDKA, WGAR, WCKY, WLS, KWK, WJR.

8:00—HAPPY BAKERS. Sponsor: Continental Baking Co. CBS. WABC, WADC, WNAC, WGR, WGN, WHK, CKLW, WDRC, WFBM, WSPD, WJSV, WCAH, WMBG, WHEC, WMT, WWVA, WORC, WMAS, WICC.

8:15—EDWIN C. HILL. "The Human Side of the News." Sponsor: Barbasol Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WGN, WKRC, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, WCCO. **Also, 11:30—** KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, KLZ, KSL.

9:00—FRED ALLEN'S SALAD BOWL REVUE. Fred Allen and his dramatic company. Ferde Grofe's Orchestra. Sponsor: Best Foods, Inc. NBC. WEAF, WTIC, WTAG, WGY, WBEN, WTAM, WMAQ, KSD, WWJ, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WLW. **Also, 12:15 a.m., Saturday**—WDAF, KOA, KGO, KHQ, KOMO, KDYL, KFI, KFSD, KTAR, KGW.

9:00—LET'S LISTEN TO HARRIS. Phil Harris and his orchestra. Leah Ray, blues singer. Sponsor: Northam Warren Corp. NBC. WJZ, WBAL, WMAL, WBZ, WBZA, WSYR, KDKA, WGAR, WCKY, WLS, KWCR, KSO, KWK, WREN, KOIL, KGO, KFI, KGW, KOMO, KHQ, KOA, KDYL, KGIR, KGHL, WSM, WAPI, WSB, WSMB, WKY, WFAA, WOAI, CFCF.

9:00—IRVIN S. COBB AND AL GOODMAN'S ORCHESTRA. Sponsor: Gulf Refining Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WKBW, WKRC, WHK, CKLW, WGL, WDRC, WHAS, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WQAM, WDBO, WDAE, WGST, WLBZ, WBRC, WICC, WBT, WDOD, WCAH, KRLD, WBIG, KTRH, KLRA, WFEA, WREC, WSFA, WLAC, WDSU, WTAR, WMBG, WDBJ, KTSA, WTOC, WACO, WORC, WMAS, WGLE.

9:30—POND'S PROGRAM. Comedy and Songs. Sponsor: Lamont Corliss & Co. NBC. WEAF, WDAF, WWJ, WTAG, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WSAI, KSD, WOC, WHO, WOW, WMAQ, WTIC.

9:30—ALL-AMERICA FOOTBALL SHOW. Sponsor: General Foods Corp. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WBBM, WKRC, WHK, CKLW, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, WBT, WCAH, KRLD, KLZ, WHP, KTRH, WREC, WCCO, WLAC, WTAR, KOMA, WMBG, WHEC, KSL, KTSA, WIBW, WACO, WMT, KFH, WORC.

10:00—THE FIRST NIGHTER. Drama. Sponsor: Campana Corp. NBC. WEAF, WEEI, WTIC, WJAR, WTAG, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF, WKBF, WTMJ, KSTP, WEBC, WSM, WSB, WAPI, WSMB, WKY, WFAA, KPRC, WOAI, KTBS, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, CRCT, KFSD, KTAR.

10:30—LUM AND ABNER'S OLDTIME FRIDAY NIGHT SOCIAL. Sponsor: Ford Dealers. NBC. WEAF, WLIT, WRC, WFBR, WGY, WBEN, WTAM, WENR, KSD, WOC, WHO, WTMJ, WKBF, WLW, WTIC, WCAE, WCSH, WDAF, WTAG, WEEI, WJAR, WIBA, WDAY, KFYR.

SATURDAYS

2:30—SAVITT STRING QUARTETTE. CBS. WABC, WADC, WOKO, WCAO, WGR, WBBM, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KRLD, KLZ, WTAQ, WLBW, WBIG, WHP, KTRH, KFAB, KLRA, WFEA, WREC, WISN, WCCO, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WACO, WMT, WWVA, KFH, WORC.

4:00—WEEK-END REVUE. Variety. NBC. WEAF, WTAG, WJAR, WFBR, WRC, WGY, WTAM, WWJ, WEEI, WSAI, WDAF, WBEN, KSD, WLIT.

5:30—JACK ARMSTRONG, ALL-AMERICAN BOY. Drama. Sponsor: General Mills, Inc. CBS. WABC, WOKO, WCAO, WNAC, WGR, WHK, CKLW, WDRC, WCAU, WJAS, WEAN, WFBL, WSPD, WJSV, WHEC. **Also, 6:30—** WBBM, KMOX, WCCO.

5:45—LITTLE ORPHAN ANNIE. Drama. Sponsor: Wander Co. NBC. WJZ, WBAL, WBZ, WBZA, KDKA, CRCT, CFCF, WLW, WHAM, WGAR, WJR, WRVA, WWNC, WIS, WJAX, WFLA, WPIF. **Also, 6:45—**WREN, KOIL, KWCR, WOAI, WFAA, KTBS, WKY, KSTP, WEBC, WDAY, WBAP, KFYR.

7:00—FREDERIC WILLIAM WILE. "The Political Situation in Washington Tonight." CBS. WABC, WADC, WOKO, WCAO, WGR, WBBM, WHK, CKLW, WDRC, KMBC, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WLBZ, WBT, WDOD, KVOR, WTAQ, WLBW, WBIG, WHP, KTRH, KFAB, KLRA, WFEA, WREC, WISN, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WIBW, WACO, WMT, WWVA, KFH, WSJS.

8:00—RAY PERKINS AND SHIRLEY HOWARD. Sponsor: Liebmann Breweries, Inc. NBC. WJZ.

8:30—GOLDENROD REVUE. Phil Spitalny's Orchestra; soloists. Sponsor: Hittleman Goldenrod Brewery. CBS. WABC, WCAO, WNAC, WDRC, WCAU, WEAN, WJSV, WLBZ, WICC, WFEA, WORC, WMAS.

8:45—GERTRUDE NIESEN. Songs. CBS. WABC, WADC, WOKO, WCAO, WGR, WHK, CKLW, WDRC, WFBM, KMBC, WCAU, WJAS, WFBL, WSPD, WJSV, WQAM, WPG, WLBZ, WBT, WDOD, KVOR, KLZ, WTAQ, WLBW, WBIG, WHP, KTRH, KLRA, WFEA, WREC, WISN, WCCO, WODX, WLAC, WDSU, KOMA, WMBG, WDBJ, WHEC, KSL, KTSA, WTOC, WSBT, CFRB, WACO, WMT, WWVA, KFH, WSJS, WORC.

9:00—JACK PEARL AND AL GOODMAN'S ORCHESTRA. Sponsor: American Tobacco Co. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WLW, WMAQ, KSD, WOW, WDAF, WTMJ, WIBA, KSTP, WEBC, WDAY, KFYR, WRVA, WWNC, WIS, WJAX, WIOD, WFLA, WMC, WSB, WAPI, WJDX, WSMB, WKY, KTHS, WBAP, KTBS, KPRC, WOAI, KOA, KDYL, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR, KGU.

10:00—SATURDAY NIGHT DANCING PARTY. B. A. Rolfe's Orchestra. Sponsor: Hudson Motor Car Co. NBC. WEAF, WEEI, WJAR, WTAG, WCSH, WFI, WFBR, WGY, WBEN, WTAM, WCAE, WWJ, WLW, WMAQ, KSD, WOC, WHO, WOW, WDAF, WRC, CRCT, KSTP, WSB, WSMB, WBAP, KGW, KOA, KDYL, KGO, KFI, WTMJ, KOMO, WRVA, WJAX, WOAI.

SUNDAYS

11:00 A. M.—HORN & HARDART HOUR. Juvenile entertainers. Sponsor: Horn & Hardart Co. CBS. WABC.

11:15 A.M.—MAJOR BOWES' CAPITOL FAMILY. Variety. NBC. WEAF, WJAR, WFBR, WRC, WTAM, WDAF, WFLA, KFYR (WAPI, WHO, WOC off 11:45), WSMB, WTAG, KDYL, WEBC, WJAX, WFAA, WGY, WDAY, WSAI, KSTP, WMC, WIOD, WKY, KTBS, WOAI, WMAQ, WWNC, KPRC, KOA, WCAE, KVOO, WRVA.

12:30—RADIO CITY CONCERT. Variety. S. L. Rothafel (Roxy), master-of-ceremonies. NBC. WJZ, WBAL, WHAM, WGAR, KDKA, WDAY, KFYR, WSMB, KPRC, KOA, KDYL, WAPI, KGO, KOMO, KHQ, WMAL, WEBC, WJDX, WIS, WCKY, KSO, WOAI, KVOO, WSYR, CRCT, WJR (KTHS off 1:00), WWNC, WKY, KFI, KGW, WREN, KOIL, WBZ, WBZA, CFCF.

3:00—WAYNE KING'S ORCHESTRA. Sponsor: Lady Esther. NBC. WEAF, WTAG, WEEI, WCSH, WLW, KSD, WOC, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WHO, WOW, WJAR, WLIT, KFI, WLS, WTMJ, KSTP, KGW, KHQ, KVOO, KDYL, WKY, WOAI, KPRC, WFAA, KOA, KGO, KOMO, WKBF.

5:00—ROSES AND DRUMS. Drama. Sponsor: Union Central Life Insurance Co. CBS. WABC, WADC, WCAO, WNAC, WGR, WBBM, WKRC, WHK, CKLW, KMBC, WHAS, WJAS, KMOX, WJSV, WGST, WBRC, KLZ, KTAT, KTRH, KLRA, WCCO, WDSU, KOMA, KTSA, WRR, WREC.

5:30—FRANK CRUMIT AND JULIA SANDERSON. Songs. Sponsor: General Baking Co. CBS. WABC, WADC, WOKO, WCAO, WAAB, WGR, WHK, CKLW, WDRC, WFBM, KMBC, WHAS, WCAU, WEAN, KMOX, WFBL, WSPD, WJSV, WICC, WCAH, KFAB, WDSU, WTAR, KOMA, WHEC, WWVA, KFH, WORC, WMAS.

6:00—CATHOLIC HOUR. NBC. WEAF, WTAG, WEEI, WJAR, WCSH, WLIT, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WIOD, WEBC, KFYR, WRVA, WOAI, WSAI, WOC, WHO, WOW, WDAF, WIBA, WFLA, WSM, WMC, WSMB, WKY, KOA, KGHL, WJDX, WBAP, KPRC, WWNC, KSTP, KGIR, KPO, WAPI, WJAX, KECA, KGW, WIS, WSB, KTBS, KDYL, KOMO, WENR, KTAR, KVOO, WDAY.

8:00—CHASE AND SANBORN HOUR. Stage Stars. Songs and humor. Dave Rubinoff's Orchestra. Sponsor: Standard Brands, Inc. NBC. WEAF, WIOD, WFLA, WMC, WJDX, KTAR, WBEN, WCAE, WTAM, WWJ, WLW, KSD, WOC, WHO, WDAF, CFCF, WSB, KFYR, WWNC, WIS, KDYL, KPRC, WKY, CRCT, WTMJ, KSTP, WEBC, WDAY, KVOO, WFAA, WOAI, KOA, KGO, KFI, WFBR, WRC, WGY, KGW, KOMO, KHQ, WPTF, WSM, WOW, WJAR, WCSH, WTIC, WTAG, WMAQ, WRVA (WAPI off 8:30), KTHS, WSMB, WJAX, WLIT.

8:30—CHOIR INVISIBLE. Orchestra directed by George Shackley. WOR.

9:00—MANHATTAN MERRY-GO-ROUND. Orchestra and vocalists. Sponsor: R. L. Watkins Co. NBC. WEAF, WTIC, WJAR, WFBR, WRC, WGY, WWJ, WSAI, WMAQ, KSD, WOC, WHO, WOW, WDAF, KHQ, KOA, KDYL, KGO, KFI, KGW, KOMO, WFI, WTAM.

9:00—GULF HEADLINERS. Sponsor: Gulf Refining Co. NBC. WJZ, WBAL, WBZ, WBZA, WHAM, WGAR, WJR, WLW, WSYR, WMAL, WRVA, WPTF, WWNC, KVOO, WFLA, WSM, WMC, WSB, WIOD, WJDX, WSMB, KTHS, WFAA, KTBS, KPRC, WOAI, KDKA, WJS.

9:00—SEVEN STAR REVUE. Nino Martini, Erno Rapee and Orchestra, Jane Froman, Julius Tannen, Ted Husing; others. Sponsor: Corn Products Refining Co. CBS. WABC, WADC, WOKO, WCAO, WNAC, WGR, WBBM, WKRC, WHK, CKLW, WOWO, WDRC, WFBM, KMBC, WHAS, WCAU, WJAS, WEAN, KMOX, WFBL, WSPD, WJSV, KERN, KMJ, KHJ, KOIN, KFBK, KGB, KFRC, KDB, KOL, KFPY, KWG, KVI, WGST, KRLD, KLZ, KTRH, KLRA, WREC, WISN, WCCO, WDSU, WTAR, KOMA, KSL, WMT, WORC, KSCJ, WNAX.

9:30—WALTER WINCHELL. Gossip. Sponsor: Andrew Jergens Co. NBC. WJZ, WBAL, KOIL, WMAL, WBZ, WBZA, WSYR, WHAM, KDKA, WGAR, WJR, WLW, WENR, KWCR, KSO, KWK, WREN.

9:30—AMERICAN ALBUM OF FAMILIAR MUSIC. Vocal and instrumental specialities. Concert orchestra. Sponsor: Bayer Co. NBC. WEAF, WTAG, WEEI, WCKY, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, KSD, WSAI, WMAQ, WOC, WHO, WOW, WIOD, WFLA, WMC, WSB, WOAI, WJDX, WFAA, KFI, KGW, KOMO, KHQ, WSMB, KDYL, WKY, KOA, KPRC, KGO, WDAF, KVOO, WRVA, WJAX, WTMJ, KSTP, WPTF, CFCF, WSM, CRCT.

10:00—JACK BENNY AND MARY LIVINGSTONE. Comedy. Orchestra directed by Frank Black. Sponsor: Chevrolet Motor Car Co. NBC. WEAF, WTIC, WTAG, WEEI, WJAR, WCSH, WFI, WFBR, WRC, WGY, WBEN, WCAE, WTAM, WWJ, WMAQ, WOW, WDAF, WTMJ, WIBA, KSTP, WEBC, WDAY, KFYR, WRVA, WWNC, WIS, WIOD, WFLA, WKY, WBAP, KTBS, KPRC, WOAI, KOA, KDYL, KGIR, KGHL, KGO, KFI, KGW, KOMO, KHQ, KFSD, KTAR, WSM, WMC, WSB, WAPI, WJDX, WSMB.

JOHN S. YOUNG

SINGIN' SAM

EDDIE CANTOR

Personal interviews with broadcast artists and executives

Backstage in

By Samuel

JOHN S. YOUNG, youthful NBC announcer, is one of the most popular microphone spokesmen in the chain's New York studios. Like many other announcers of the network, Young started his broadcasting career at Station WBZ, Boston. It seems that WBZ and the Schenectady transmitter, WGY, are the two stations supplying the most stellar announcers to the NBC New York staff. Young was born in Springfield, Mass., thirty years ago. He attended Yale, where he studied drama under George Pierce Baker. Rudy Vallee was one of his classmates. At NBC, Young is regarded as a model for successful announcing. A few months ago he received an honorary degree of Doctor of Laws from St. Benedict's College. The degree was conferred primarily for his work on such broadcasts as the Sunday Catholic Hour, the inaugural broadcast of Pope Pius, the broadcast of Cardinal O'Connell from the Eucharistic Congress in Dublin, and other programs of similar nature. While broadcasting from Boston, his announcing at football games and symphonic concerts resulted in an invitation to join the NBC. In addition to his numerous studio assignments, Young is often assigned to spot news broadcasts.

HENRI DEERING, young American pianist, is one of the latest big names in the concert field to be lined up by NBC for a weekly broadcast series. Deering is a native of St. Louis. He was a church organist at the age of ten. A year later he made his début as a concert artist. He pursued musical studies through his teens, but his advanced training was interrupted by the World War. He gave up music and enlisted as a machine gunner with the 77th Division. Later he was detailed with the Army of Occupation in Coblenz. After being demobilized, Deering again pursued musical studies in Paris and Berlin. He made his European début in Berlin in 1922 and was soon booked for engagements in all important European music centers. He returned to the United States in 1925 and since that date has divided his time between musical engagements on both continents. He is in demand as a soloist and has appeared with the New York Philharmonic, the St. Louis Symphony, the San Francisco Symphony and the Cleveland Symphony orchestras. Deering is especially noted for his interpretation of the works of Claude Debussy, the great French composer.

TWO of last season's outstanding network features—Edwin C. Hill, the news commentator, and Harry Frankel, who is better known as Singin' Sam—are brought together as co-stars of the new Barbasol programs heard over CBS daily, excepting Saturdays and Sundays. Singin' Sam has been sponsored by the Barbasol Company for two years, while Hill has appeared on a sustaining feature, "The Human Side of the News," and a commercial series, "The Inside Story." Hill is considered by many radio listeners as the air's ace news commentator. Hill is featured on the Monday, Wednesday and Friday Barbasol broadcasts. Frankel, who is starred on the Tuesday and Thursday periods, is an old-time minstrel performer. His programs, consisting of a blend of old and new songs, have always won favorable comment. In addition to having two of the five weekly broadcasts to himself, Singin' Sam also opens and closes the Hill programs with his familiar theme song.

SINCE the Old Gold program, starring Fred Waring's Pennsylvanians, was launched on CBS last Winter, the period has become one of the outstanding commercial offerings on the networks. Waring's unusual aggregation of vocalists and instrumentalists brought a new program style to the air that clicked in a big way. The program is broadcast from the main auditorium of Carnegie Hall each Wednesday night before some 3000 guests who are fortunate enough to obtain tickets. After each broadcast, the Waring troupe puts on a special half-hour show for the visible audience. The program was recently augmented by the signing of Harry Richman and Milton Berle as regular weekly features. Richman, a veteran stage and radio entertainer, was assigned to comedy dialogue parts with Berle in addition to his singing rôle. Berle is still in his twen-

HENRI DEERING

EDWIN C. HILL

WARING'S PENNSYLVANIANS

HARRY RICHMAN

RUTH ETTING

JIMMY DURANTE

Broadcasting

Chatty bits of news on what is happening before the microphone

Kaufman

ties and has been quite sensational in his vaudeville efforts. He is a newcomer to the ranks of weekly radio artists but seems to have a style especially adapted for the microphone.

JIMMY "SCHNOZZLE" DURANTE, the big-nosed funny man of the stage and screen, has taken up radio in a big way as star of the Sunday night Chase & Sanborn Coffee Hour (NBC). Sharing headline honors with Durante is Ruth Etting, famed Ziegfeldian vocalist, who has already won a wide radio following through previous air assignments. Durante, too, has been heard over the air before, but it was always as a guest star. This series marks his first weekly radio schedule. The Durante-Etting team was created for the program when it was learned that prolonged motion picture activities on the West Coast prevented Eddie Cantor from returning to his old comedy rôle on the program on the scheduled date. Perhaps by the time this item is published Cantor will already be back on the program. Bert Lahr, the stage comic, who was featured on the program for an extended period, still represents the same sponsors as star of the Wednesday night Chase & Sanborn Tea Hour (NBC). The Durante-Etting programs have been originating on the West Coast. Dave Rubinoff's orchestra supplies the musical background for Durante and Etting and will do the same for Cantor upon his return to the air. Durante is a product of the burlesque stage. His second venture was vaudeville as a member of the comedy trio of Clayton, Jackson and Durante. The comedians soon were in demand as New York night club entertainers. Hollywood snatched Durante and he scored favorably in the talking films with his mad comedy. Ruth Etting, recently featured on a CBS series, earned a wide following for the heart-throbbing manner in which she sings sentimental ballads. She was once a chorus girl. While appearing in a musical show, the star became ill and Ruth was given the rôle. She won instant recognition as a vocalist and after a vaudeville tour attained stardom in several Ziegfeld musical productions.

IT seems that the comics have a strong grip on broadcasting that will not be weakened for a considerable time. From the vaudeville boards, radio has drafted Joe Penner, a youthful comedian who less than a decade ago was a factory worker in the Detroit Ford plant. Penner's successful guest appearances on Rudy Vallee's Thursday Fleischmann Yeast program led to the starring of the vaudevillian on the new Fleischmann Bakers' Broadcast presented over the NBC Sunday nights. Co-starred with Penner is Ozzie Nelson, orchestra conductor, and Harriet Hilliard, vocalist. Nelson is a familiar microphone personality to many listeners who have followed his previous sustaining broadcasts from various restaurants. This series marks his first network commercial engagement. Nelson attended Rutgers University, where he became an All-American quarterback.

NEILA GOODELLE, charming vocal soloist with Buddy Rogers' California Cavaliers, is frequently featured on the orchestra's NBC broadcasts from Chicago. Neila is a native of New York State and received her early professional training on the musical comedy stage. She appeared in the "Garrick Gaieties" and succeeded Ruth Etting in one of the annual editions of the Ziegfeld Follies. For the past two years she has been a featured night club performer. Prior to joining the Buddy Rogers band, Neila was a featured songster with Guy Lombardo's Orchestra at a Chicago restaurant.

THE Big Show" is the fitting title of the new all-star series presented over the CBS Monday nights. The half-hour period, authored by David Freedman, script writer for many of radio's leading comics, features Lulu McConnell, stage star, Gertrude Niesen, torch singer, and Isham Jones' Orchestra. Paul Douglas, the announcer who directs the juvenile entertainers on the Sunday Horn and Hardart Hour over WABC, serves as master of ceremonies of "The Big Show." Miss McConnell's appearances on the vaudeville and legitimate stage won her a huge

(*Continued on page 374*)

NEILA GOODELLE

MILTON BERLE

JOE PENNER

Technical Review

RADIO SCIENCE ABSTRACTS

Radio engineers, laboratory and research workers will find this department helpful in reviewing important current radio literature, books, Institute and Club proceedings and free technical booklets

Conducted by

Joseph Calcaterra

The Inductance Authority, by Edward M. Shiepe; published by Herman Bernard, 1933. For the first time, so far as we know, a complete set of curves has been calculated for the inductance of single-layer solenoids which will answer the oft repeated question "How many turns?" Mr. Shiepe has calculated the inductance of a sufficient number of coils, with different diameters, kind of wire and number of turns, to enable him to draw curves. This set of curves, contained in his book, gives the relation between number of turns and inductance for different sizes of wire and for diameters varying from ¾ inch to 3 inches.

The book contains some forty charts. The first one shows the relation between wavelength, inductance and capacity; it covers frequencies from 100 kc. to 20,000 kc. A larger chart of the same relation is furnished separately to each purchaser of the book; the latter covers frequencies from 5 kc. to 50,000 kc. The second chart shows the tuning range to be expected when the minimum and maximum capacity is known. Then follow the coil charts, each of which is for a different size of wire or different insulation (from number 14 to number 32 B. & S.). On every chart, microhenries are plotted against number of turns on logarithmic paper and there are 13 curves on each chart (for 13 different diameters). Thus it is possible to interpolate between these curves if a diameter happened to be an odd size. In the introduction the use of the curves is explained together with the modifications necessary to allow for shielding, spaced winding, etc. The curves were calculated from Nagaoka's formula employing the latest correction factors. The details of this are also explained in the text. Mr. Shiepe deserves the heartfelt thanks of the radio fraternity for solving once and for all this vexing problem.

Industrial Research Laboratories of the United States, by C. J. West and C. Hull; fifth edition. Published by the National Research Council, 1933. This is an alphabetical list of research laboratories in the United States, including consulting research laboratories. The following information is given on each laboratory listed: Name of company, address, research staff (name of the chief and number of engineers, physicists, etc.), and a short summary of the kind of work undertaken in that laboratory. The index facilitates finding all laboratories studying a certain subject; such as: Abrasives, Accelerators, Acetylene, Acids, Acoustics, etc.

Sound Amplification Systems. We have received from the Miles Reproducer Co. a new catalogue covering their public address amplifiers, various types of microphones, portable and stationary p. a. systems and loudspeakers. Readers of RADIO NEWS may obtain this catalogue free of charge direct from the manufacturer.

American vs. British System of Radio Control, compiled by E. C. Buehler. Vol. VIII, No. 10, of The Reference Shelf. The H. W. Wilson Co., 1933. This number of the reference shelf is prepared primarily for students in the field of debate. It consists of: Introduction, Briefs, a bibliography and reprints of articles which have appeared in various periodicals during the last few years.

Review of Articles in the September, 1933, Issue of the Proceedings of the Institute of Radio Engineers

The Radio Patrol System of the City of New York, by F. W. Cunningham and T. W. Rochester. This paper describes the New York radio patrol system from an organization viewpoint and gives brief information on the selection of a suitable receiving system for given local conditions.

An Outline of the Action of a Tone Corrected Highly Sensitive Receiver, by E. B. Moullin. This article analyzes the action of a highly selective simple tuned circuit located between a source of radio-frequency energy and the terminals of a detector. The effect of linear and square-law detection together with an audio-frequency tone correction system is described and various interference conditions are analyzed with the aid of graphical construction.

A Study of Reception from Synchronized Broadcast Stations, by Charles B. Aiken. This paper points out and discusses the factors which tend to produce distortion under certain conditions when a synchronized program is sent out by a number of stations on the same frequency.

Notes on Television Definition, by William H. Wenstrom. The degree of definition required in television transmission to adequately portray various subject matter under various conditions is discussed in this article.

Low-Frequency Radio Receiving Measurements at the Bureau of Standards in 1931 and 1932, by E. B. Judson. This report gives the monthly and annual averages of field intensities of ten European and three American low-frequency transatlantic radio stations between frequencies of 16 and 24 kilocycles, and the field intensity of atmospherics on 15 and 23 kilocycles, observed at the Bureau of Standards, for the years 1931 and 1932.

Note on a Modified Reactance-Frequency Chart, by J. R. Tolmie. This article contains a chart and description of a method which makes it possible to read directly, the susceptances or reactances of any coil or condenser falling within the range of the chart.

Review of Contemporary Literature

Filters in Action, by C. E. Lane. Bell Laboratories Record, September, 1933. A simple exposition of the principles involved in the design of various types of electrical filters. The action of mechanical filters is used to demonstrate the action which takes place in electrical filter circuits.

Direct Current Conduction in Dielectrics,

by E. J. Murphy. Bell Laboratories Record, September, 1933. This article points out the many variable factors involved in the direct-current conduction of dielectrics and the many ways in which different conditions affect the conductivity of dielectrics.

The Use of Triode Vacuum Tube Rectifiers to Supply Constant Voltage, by L. A. Richards. The Review of Scientific Instruments, September, 1933. The article describes the methods used to obtain constant d.c. voltage outputs by using triode tubes as rectifiers with the changes in the a.c. line-voltage control the grid bias of the triode rectifiers.

String-Controlled Alternating-Current, by L. H. Stauffer. The Review of Scientific Instruments, September, 1933. A device for generating alternating current of variable frequency (50 to 1000 cycles per second) is described in this article. Simplicity, continuous frequency control and ease of calibration are features of this device. Many applications of the device are described.

A Study of the Velocity of Sound in Air, by Martin Grabau. The Journal of the Acoustical Society of America, July, 1933. An investigation of the velocity of sound in relatively unconfined air at frequencies ranging from 20,000 to 70,000, and a study of certain irregularities of the wave system near the source, using a magnetostriction oscillator as the sound source.

Beat-Frequency Oscillator, by Marcus F. Cooper and Leonard G. Page. The Wireless Engineer and Experimental Wireless, September, 1933. This article describes a power line operated instrument primarily designed for testing talking picture recording apparatus and commercial amplifier equipment.

Improving Quality in Broadcast Transmission, by H. H. Scott. General Radio Experimenter, August-September, 1933. This article points out the importance of periodical checking of transmitter characteristics as a means of maintaining quality transmission. The instruments necessary to perform such check-ups and their use are described.

Loudspeaker Cost vs. Quality, by Hugh S. Knowles. Electronics, September, 1933. This article contains a practical discussion of the influence of cost on performance, taking into consideration the factors of size, loudness, efficiency, type of response and power-handling capacity affected by price limitations.

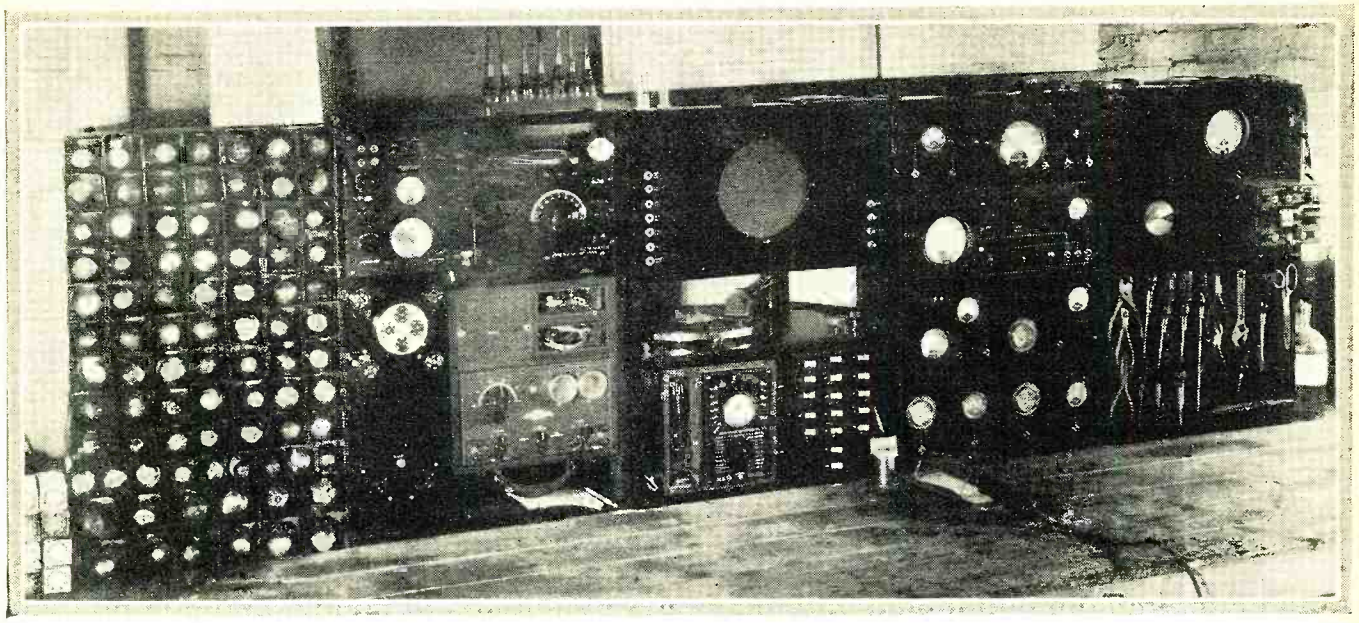
Plate Supplies to Conform to the New Regulations, by George Grammer. QST, September, 1933. A discussion of what constitutes "adequate" filtering in the design and operation of amateur transmitters to prevent interference, and the methods which can be employed to obtain satisfactory filtering at minimum cost.

The New Amateur Regulations, by K. W. Warner. QST, September, 1933. A complete listing and explanatory notes on the new amateur regulations, effective October 1st, covering wave-band allocations, d.c. power supply requirements, combination station-operator licenses and other extensive changes.

National Service Codes, by John F. Rider. Service, August, 1933. A number of suggestions are made in this article for the consideration of those interested in preparing national service codes for servicemen.

Platt Lets Them See the Difference. Radio Retailing, September, 1933. How the graphical presentation of the difference between the construction and cost of midget and larger

(*Continued on page* 364)



The Service Bench

Service Sales Promotion—New Sales Ideas—Sales and Follow-Up Letters—Service Clubs—The Service Shop De Luxe—Servicing A.V.C. Circuits—Tube Short Indicator—Spartons—Zeniths

Conducted by
Zeh Bouck

EMERSON pointed out that if you build a better mouse trap than anyone else, the world will beat a path to your door, even if you live in the middle of the woods. But Emerson was a philosopher, not a salesman. It takes a long time to beat a track through the woods. Build a good mouse trap, surely, but put it on display at Broadway and Forty-second Street, with streamers leading to attractively lettered cards proclaiming its superior features, and you'll sell a lot more traps—more quickly.

A Christmas Sales Idea

The gift certificate has, for some years, been a popular Yuletide presentation, and for many thousands has solved the ever-perplexing problem of what to give. The gift certificate is a simple order on a store, garnished with holly and Xmas bells, for a stated amount of merchandise deliverable to bearer. The choice of goods is, of course, left to the recipient.

The same idea merits a chance in the radio service business. There is just about time enough, as you receive this issue of RADIO NEWS, for the ambitious serviceman to circularize his active clientele along the following lines:

"My dear Mr. .....: Are you puzzled about what to give your radio fan friend for Xmas? Why not make him a present of guaranteed care-free radio reception for the coming year by sending him one of the enclosed gift cards filled out by yourself and endorsed by us?

"It can be made out for any amount desired. Five dollars will usually provide a year's service on a good receiver, including the essential tube replacements. Strict accounting of work will be kept and forwarded to you. You pay us only as the work is done. (If you care to remit in advance, 20% additional service will be rendered, free of charge. In other words, ten dollars in advance will pay for twelve dollars' worth of servicing on your friend's radio. You will still receive an accounting for the work done.)

"All that is necessary is for you to fill out the enclosed gift certificate, with the exception of the space provided for our endorsement, and mail it to us. Record will be made of your friend's name and address and the amount of service to which your generosity entitles him. The card will then be signed and returned to you with a special gift envelope in which you may mail it to your friend.

"You know us and our work and may rest assured that the same service we have rendered you will characterize our efforts in behalf of the recipient of this Xmas gift.

"Needless to add, we extend to you, personally, the season's greetings and our best wishes for a prosperous and happy New Year—in radio and everything else!

"Yours sincerely,

....."

The following suggests a gift certificate for enclosure with the above letter:

$.... RADIO GIFT CERTIFICATE $....

The season's greetings to: .....
..... May your tubes burn brightly and reception be staticless for a long time to come! In case of radio trouble, call on

The ACME RADIO SERVICE COMPANY
Day and Night Service
Tel. Main 106 *101 Elm Street*

This certificate entitles you to $..... worth of service, which may include repairs, tube replacements, etc., with the compliments and best wishes of

(Signature) .....
Endorsed by .....
Acme Radio Service Co.

Your local printer can work up an attractive certificate with the usual seasonal decorations. It would be a good idea to enclose with the gift order, a small sticker which could be pasted inside the radio cabinet, carrying the name of the service company, address and telephone number.

Follow-up Letters

An excellent follow-up letter has been prepared by the Edwards Radio Service of Washington, D. C. It is addressed to previous customers, signed by the manager, and reads:

"Dear Customer: Some time ago we had the pleasure of servicing your radio and sincerely hope that our work was satisfactory in every respect.

"We have recently added several men to our staff of technicians and also new service cars. They are stationed in every section of the city to give you prompt and efficient service.

"Our radio laboratory is equipped with the latest and most accurate testing apparatus obtainable, and is in a location free from outside electrical disturbances, thus eliminating all guesswork in the analysis and repair of your radio.

"If your radio is not working properly, call us and we will dispatch one of our experts to put it in first-class condition.

"Very truly yours,
"Edwards Radio Service.

"P.S.: Remember that there is no charge for testing tubes or radios when you bring them to our store. We also specialize in automobile radio repairing."

Personal follow-ups by a representative are also a part of the Edwards Radio Service scheme of things. If no one is at home, the attractive card shown in Figure 1 is left in the mail-box or slipped under the door. This card is printed on a good-quality, heavy-weight gray stock.

Kinney Brothers Radio, San Diego, California, recently sent the following letter to their mailing list:

"Dear Sir: We extend to you a very cordial invitation to visit our store, to see and

hear the splendid new line of radios which we have selected for your approval.

"Neither time nor expense was spared in producing the various units in our present lines. Every receiver and loudspeaker had to measure up to high standards of quality before being considered worthy to maintain the prestige which years of excellent service have earned for them.

"You will find in our three lines of radios, console models at very attractive prices—receivers employing the famous superheterodyne circuits—sets in which the new screen-grid Radiotrons are used—and Radiola phonograph combinations which leave nothing to be desired.

OUR special radio inspector called to ascertain if the the technical work we did on your radio recently was satisfactory. As you were not home we could not give it our final inspection. If your radio is not satisfactory kindly let us know, as all of our work is guaranteed. Q Q

EDWARDS' RADIO SERVICE

Line. 4995-9118 ··· Massachusetts Ave. at Ninth St. N. E.

FIGURE 1

"Added to the mechanical perfection of every Bosch, Atwater Kent and Radiola, is the beauty of the cabinets in which they are encased. Tapestry panels, maple inlays and matched walnut lend both charm and dignity to these new models, which are worthy both of the manufacturer and of a place in your home.

"Phone Main 3050 for a demonstration of the model you are interested in, or call on us in the near future—you will be an expected and welcome guest."

Both of the above letters are set up in typewriting style type and are printed on the companies' letterheads. The Edwards letter carries a facsimile signature printed with the letter. Our preference is for individual and personal signatures.

More About the Radio Service Club

In the *Service Bench* for July, 1933, we published a letter from Raymond Schaaf of Petoskey, Michigan, in which he requests data from servicemen who have tried the service club idea, whereby clients, by joining up and paying dues, are guaranteed service for the tenure of their membership.

Mr. Herman Spencer of 204 Townsend Street, Sandusky, Ohio, answers Mr. Schaaf:

"I have had this idea in mind for a long time, and recently had my membership blanks printed, a sample of which is enclosed.

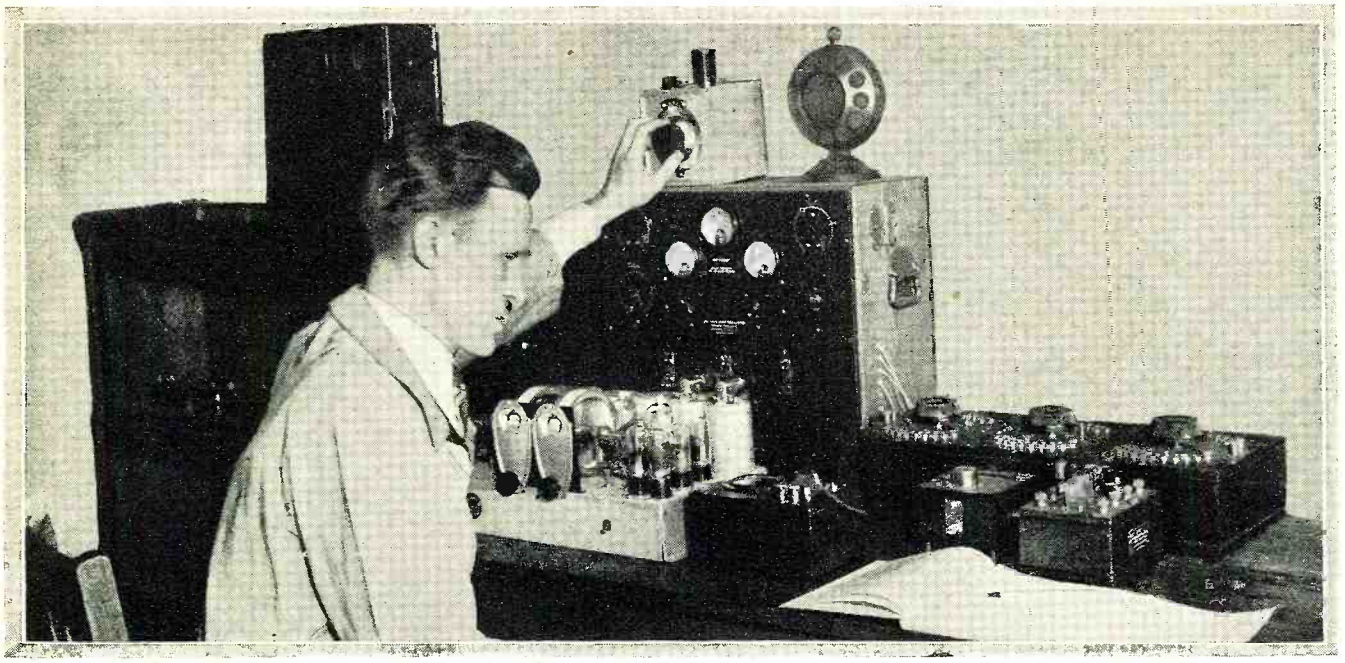
"Members' dues are five dollars a year, payable in advance, or, on a time-payment plan, one dollar a month for the first six months of the year.

"An excellent feature in the club idea is the possibility of securing members through radio sales by other stores. You can call on radio sales dealers, furniture stores, general stores, etc., and get them to add the membership fee to the retail price of each set they sell, whereby the purchaser is guaranteed perfect radio reception for a year from the time of buying the receiver. This idea has its appeal to such dealers because, as you know, they often have no servicing facilities.

"I have started this plan with excellent results so far. I shall welcome letters from readers of RADIO NEWS if I can be of any further assistance."

The "Certificate of Membership" issued by Mr. Spencer is printed on "safety paper," such as is used for bank checks, and provides space for the following information: Date, expiring date, year and type of radio, number of tubes, name and address. It an-

(*Continued on page 369*)



With the Experimenters

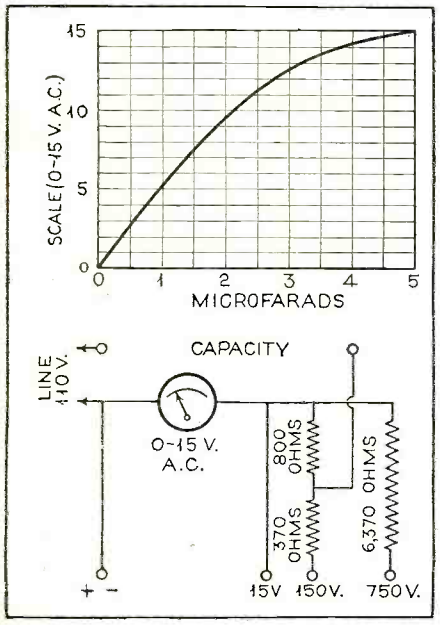
A.C. and Capacity Meter, Automatic Tone Control, Simple Lightning Arrestor, A.C.-D.C. Indicator, A.V.C. for Battery Receivers

Conducted by
S. Gordon Taylor

Capacity Meter and Multi-Range A.C. Voltmeter

Practically all amateurs and experimenters are desirous of owning an a.c. voltmeter with several ranges, and one which would indicate capacities as well. As an a.c. filament voltmeter can be converted, it should not be necessary to be without one.

The meter used by the writer for this purpose was a Jewell Pattern 74 a.c. volt-



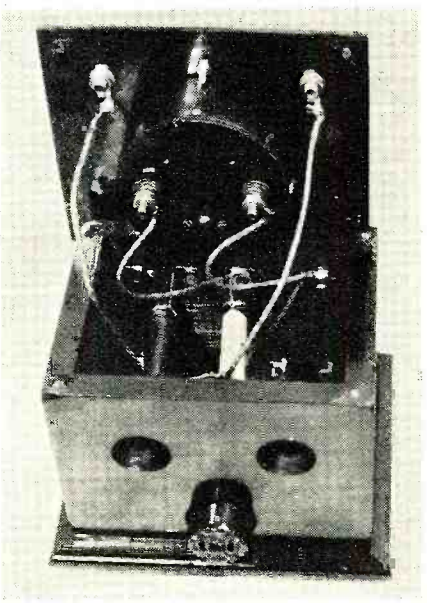
meter, 0-15-volt range. As this meter has an approximate resistance of 130 ohms, it is obvious that a total resistance of 1300 ohms (130-ohm meter plus 1170 ohms series resistance) will give us a 150-volt scale, and likewise 6500 ohms will give us a 750-volt scale. For the 150-volt range two resistors were used, one of 800 ohms and another of 300 ohms, connected in series. Carbon resistors of the 2-watt type were used, and the absolute value obtained by filing the sides of the 300-ohm resistor until the proper value is reached (approximately 370 ohms). For the 750-volt range an Electrad 50-watt adjustable resistor, type C-70, was found highly satisfactory when adjusted to 6370 ohms.

Different makes of meters have different internal resistance values and will therefore require different series resistance values from those mentioned.

The capacity range utilizes 110 volts a.c. in series with the meter and 800 ohms resistance. It will be found on shorting the capacity test terminals that the meter goes off scale, but it is amply protected by the 800-ohm resistor. This eliminates the possibility of burning out the meter with a shorted condenser. The best method of calibration is to use standard condensers, but a fairly accurate calibration may be obtained by using filter condensers of known values from .1 mfd. to 5 mfd. This should be tried with several different makes of condensers until a logical calibration curve results. If the meter used is of the same type as was used by the author the resulting curve should be practically the same as the curve shown.

The case shown in the photograph measured 4½ inches by 5½ inches across the top and 4 inches deep. The top was cut to give a slanting panel, and two 1-inch holes were drilled in the back to provide ventilation for the resistors. A plug receptacle was installed on the back of the case and wired for the a.c. input. A cord was made up with a male attachment plug on each end to facilitate ease of coupling to an a.c. line. Two pin-jacks were placed on the panel for capacity readings, and four pin-jacks were placed along the front of the case for the voltage scales. The various ranges are marked above the jacks with white ink and then shellacked over to make them permanent.

Standard test cords may be used with the meter, however, a very good set may be



made by clipping the heads of two nails and filing the nails to a point. The lead is then soldered to the blunt end of the nail and a piece of spaghetti slipped over the nail, covering the joint. General Radio plugs were used on the other end and binding-post caps

screwed on them to provide an insulated grip.

It may be noted that the resistors are considerably overloaded, but for tests of reasonably short duration no excessive heat-

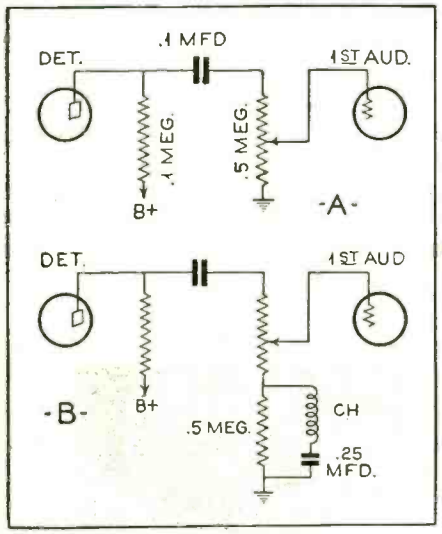
ing was observed. Practically any a.c. meter may be converted by this method; however, if one with a high voltage range is used, the series resistor must be removed and the value for resistors computed by Ohm's law.

LOWELL B. HOUDYSHELL,
Los Angeles, Calif.

Automatic Tone Control

It is oftentimes difficult or impossible to make the required tap on the volume control when installing a tone correction or automatic tone compensation circuit. This difficulty can be overcome by using the following circuit. At A is shown the regular first audio stage and at B the same with the tone compensation feature added.

The choke is 1100 turns of fine wire wound in a slot 1¼ by ⅜ inch wide, of

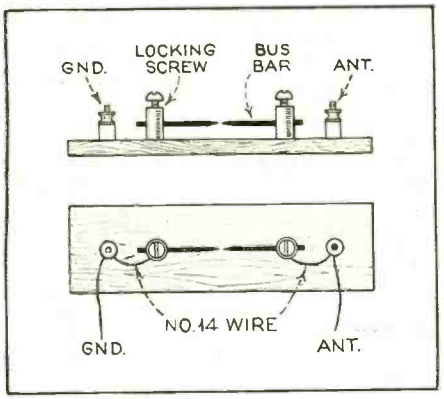


wood or bakelite. It must be tried in various positions to find the position of least hum. I have tried various numbers of turns of wire and condenser sizes, and the values given provided the best results in my receiver. The .5 meg. resistor may not be necessary or another value substituted. The greater the gain of the audio amplifier following the volume control, the greater will be the effect of this compensation. On the writer's receiver, from medium volume to low volume (volume control fully retarded) there is no apparent reduction of the low frequencies, only the medium and high frequencies being reduced. This naturally greatly improves the tone at low volume.

LLOYD BIRMINGHAM,
West Allis, Wis.

Home-made Lightning Arrestor

An effective lightning arrestor is easy to make. Secure two binding posts of the type which is used for making headphone and speaker connections, two binding posts of the usual type, two short pieces of bus wire and a piece of bakelite panel material about 1½ by 2½ inches in size. These are mounted as shown. The points of the bus wire are filed to points and are adjusted as closely as possible, without an actual short-circuit. An easy way to adjust the points is to place a page from this magazine between the points, adjust them as close as possible and then remove the paper by burning it out with a match. The finished unit



is connected to the set as shown in the drawing. To be most effective, wire not smaller than No. 14 should be used for all connections in the arrestor and from it to antenna and ground.

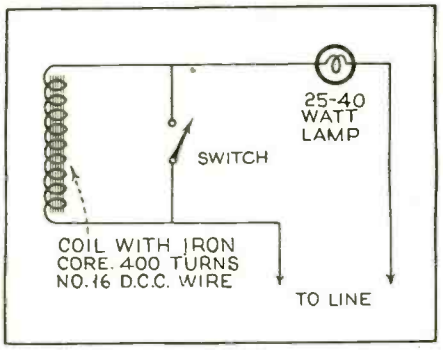
HARRY D. HOOTON,
Beech Hill, W. Va.

A.C.-D.C. Voltage Indicator

It is often necessary to test line voltage to tell whether it is a.c. or d.c. One way to make this test is with a neon lamp, but if a neon lamp is not available at the time of the test, an ordinary light bulb may be used if it is connected up right.

Wind on an iron core 400 turns of No. 16 d.c.c wire and connect this up in series with a bulb as illustrated herewith. A switch should be connected across the coil. An ordinary 110-volt lamp is used.

When connected to the source of power and the switch is closed, the brilliance of the bulb is noted. Then the switch is opened. If the bulb lights the same with the switch open as when closed, the supply is d.c. If



the brilliance decreases when the switch is open, it is an a.c. line.

The reason for this is that the coil offers a much higher resistance to a.c. than to d.c.

A.V.C. for Battery Receivers

Some time ago you asked for automatic volume control circuits for battery radios. I am using the inclosed circuit and thought some experimenters might wish to try it. Circuit "A" was the original detector circuit and circuit "B" the circuit as revised to provide the automatic control.

I have been using this automatic volume control for nearly a year. It keeps the volume nearly uniform from locals to stations in the noise level. I find it especially good for short-wave reception. The meter

(*Continued on page 383*)

Technical Review

(*Continued from page 359*)

sets affects performance is helping a dealer sell more large sets is described in this merchandising article.

How to Get Copies of Articles Abstracted in This Department

The abstracts of articles featured in this department are intended to serve as a guide to the most interesting and instructive material appearing in contemporary magazines and reports. These publications may be consulted at most of the larger public libraries, or copies may be ordered direct from the publishers of the magazines mentioned.

RADIO NEWS *cannot undertake to supply copies of these articles. They are NOT included in the* RADIO NEWS *Free Technical Booklet Service.*

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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 following section, simply write the numbers of the books you desire on the coupon appearing at the end of this department. 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. *1933 R.F. Parts Catalog.* Specifications on the line of Hammarlund variable and adjustable condensers, r.f. transformers, sockets, shields and miscellaneous parts for broadcast and short-wave receivers, complete short-wave receivers and transmitting variable condensers.

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

5. *A 1933 Volume-Control, Fixed and Variable Resistor Catalog.* This Electrad catalogue gives data on standard and special replacement volume controls, truvolt adjustable resistors, vitreous wire-wound fixed resistors, voltage dividers and other resistor specialties and public-address amplifiers (using new tubes).

6. *Line-Voltage Control.* Characteristics and uses of a real voltage regulator and complete chart showing the correct Amperite recommended by set manufacturers for their receivers. Also tells how to improve your customers' sets and make a profit besides.

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

9. *Catalog of Fixed, Metallized and Precision Resistors.* This catalog gives specifications of the International Resistance Co. 1933 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.

10. *Information on the Suppression of Motor-Radio Noises.* This folder of the International Resistance Co. gives information on how to overcome motor-generator, ignition-coil, interrupter and spark-plug noises in automobile radio installations.

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: a list of the most commonly used values of resistors with their corresponding color designations, and a complete catalog of products.

18. *Volume Controls, Fixed Resistors, Motor-Radio Spark Suppressors and Power Rheostats.* A catalog containing descriptions, specifications and prices of the line of Centralab standard, special and replacement volume controls for receivers, amplifiers, public-address systems and talkie installations, fixed resistors, motor-radio spark suppressors, wire-wound rheostats and potentiometers. Details are given on how to obtain, without charge, a copy of the 64-page Centralab Volume Control Guide for Servicemen.

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

34. *Serviceman's Replacement Volume-Control Guide.* A vest-pocket size booklet containing a revised 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. Contains specifications and volume-control circuits for over 2000 different receiver models.

39. *Radio Servicing and Radio Physics.* A folder which gives descriptions and tables of contents of two books on every phase of radio. The books are written by A. A. Ghirardi and Bertram M. Freed.

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.* This bulletin gives 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. The bulletin has been prepared by the Lynch Mfg. Co. and gives both the theoretical and practical data required to make all the calculations to convert or change the range or function of a given meter.

43. *How to Modernize Old Set Analyzers.* This valuable folder describes in detail the new set analyzer remanufacture plan perfected by the Supreme Instruments Corp. for the conversion of obsolete set analyzers such as the Jewell Pattern 198, 199, 408 and 409 analyzers; Weston model 537, 547, 565 and 566 set testers; and Supreme 99-A, 400-A and 400-B diagnometers into efficient, up-to-date testing equipment, at low cost. Special auxiliary units for increasing the usefulness of standard analyzers are also described.

44. *How to Add a Remote Control and Station Selector Unit to Any Receiver.* A folder published by Wholesale Radio Service which shows how any single tuning control receiver can be converted into a remote control and station selector set at a total cost of only $12.50.

45. *Condenser Bulletin for 1933.* This bulletin gives descriptions, specifications and prices on the line of Potter paper and electrolytic condensers for by-pass, filter and replacement use in home and auto radio sets. It also describes the Potter interference filters and tone controls.

47. *A Modern-Low-Cost Portable Public-Address System.* This bulletin describes and gives the specifications and price of an efficient, low-cost portable public-address system—the type U-19—designed and manufactured by the United Sound Engineering Co.

48. *A Low-Cost Superheterodyne Receiver.*

December, 1933

RADIO NEWS Free Technical Booklet Service
222 West 39th Street
New York, N. Y.

Gentlemen: Please send me, without charge, the booklets or folders I have filled in below:

Numbers.....
.....
.....

My occupation or connection in radio is checked off below.

- ☐ Serviceman Operating Own Business
- Serviceman Employed By:
  - ☐ Manufacturer
  - ☐ Jobber
  - ☐ Dealer
  - ☐ Servicing Organization
- ☐ Dealer
- ☐ Jobber
- ☐ Radio Engineer
- ☐ Experimenter
- ☐ Laboratory Technician
- ☐ Professional or Amateur Set Builder
- ☐ Licensed Amateur
- ☐ Station Operator
- ☐ Public Address Work
- ☐ .....

I am a ☐ subscriber ☐ newsstand reader.

I buy approximately $..... of radio material a month. (Please answer this question without exaggeration or not at all.)

Name.....

Address.....

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

PLEASE USE PENCIL AND PRINT IN FILLING IN COUPON

This folder describes the midget radio manufactured by the Fordson Radio Mfg. Corp.

49. *Portable and Home Type Receivers.* This folder gives descriptions and prices of the line of receivers, chassis, amplifiers and radio parts made by the International Radio and Electric Co. The list of receivers ranges from the most inexpensive midget sets to the higher cost console models.

52. *The Servicer.* A monthly house organ published by the International Resistance Co. It contains information to help the serviceman do better work and make more money doing it.

53. *Practical Training for Radio Servicemen.* This book, prepared by the Radio Training Association of America, gives an outline of their course of instruction for radio servicemen—a course that is endorsed and recommended by more than thirty leading radio manufacturers and trade associations. This book shows how to qualify for a big radio future.

54. *Public-Address Systems, Transmitting, and Short-Wave Receivers and Accessories.* This catalog, issued by the Wholesale Radio Service, covers the entire requirements of men engaged or interested in these fields for amplifiers, loudspeakers, microphones and other special and standard equipment required for such work.

56. *Servicing and Testing Instruments.* A folder containing descriptions of a new line of Supreme 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 Supreme Master diagnometer which employs the "free reference point system of analysis."

57. *How to Build a High-Quality Condenser Microphone.* This circular describes a condenser microphone kit and instruction sheets with which it is possible to build, quickly and easily, a high-quality condenser microphone. The kit is made by the Bruno division of the Amperite Corp.

New Broadcast Metropolis

(*Continued from page* 333)

linens and silks for the studio decorations. Cloth has taken the place of even paint and paper in the decorative scheme. Woven linen was found to be best for studio ceilings, backed by acoustical materials.

The studios are of conservative modern design. Color, either harmonizing or contrasting, is the basic decorative scheme of each studio.

Four "speakers" studios utilize distinctive wood design. The scheme of one speaker studio is English tudor with oak panels and a fireplace. Another studio is of Georgian style, a third of early American and the fourth modernistic.

Wood-panelling and fireplaces are also noted in the main reception lobby, sponsors' rooms and guest rooms.

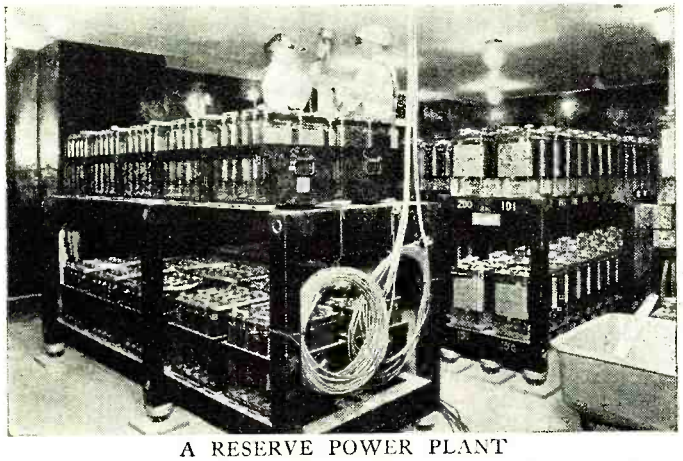
The growing demand from radio listeners for permission to attend broadcasts and observe favorite stars in action at the microphone is the reason for elaborate provisions to accommodate guests at the Radio City studios. It has been rumored that a small admission fee may be charged, but it is understood that there are many obstacles in the way of this plan, as such a move might bring the studios under a theatrical rather than a broadcasting classification.

Studios are laid out to accommodate the largest possible number of visitors with minimum confusion. When the guests enter, through a large mezzanine rotunda, they will take special elevators to the second floor lobby where they will be greeted by hostesses. There are several lounge and smoking rooms, opening out on terraces. Audition studios and sponsors' and artists' lounge rooms are also on this floor. Special elevators from the reception floor take guests to the visitors' galleries of the various studios.

NBC will move into the new studios gradually so that broadcasting will not have to be interrupted. The transfer from the old headquarters at 711 Fifth Avenue to Radio City has been under way for several past weeks. Although broadcasts may originate from the new site before November 15, it will be on that day—the seventh anniversary of the chain—that the official opening program will go on the air.

In another part of Radio City—the huge Music Hall theatre—there is another completely equipped broadcasting studio which has been used by S. L. Rothafel (Roxy) for his Sunday afternoon Roxy Gang programs over the NBC.

American broadcasting, on the whole, benefits by the gigantic radio development in Radio City. Long the leader in the field of broadcast entertainment, America makes still greater strides forward in world radio pioneering.



A RESERVE POWER PLANT

A battery room where sufficient battery power is reserved to continue operation for seven days should a natural catastrophe or bombing raid disable the regular power plant. This reserve situated in bomb-proof chambers would continue operation

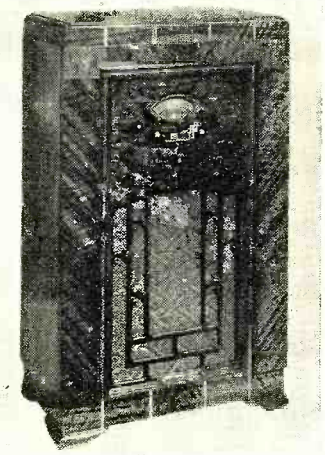
What's New in Radio

A department devoted to the description of the latest developments in radio equipment. Radio servicemen, experimenters, dealers and set builders will find these items of service in conducting their work

By The Technical Staff

Modernistic Console Receiver

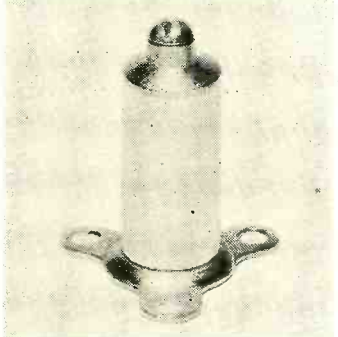
Description—The new line of Atwater Kent receivers include a standard console, two consoles of modernistic design and four table type sets. The model 510 shown in the illustration is a 10-tube superheterodyne, employing the following type tubes: four –56's for the oscillator, second detector, automatic volume control and first audio-frequency stage; three –58's for the r.f. stage, first detector and i.f. stage; and two –2A5 type tubes for the push-pull power output stage. The –80 type tube is used for rectification. This set features four-point tone control, automatic volume control, visual tuning and a silent tuning device for eliminating in-between station noise. In addition to the regular broadcast range this receiver has a waveband switching arrangement to extend the frequency range to 3200 kc., providing police, maritime, airplane and amateur signals.



Maker—Atwater Kent Mfg. Co., Philadelphia, Pa.

Isolantite Stand-Off Insulators

Description—Announcement is made of the new National isolantite stand-off insulator designed for mounting low-power transmitting equipment and adaptable to numerous commercial and experimental radio purposes. These insulators have a unique 3-point mounting arrangement whereby the three metal feet permit fastening the unit down to any kind of base material without danger of cracking or damaging the ceramic material. The insulator is made in various convenient sizes, the unit shown in the illustration measures 1½ inches overall.



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

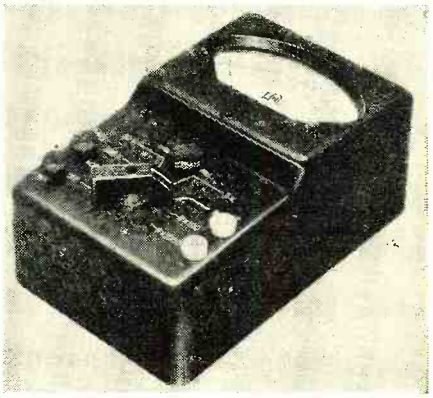
Compact Photoelectric Cell

Description—This new Rhamstine photo-electric device employing a dry-disc type photo-cell is complete with battery and a sensitive relay, ready for operation. The relay is adjustable. This "electric eye," as it is called by the manufacturer, has numerous commercial and experimental applications, such as, for instance, controlling lights, doors, burglar-alarm systems, window display signs, traffic signals, detection of fire or smoke, etc. By the use of an auxiliary relay this photo-cell can be adapted to the operation of bigger jobs such as opening doors and control of flood lighting. By employing ordinary light bulbs and special filters, it can operate on infra-red or invisible light beams.

Maker—J. Thos. Rhamstine, 511 E. Woodbridge, Detroit, Mich.

Vacuum Relay Protected Volt-Ohmmeter

Description—This new compact IRC volt-ohmmeter meets a real demand for an accurate point to point radio servicing instrument. In addition to its use in service work it is adapted to laboratory and school use or wherever voltage and resistance measure-

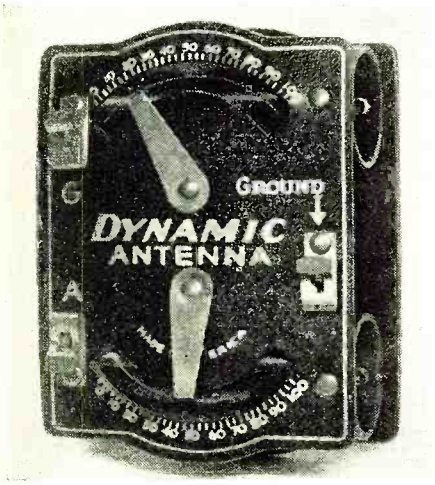


ments are made. The basic meter employed is an 0 to 1 milliammeter, with ranges of 0-3-30-300 and 600 volts. The resistance ranges are: 0-1000-1,000,000 ohms. One outstanding feature of this instrument is the automatic vacuum relay which prevents burn out of the meter or other components. The relay disconnects the meter instantly should it be overloaded, then reconnects it when the overload is removed. Other features of this instrument are: a 3 inch etched meter scale with a double strength glass cover, a rotary switch and a compensating arrangement for battery variations on the ohmmeter. The instrument weighs 2½ pounds and measures 7 inches long by 3 inches deep.

Maker—International Resistance Co., 2100 Arch St., Philadelphia, Pa.

Antenna Device

Description—The Electrical Laboratories dynamic tuned aerial eliminator is designed to take the place of the conventional type of inside or outside antenna. The manu-



facturer also recommends it for use with the regular aerial and ground system to improve radio reception. It is well constructed and small in size, measuring 4½ inches long by 3½ inches wide by 1½ inches deep. It is simple to install and operating instructions accompany each unit.

Maker—Electrical Laboratories Co., 141 E. 25th St., New York City.

Utility Meter

Description—The Shallcross No. 681 quick-change d.c. volt-ohmeter and the No. 685 a.c. utility meter provide essential a.c. voltage measurements and a wide range of impedance measurements. The various meas-

urement ranges are as follows: a.c. volts, 10. 125, 500 and 1,000; resistance, 25, 50,000, 500,000 and 5,000,000 ohms; capacity, .0005 to .1, 1 and 10 mfd.; inductance, .5 to 100, 1,000 and 10,000 henries.

Maker—Shallcross Mfg. Co., 700 Parker Ave., Collingdale, Pa.

?QRD?

A column devoted to the commercial operator and his activities

Conducted by GY

ADMIRAL BYRD'S second expedition to the South Pole is still on the lookout for two Commercial Firsts and for the pay of "glory and frostbite" it looks like there won't be any takers. The amateurs are all agog over the prospects of glory and adventure. Six hundred applications have been received from the amateurs, from which four will be picked to accompany the expedition and handle the traffic once they reach the polar ice. The U. S. Navy is donating a Chief Radioman. A number of other organizations are donating items of apparel, oil—even whiskey—so it will be up to the R.M.C.A. to donate the operators or else. . . .

The question of the day is whether there is such a Xmtr as an inductively-coupled Telefunken or not. Bliss sez there is, as he worked with the bloomin' thing for over a year and he should know. But Kerchoff sez there isn't "no sech animal." The former has no backers, but is that any reason to believe that Bliss is wrong? Perhaps some "op" converted the job to suit his own ideas without requesting permission for the act from his home office? And to add to the confusion, Bliss insists that it was a Telefunken on wheels. Meaning that to tune the darn thing it was necessary to put the sleeves on wheels because of their length and weight. Ye Ed has never seen this type but requests information from those 30-year gadgets who should know.

The Airways code has been presented to the Administration in Washington with a minimum wage of $80 per month for the ops, whether on fixed or mobile assignment. Mr. Hoyt Haddock, president of the A.R.T.A., presented the operators' side of this important ruling, insisting that the minimum for these ops should be $165 per month. He believes that he has convinced the Advisory Board that if they O.K.'d the former wage a rank injustice would be done to the ops. Although very few of the Airways operators are members of the A.R.T.A., Mr. Haddock represented them for his association, because it is the only association which has the interests of the welfare of radio operators at heart. In his presentation before the Board he was complimented by Mr. Green, president of the A. F. of L., who was also present. Mr. Haddock will be there again when the codes for the marine and broadcast operators come up for their hearings.

A legal point has been raised as to whether a master of a vessel commits a falsehood when he signs an op's ticket after that op had signed on his ship as a deckhand. Although the ship is covering the law by having on board a licensed commercial op, does the inspector know that he is aboard by looking over the list without seeing his ticket? What is the operator's status or is there no definite line drawn between the laborer and the professional?

Ben Beckerman, the op on the *S.S. Madison,* who sent out the SOS when that ship almost foundered in one of the most terrific storms which hit the east coast in the last decade, sez that he must be down in the books for hanging. He has been through two other disasters and has intercepted three SOS's in his 26 years of operating experience, but that this was the first time that he was called upon to send out an SOS without it being necessary. The *Madison* made port in Norfolk, Virginia, after she had been given up for lost. With most of her superstructure gone, listing dangerously to port and bucking up against a terrible storm, one cannot blame the skipper for telling Beckerman to shoot the works. Beckerman handled his watch like the veteran he is. He is a VWOA and received his ticket way back in 1911. Good luck to you, OM.

The American Radio Telegraphists Association is in a blue funk. They are in the doldrums. As the saying is, they are under the weather. And why, ye arsk? Well, the name of the organization is now on the carpet. With so many broadcast ops coming into the association, the question of the "Telegraphists" part of the name is in doubt. Shall it remain as it is or should it be something else? How about Telegraphists and Telephonists? Or American Radio Operators Ass'n? Or what have you? What difference does it make as long as all the radio gadgets stick together and have this organization for the national headquarters? Whether you are commercial, marine, broadcast or airways, there is only one thing of primary importance to the op, and that is "a raising of the present standards." Wasn't it Shookabeer who weazed, "What's in a blinkin' nyme, enyho?"

Mr. Moichiro Hida, radio op on the *Oregon Maru,* who intercepted that SOS of the *S.S. Nevada,* received his testimonial scroll, which was presented to him by the VWOA through his Kobe, Japan, office. Upon its receipt he said, ". . . When I recollect on what I did on that occasion of the miserable distress of the *S.S. Nevada,* which was nothing more than performing a duty on my part, I am inclined to consider that you were too kind . . . and it shall become an esteemed memorial for me forever." This modesty is indeed worthy of comment. Just doing his duty and standing his watch as a true radio operator.

Which is the line that sent a letter to its employees enquiring about their being satisfied with the present wage scale and working conditions? All its employees, including the operators, who are receiving $66 per month, stated that they were satisfied. Well, perhaps they are? . . .

Those who have relatives in the Far North regions have been in the habit of entering their messages to KDKA, Pittsburgh, for the Saturday night broadcast at 23.30 E.S.T. will please note the change is shifted to Sunday nights at the same time, 23.30 E.S.T. These programs have been going on for the past eleven years on the 980 kc. band for the purpose of getting messages through to those in the isolated regions where it sometimes takes months to get letters through to them.

The North American Radio Conference turned out to be a flop because of the avaricious requests of the various countries for too many cleared channels. These, if granted, would have left the others high and dry without any channels for themselves. . . . Lisbon, Portugal, with its request for bids for an ultra-short-wave broadcasting transmitter is blazing a trail for other nations to follow. There is plenty of room in these low frequencies for everyone.

Xenia, Ohio, gets a lick in to say that he sure misses the old gang whom he knew

when he was pounding the brass. Oh, yeh, we forgot to mention his name, which is Georgie Wilkins. He was on the *S.S. John D. Archbold*, which was shot out from under him by a German torpedo. His S.O.S. was picked up by GLD and rebroadcast so that the French subchaser, *Engageante*, picked them up in the nick of time. Rather close shave. Nowadays things are not so exciting, but still we have our Madisons and Coldwaters, etc., to keep the blood from getting stagnant. Sez he'd like to hear from G. Wheeler or Hank Travis just for old times' sake. . . . Culbertson writes in to say that his YL is going to give him the atmosphere if he doesn't connect up with a job pronto. Stew bad, FC, but can't you give her a little tenderness about which everyone is singing. Enyway, just try hanging around for a short time and there is no doubt but you'll connect. Incidentally, GG was the guy who bought your motorcycle from you, so he tells me. . . . The static room shipped out seven more men these last few weeks, and with things picking up, new applications have been coming in for billets. Looks like the old times are coming back when an op was at a premium. So here's hoping and a cheerio for bigger and better codes. . . . 73 . . . GY.

The Service Bench

(*Continued from page* 361)

nounces that the holder "has been granted membership by the Co-operative Radio Service and is entitled to all privileges as stated herein on enrollment certificate. The above member is entitled to all privileges as set forth below for a period of twelve months from date of issue.

"1. Inspection of member's radio every three months by engineers of the Co-operative Radio Service.

"2. Replacement without charge by the Co-operative Radio Service of any and all defective, burnt-out, inoperative or worn-out parts with the exception of electron tubes during the term of membership.

"3. Co-operative Radio Service at all times will assist members with their radio problems so that 100% efficiency will be derived from said member's set.

"4. Above member is entitled to free radio service and parts during membership term, regardless of service required during membership period of one year."

The signature of the member is required, plus those of two witnesses. An "Issuing Officer" and "Chief Engineer" sign for the Co-operative Radio Service. The certificate of membership is not transferable.

The Service Editor will be glad to hear from other readers of their success or failure with the club plan.

THIS MONTH'S SERVICE SHOP

Our heading photograph this month illustrates the sort of service shop that makes radio servicing both pleasurable and profitable. This equipment and layout was designed by D. H. Leitch, of Winnipeg, for the Marshall-Wells Co., also of Winnipeg, and wholesale distributors for Stewart-Warner in western Canada.

Mr. Leitch writes: "Although this equipment is fairly complete, provision has been made for expansion and additions have been effected since the photograph was taken. At the left is seen a specially selected stock of tubes for test work. This tube section is made of tube cartons. The next section includes a Jewell 540 tester, preheater and Jewell oscillator for broadcast and intermediate frequencies. Above this is a Candian-Marconi short-wave oscillator covering from 10 to 200 meters. The speaker in the next section may be used in a variety of ways by means of a jack and plug system. Below the speaker is a turntable and a PAM power supply and amplifier. There is a Weston 660 tester and a terminal board for battery sets in this same section.

"The third section is composed of four panels, including 200-volt leakage tester, direct-reading Jewell capacity meter, direct-reading ohmmeters from 1 to 2,000,000 ohms, d.c. and a.c. voltmeters, ammeters and milliammeters covering all useful ranges.

Notes from a Serviceman's Case Book

The methodical serviceman will take a tip from Dr. Watson and Mr. John Nisslein, of Port Richmond, S. I., N. Y., and keep a case book—for future reference and possible contribution to the *Service Bench*. We thank Mr. Nisslein for the paragraphs that follow:

"Cross-talk in the Zenith 50 series can be cured by using a dual volume control, combining screen-grid voltage control and antenna shunt. Or the screens may be operated at their maximum voltage and the antenna shunt alone used very successfully. No doubt this would work out O.K. when this trouble is encountered on other makes using S.G. or cathode variation for volume control, as the r.f. tubes act as detectors due to the high bias voltage, when volume is reduced, and the undesired signal thus rides in on the carrier.

"Another frequent complaint on this model is hum—which is usually caused by a defective Mershon condenser. However, in two cases it was found that a heater wire was grounded where it passed beneath the r.f. by-pass block, the insulation being cut by a sharp edge. Replacing this block cured a number of cases of fading for which no other cause could be found. Other instances of fading, and sometimes of weak volume, were due to the fine wire on the r.f. chokes being broken or poorly soldered.

"With the Federal Type H, fading is frequently due to poor soldering of the radio-frequency coil windings to the lugs, and as it naturally is the most inaccesible lugs that are neglected, it is necessary to drill out the rivets and remove the coil in order to re-solder."

THE DAY'S WORK

The *Service Bench* solicits data from servicemen on troubles with a.v.c. circuits. Such arrangements have now been in general use just long enough to develop faults and, simultaneously, service material.

Sharp Volume-Control Cut-off

In our own work, we have run into several instances of sharp volume-control cut-off which was ultimately traced to the a.v.c. circuit. This condition may readily exist in volume-control arrangements where the manual control varies the bias of the automatic volume-control tube—such as in the National AGS superheterodyne. The remedy in each instance has been the replacement of the a.v.c. tube. In some cases it has been necessary to try several tubes before altogether satisfactory operation was secured.

Servicing Spartons

"Servicemen and radio dealers are finding it increasingly difficult to obtain the type 481, 482 and 484 tubes for replacement in Sparton electric receivers. Since these tubes are designed for operation with 3 volts on the heaters, it is obvious that the voltage must be dropped to 2.5 volts before the standard type tubes can be used. I employ small adjustable resistors, one in each filament

(*Continued on page* 383)

Radio Physics Course

LESSON 24—D.C. GENERATORS

This series deals with the study of the physical aspects of radio phenomena. It contains information of particular value to physics teachers and students in high schools and colleges. The text material aids teachers in laying out current class assignments

By Alfred A. Ghirardi*

IF current flowing only in one direction is desired, the machine producing it is called a *direct current generator*. In d.c. generators, the collector rings shown in (A) of Figure 1 are not used. An automatic switching device called the commutator is employed instead (see B of Figure 1). The commutator is a switch which keeps the current in the external circuit flowing in the same direction continuously, even though the current in the armature coils is reversing. The simple commutator shown consists of a split ring having two segments insulated from each other and from the armature shaft. The commutator rotates with the shaft, and the stationary brushes rest against it.

At the instant that the direction of the induced e.m.f. in the rotating coil reverses in direction, the commutator segments are just ready to slide around and reverse their positions under the brushes. Thus in (B) of Figure 1, segment D touches brush E and segment F touches brush G. The direction of the current in the moving coil and in the external circuit is as shown. At the instant that the e.m.f. in the coil reverses, segment D is just ready to slide around to brush G and segment F slides around to brush E, thus maintaining the current in the same direction in the external circuit as shown. (C) of Figure 1 shows the positions just after this has taken place. Commercial d.c. generators have a large number of coils on their rotating armatures. Their commutators thus have a large number of copper commutator segments, each one insulated from the next and from the clamping rings and armature shaft by means of mica insulation. A pair of commutator segments connects to each coil. There are usually as many brushes as there are poles in the field magnet. The commutator must be kept clean. This is done by holding a piece of 00 sandpaper (never emery cloth) against its surface for a few seconds while running. The brushes should be fitted properly so they make good contact with the armature surface, to reduce any sparking.

By winding a large number of *coils* of wire, each having only a few *turns*, on the armature of a d.c. generator, instead of a fewer number of *coils* each having more *turns* of wire, a more constant e.m.f. is made available at the terminals of the machine. There will always be at least one coil producing its maximum e.m.f. while the others are going through zero or some intermediate value. The sum of the e.m.f.'s of all the

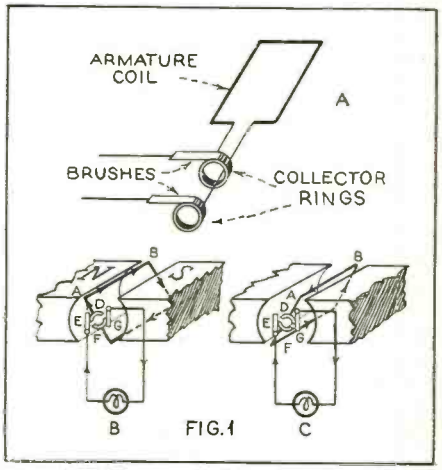


Figure 1. Action of the commutator in a d.c. generator

conductors gives a fairly smooth resultant voltage, as shown at (B) of Figure 2. Only a slight ripple remains in it. We shall see later, when studying the operation and construction of electric radio receivers designed to operate directly from 110-volt direct-current electric light lines, that this ripple in the e.m.f. or current is objectionable in that it causes hum in the output. Hence the ripples must be smoothed out. (A) of Figure 2 represents a smooth, unvarying direct-current voltage such as might be produced during the discharge of a storage battery. (C) represents direct-current voltage with rather strong pulsations in strength, such as might be produced by a d.c. generator hav-

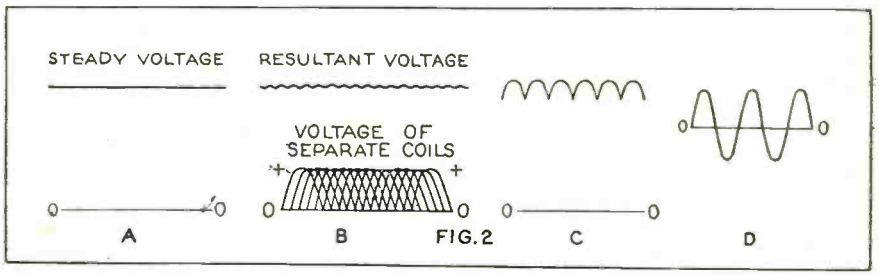


Figure 2. Various types of e.m.f. waves; (A) steady d.c., (B) slightly rippled d.c., (C) pulsating d.c, (D) alternating

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

ing only a few coils on its armature. An alternating-current wave is shown at (D).

The strength of the induced voltage depends on the number of turns of wire on the armature, the field strength, and the speed of rotation of the armature. This voltage may be varied either by changing the speed of the armature (this would also change the frequency in an a.c. generator), or by varying the current that energizes the field magnets. This is done by means of a variable resistance (field rheostat) inserted in series with the field coils for this purpose.

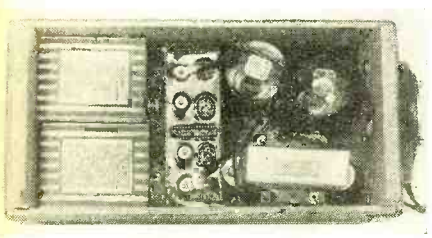
It should be remembered that the electrical power produced in the electric generator is developed at the expense of the mechanical power used to rotate the armature conductors in the magnetic field against the forces of repulsion existing between the magnetic poles of the field and the magnetic poles produced in the armature by the induced current flowing through the coils. The more electrical power taken out of the generator, the greater is the mechanical power which must be supplied to it by the steam engine, turbine, water wheel or gas engine which drives it. When a generator is run on open-circuit, no power other than that required to make up for its magnetic losses, friction losses in the bearings, windage, ets., need be supplied to keep it running.

Ears for the Deaf

(*Continued from page* 331)

shown here the parts are removed from the carrying case. It is ordinarily so used, with a battery placed in a pocket or handbag and the microphone suspended on the clothing by means of a clip provided on its back. The microphone is of the double type and represents perhaps the highest refinement yet attained in sensitive microphone design in that a good degree of fidelity is obtained in spite of the unusual sensitivity.

The two outstanding features of this device, however, are found in the mechanical amplifier, which is the small rectangular object mounted on top of the battery, and the bone conduction unit or Lieber oscillator, which takes the place of the usual earpiece and in use is placed against the



POWERFUL AID

Figure 7. The internal arrangement of the larger unit shown in Figure 8

mastoid bone behind the ear. Thus the sound is conducted direct to the inner ear through the bony structure of the head instead of having to pass through the complicated processes involved in the functioning of the outer and middle ears. In many cases of deafness the defect lies somewhere between the outer and inner ears and by means of bone conduction the defective gap is successfully bridged. In extensive tests it has been clearly demonstrated that many deaf persons can hear much better through bone conduction than through air conduction.

The schematic arrangement of the bone conduction unit is shown in Figure Ten. It will be noted that the mechanism is supported on the diaphragm and that the diaphragm is attached directly to the outer shell or case. Thus the vibration of the diaphragm is transmitted directly to the shell and through the shell to the bone against which it is held.

The mechanical amplifier is shown in schematic form in Figure Nine. A study of this figure will show that the amplifier consists of an electro-mechanical device similar to a telephone receiver, and a carbon ball microphone, but that the two have a common diaphragm. In operation the current from the pickup microphone flows through the magnet winding of the mechanical amplifier, causing the amplifier diaphragm to vibrate. This in turn varies the pressure on the carbon balls of the microphone portion and accordingly varies the battery current flowing through this microphone. In effect the results are somewhat similar to those that would be obtained if two highly sensitive hearing aids were used in such a manner that the output of the first was fed into the microphone of the second, the sound being amplified in each of the microphones. This amplifier unit, small as it is, actually does provide a surprising increase in the volume of sound.

This Sonotone equipment is so designed that the miniature and regular earpieces and the bone conduction unit are interchangeable.

With radio making such important contributions to the hearing aid art it naturally follows that radio outlets offer the logical media for merchandising this equipment, particularly the vacuum-tube devices. Hearing aids of the "telephone" type and the older ear-trumpets have been retailed largely through opticians and drug stores, with here and there a dealer who specialized in hearing aids. This has in many cases put a heavy burden on the manufacturers because they found it necessary to train these dealers and to render all sorts of unsual service to them.

For the manufacturer of vacuum-tube equipment the outlets are ready made. Practically every radio serviceman and most dealers are thoroughly familiar with public-address systems, and the principles involved in such equipment are almost identical with those involved in hearing aid devices. Thus equipment of the latter type can be distributed in the same manner as radio products, through regular radio jobbers and distributors, without the need for intimate contact between manufacturer and dealer and in this way distribution costs can be reduced to a minimum. A certain amount of training in the psychology of the deaf would be helpful, but this could be provided to the dealer in the form of manufacturers' service literature.

From the standpoint of the radio dealer and serviceman, hearing aid equipment offers a new field of activity which holds much promise. Not only will there be the opportunity for handling manufactured lines but there is a large field for custom-built equipment. As indicated before, the ideal hearing aid is one which is especially adapted to the individual hearing response curve—and extensive studies have shown that almost no two deaf persons have the same hearing characteristics. Only in a broad way can the manufacturer provide equipment directly adapted to the individual. The radio dealer, however, being in personal contact with the prospect, can determine the required characteristic and design a hearing aid including tone control, and possibly a fixed audio filter system, which will emphasize the frequency ranges in which the prospect is most deficient and attenuate those at which he is most proficient.

There is also a good deal of business to be built up along the lines of high-quality permanent installations for the homes or offices of hard-of-hearing persons. In addition there are all sorts of possibilities in

installing group hearing aid systems for churches, theatres, schools and other meeting places. It might be mentioned here that manufacturers of group hearing aids favor the radio serviceman for making such installations. They are finding it more practical to make and sell their equipment to dealers who are qualified to make such installations, than to train specialists of their own for installation work.

Finally, the opportunity is now presented for the radio merchandiser to assemble and sell small pocket-type hearing aids. The microphones required for such equipment are a very special item and have not until recently been available except as a part of a complete hearing aid. Now, however, the microphones, low impedance earpieces of both the standard and miniature types, and even bone conduction units are available separately. To assemble equipment of this type is simple, the parts are not expensive and the profit is worth while in spite of the fact that the completed outfit can be sold considerably below the cost of similar manufactured devices.

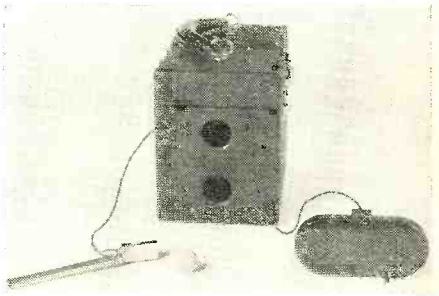
Some of the parts now available to those who wish to construct hearing devices are shown in Figures Five and Six. In Figure Five (A) is shown a sensitive type microphone made by the Kurman Electric Company. Its overall size is 2⅛ inches square and ¼ inch thick. It is intended for use in either pocket type or portable hearing aids. Used in conjunction with a 3-volt flashlight battery and the miniature earpiece shown in Figure Six (A) it makes up into an effective pocket type hearing device of unusually small size. Or it may be used with a vacuum-tube amplifier such as shown in Figure Two.

Figure Five (B and C) are other examples of sensitive microphones especially designed for hearing aid circuits. At (d) and (e) are shown models of two battery cases which can readily be made at home. The smaller one is a flashlight case with the top plate removed and a wood or fiber plate substituted, this plate bearing contact springs to establish contact when the battery is slipped into the case. The larger case consists simply of a metal band bent to the required shape, with wood or composition blocks inserted in the ends. These blocks carry the spring contacts, jacks or any other kind of terminals desired. These two microphones are made by the H. E. Clarke Company and this company also publishes a book containing much data of interest to those who desire to construct hearing aids. This book contains information on microphones, amplifiers and amplifier circuits, the design of battery cases such as those illustrated, etc.

In Figure 6 are shown a number of earpieces. The Trimm Featherweight is shown at the top. This is available either singly or in pairs, with single or double headbands or a lorgnette handle. At (B) is the new Trimm Miniature. Both of these types are available in low and high impedance, the low impedance type for use with a battery and microphone, the high impedance type for direct connection in the plate circuit of vacuum-tube amplifiers. The Miniature model is equipped with a nipple to fit into the ear canal and a spring wire clip which can be bent to fit the convolutions of the ear, to hold the earpiece securely in place. If desired, the low impedance miniature type earpiece may be obtained with a volume control rheostat mounted on the cord, as shown at (E).

An unusually small miniature type earpiece is made by the Kurman Electric Company, and is shown in Figure 6 (C). This is so light in weight that it requires no clip or other device for holding it in position. The nipple, slipped lightly into the ear canal, is sufficient support. It is also available in low and high impedances, and it is understood that these units can be obtained individually wound to any desired special impedance.

It is hoped that the foregoing article, by informing the public concerning the newer developments in hearing aids, will materially help the deaf in attaining a more nearly normal existence through the use of the really effective devices now available to them.



BATTERYLESS UNIT

Figure 8. All operating power for this vacuum-tube hearing aid is drawn from either a.c. or d.c. light lines. Microphones of varying degrees of sensitivity are available, also either the bone conductor or miniature earpieces shown here, or a standard earpiece if preferred. This choice of microphones and output devices make this equipment adaptable to practically any requirements

(*Readers desiring the addresses of the manufacturers of equipment mentioned in this article may obtain same by addressing an inquiry to* RADIO NEWS.—*The Editors.*)

Magnetostriction

(*Continued from page 337*)

shown, and they cracked after a certain time. It is interesting to note that the openings are of a rather rounded form. (See the broken part at the left side of the picture.) It seems that the colloidal flux of the glass, particularly the silicates contained therein, start to recrystalize after a considerable time (many years) has elapsed. X-ray analysis of aged glass show crystaline elements similar to the silicate structure, while glass which has come from the annealing furnace not too long ago shows a perfect amorph. structure. It may be possible that this intense audible sound also forces the process of recrystalization in the glass vessel, similar to the case of the nickel tube.

But while these effects upon glass, metal and other inorganic materials are new and extremely interesting, it is the field which is opened for experimentation in biology, physiology, organic chemistry, physics, etc., which shows particularly great promises. Sound waves, strong enough to disintegrate nickel rods and glass vessels, will naturally have a much more intensive effect upon more tender material, as for instance, biological tissue or organic substances. For example, tadpoles and small fishes, which are brought near the top of this sound vibrator, die after a short time. Fluids can be sterilized under the influence of super audible sound, as bacteria apparently are killed by these frequencies.

Will we ever be able to find a specific frequency under which a certain type of bacteria is killed despite the fact that the tissue in which it is embedded has recived only a tolerable dosage of vibration? That there is an intensive action of sound upon various biological objects is sure. It can be easily proved that the peristaltic movement of our stomachs decreases under the influence of intensive sounds. That even lethal effects can be reached by the in-

fluence of noise upon humans has been shown by the old Chinese custom of torturing prisoners by hanging a great bell over them and by pounding upon it until the man enclosed gave up his spirit. Similarly, sound in smaller dosages, as the noise of our busy streets and subways, is known only too well in its ability to shatter our nerves.

In addition to killing bacteria and animals if the "dosage" of sound is sufficiently large, various sounds can be perceived, the frequency of which seems to be typical for various animals. While the upper limit of ordinary human hearing lies somewhere over 14,000 oscillations per second, it is interesting to note that certain insects, if exposed to the effect of the supersonic oscillator of the magnetostriction type, give typical reactions. For illustration, *crickets respond in their chirping to sounds which can not be perceived by the human ear.* It is possible to induce crickets to chirp, even over considerable distances, if the super-audible sound generator is put into action, without the human ear perceiving any sound whatsoever. That it is a sound wave and not any other action which is received by the cricket can be proved by removing the hearing organ of the cricket.

From the super-audible sounds which we can not perceive, but which can still be heard by insects, to the infra-audible sounds which can be perceived by us only in the form of separate impressions, noticeable mostly to our sense of touch, there is only a limited region in which we can hear. This is comparable, to some extent, to electromagnetic waves, from the enormous spectrum of which only a small part can be recognized with the human eye.

There is one more important application to which these sounds seem adaptable. In many instances the suspension of materials in fluids in which they are not easily soluble is a difficult feat to accomplish. It is interesting to note that the thorough shakeup which is given materials of all kinds with this high-powered sonic vibrator tends to facilitate their colloidal dispersions. Will this method be a means for improving pharmaceutical products? Will it make possible better oils, finer porcelains and many other improved products? Only the future will tell. But one thing is sure—radio has again and again fertilized fields whose direct connection with the mother science seemed to be vague—at the beginning.

[4] Physics 3, 209-229, November, 1932.

S.W. Crystal Super

(*Continued from page 347*)

the a.v.c. compartment at the left in this "C" section. Make the cans and covers in the same way you did for section "B".

Consider, now, the construction of the coils for this "C" section. Make up coil L4 on R-39 form with 60 turns of No. 22 double cotton covered wire. Make up L5 and L6 on one coil form as follows and see Figure 14. Also make up or buy a ganged, double, two point switch. This is to be mounted inside harmonic amplifier shield can and connected so that at position 1, L5 uses all turns from 1 to 30 and L6 all turns from 1 to 10. When switch is turned to position 2, L5 uses only turns from 1 to 15 and L6 uses only turns 1 to 5. Coil L7 is a stiff coil of three turns of wire 1¾ inches in diameter mounted horizontally on a bakelite post near level of top of coil L5. This coil can be bent up and away to loosen the coupling and left in its best position.

Get two of the small neon lights such as are used in the "neon pencils" used to test spark plugs in automobile engines. Make up two little absorption meters consisting of

these neon lamps, small coupling coils and the associated condensers which are the Hammarlund small trimmer type. With some oscillator or "driver" running at 13,797 kc. adjust one meter to this frequency and the other to 7884 kc. These two neon lights are mounted on the front panel of the harmonic amplifier can, and under each one is the small snap switch shown in the circuit. Also put a small name plate with its frequency noted under each light.

When you have L5 and L6 tuned to the seventh harmonic the neon light for 13797 kc. will glow, and even if something else is wrong or out of adjustment in the receiver, you will at least know that your harmonic amplifier is delivering its proper frequency for the signal you may be trying to tune in. The other neon light will show you whether the 7884 kc. frequency is perking okay. Place the various parts as shown in Figure 13 and wire carefully.

You will have to buy a crystal ground for a frequency of 1971 kc. unless you are an old timer amateur and can grind your own. Better buy one with its proper holder. Mount this in the left back corner of the oscillator tube box shield.

All ready?

Well, let's test out this section now. Disconnect, temporarily the plate and screen grid B plus leads, from the second tube which is the harmonic amplifier. Turn on the current and note current in milliammeter MA1 then turn condenser C7 until there is a sharp drop in the plate current. Now turn out just a little bit more of this same condenser. If you have a wavemeter, test the frequency generated and if the crystal is okay your meter will show 1971 kc.

Now shut down for a few moments. Connect the plate and screen voltages to the other tube. Turn whole section "C" on again and with double, two point switch set at position to use whole of coils L5 and whole of L6, tune condensers till you find the 4th harmonic which is 7884 kc., and prove this with your wavemeter or the neon tester. Mark condenser setting where you get this frequency. Repeat with switch set to use ½ of coils L5 and L6 and find condenser setting for the 7th harmonic or 13797 kc. Check with wavemeter and neon tester and record condenser setting.

It is also assumed that you have wired the type –56 a.v.c. tube and its associated resistors in the left hand compartment. No test is to be made on this yet, except to check over to be absolutely sure all resistors are good, and of the right rating and wired exactly as per circuit.

The next article will complete the constructional data and will also contain instructions on testing and putting the completed job in operation.

Mixing Circuits

(*Continued from page* 341)

stance, if a line of any length is used on the secondary side, a step-down ratio may be used, keeping the impedance of the line low. If the mixing circuit is close to the amplifier, a step-up ratio may be used which will give us some amplification. This circuit is not considered a very satisfactory one, and if a transformer is necessary in this position, Figure 9 gives a preferable combination.

The transformer here must be especially made for each instance. and has several low-impedance primaries and one secondary of either high or low impedance to suit conditions. Each source of input works into its individual primary through a T-pad, as shown, or through an H-pad if desirable. If the transformer is well made, this is a satisfactory method of mixing, as each circuit is definitely independent of the others and all input circuits can be kept at low potential to ground. It is rare that a circuit of this nature is used except in broadcasting, as the cost of the transformer is obviously high.

In all the circuits discussed above we have limited ourselves to two inputs for simplicity, but any or all of them may be used with several more input circuits than shown.

Microphone Current

In using carbon microphones, it is necessary that a certain source of potential be applied across the instrument so that current may be established through it. There are several different ways in which this may be done, and some amplifiers are equipped to furnish this microphone current from the a.c. power pack. It is generally better, however, to use batteries as this source of potential. Two dry cells are usually sufficient, and with ordinary usage will last from six to eight months, so their replacement problem is small. Using a circuit such as the one shown in Figure 10 will permit close variation of the potential to meet individual cases. A 400-ohm potentiometer across the two dry cells with a switch in series with the cells to prevent discharging them through the potentiometer when not in use will give all the control necessary at this point. The potentiometer may be one of the type with a built-in switch and connected so that the switch operates on the low end of the potentiometer, automatically preventing the sudden application of potential to the microphone and eliminating the "kick" that a microphone usually gets when current is suddenly removed. A closed-circuit jack in each of the outside leads will permit the reading of the current through each button of the microphone individually, and this value should never exceed the manufacturer's rating.

Backstage

(*Continued from page* 357)

following that she will most likely enlarge during the new radio series. "The Big Show" is sponsored by the Ex-Lax Company, which last season presented the successful dramatic series entitled "The Magic Voice."

ERNO RAPEE, musical director of New York's great Radio City Music Hall and former musical director of the NBC, is conductor of the 50-piece symphony orchestra featured on the new series of "Bath Club Reviews" over a Sunday night CBS hookup. It is understood that Rapee's commercial series on CBS will in no way hamper his work on the Sunday Roxy Gang broadcast over NBC. The new Bath Club programs will also feature Jane Froman, the soprano well known to radio listeners for her many stellar appearances on programs of both the NBC and CBS, and Nino Martini, the young singer who was recently engaged as leading tenor for this season's Metropolitan Opera Company presentations. Rapee, a native of Budapest, became noted for his efforts in introducing classical music in New York's leading motion picture palaces. With the advent of the talkies, he composed, directed and arranged musical settings for many feature screen productions. He has conducted famous symphony orchestras here and abroad, among them the Berlin Philharmonic and the Philadelphia Symphony.

THOSE two corpulent funny men, Eddie East and Ralph Dumke, recently returned to the air as the featured funsters of the Texaco Fire Chief program. If you don't recall their previous performances under the names of East and Dumke, you are certain to remember the boys for their unusual per-

formances as the "Sisters of the Skillet." On the current series they are known as the Texaco Reporters and share microphone honors with Don Voorhees and his orchestra. The two comedians, who jointly weigh nearly 500 pounds, are veteran NBC entertainers. Before coming to the microphone, they were well-known vaudeville performers. They recently supplemented their radio work with vaudeville appearances in which they mimicked various broadcasting headliners.

C. R. Oscillograph

(*Continued from page* 340)

L1—Filter choke, 30-henry, 15 ma.
R1—Rheostat, ½ ohm, 3½ amp.
R2—Metallized resistor, 100,000 ohms, 2 watts
R3—Aerovox cement-coated resistors, 100,000 ohms, 20 watts (2 required)
R4—Aerovox adjustable Pyrohm resistor, 2 taps, 50,000 ohms, 75 watts
R5, R6, R7, R8, R9—Clarostat wire-wound potentiometers, 50,000 ohms, 9 ma.
S1, S2—Sockets, 4 prongs
S3—5-prong Isolantite socket
S4—6-prong Isolantite socket
S5, S6—7-prong Isolantite sockets
SW1—Off-on toggle switch
SW2—S.p.d.t. toggle switch with neutral position
SW3—Yaxley 6-point switch open between contacts
T1—Transformer with windings as follows: two 2.5-volt, 5 amp.; one 1400-volt, center-tapped (two 700-volt transformers can be used instead, with secondaries in series and primaries in parallel)
T2—Tranformer with windings as follows: one 5 volts, 2½ amp., center-tapped; one 2.5 volts, 3 amps.; one 2.5 volts, 3 amps., center-tapped; one 700 volts, center-tapped
T3—Good quality audio transformer, about 2:1 ratio. Preferably with electrostatic shield between primary and secondary
V1—866 rectifier. Type -81 can be used with 7.5-volt transformer winding
V2—Type -80 rectifier
V3—General Radio Thyratron
V4—Type -58 pentode
V5—Telephoto cathode-ray tube (if tube of another make is employed, some alterations in voltages may be necessary)
6 knobs
1 7-wire cable, well insulated, 7 feet
1 a.c. 110-volt plug receptacle
1 7-foot length lamp cord with 2 plugs
1 'phone plug
1 metal chassis
1 bakelite panel
Adequate to mount equipment
2 binding posts

11 New Tubes

(*Continued from page* 335)

serves to suppress the effects of secondary emission. The heater requires a potential of 30 volts and can be connected in series with the other tubes in the set. The -48 should then be on the positive side. Heater-cathode voltage (measured from cathode to the negative side of the heater) should not exceed 90 volts. For a simple tube, the self-bias resistor should be 360 ohms; for the push-pull stage, 180 ohms. The resistance in the grid circuit should not exceed 10,000 ohms. The tube has a 6-prong base; connections are shown in Figure 2. The technical data on these tubes has been released by the engineering departments of RCA, Cunningham and Sylvania.

Low Cost Super

(*Continued from page* 343)

transformer equipped with a 7000-ohm impedance primary to match the output of the 2A5 tube.

This receiver was tested in the RADIO NEWS laboratory in the heart of New York during the daytime and brought in distant stations such as Philadelphia and Bridgeport with good volume and without interference, while all locals were on the air. Those who are familiar with the unfavorable conditions for radio reception in mid-town New York and with the congestion of the air lanes in this locality will realize that such performance is unusually fine.

From the standpoint of the set builder, the "Air Marshall" offers constructional advantages which are seldom found in commercial kits. First of all, the kit is complete in every detail. The chassis is drilled, not only for mounting each and every part, but also for all wires which must run through it. Resistors are furnished mounted on a convenient bakelite strip. The assembly and wiring directions are exhaustively complete, so that nothing is left to the imagination. Every socket terminal and every coil connection is sketched out in pictorial form so that there is not the slightest chance for a misunderstanding. The correct method of adjusting the completed receiver is also clearly explained. As a result, here is one superheterodyne which can be tackled by the novice without fear of running into trouble.

Next month the circuit diagram and complete list of parts will be given, together with further information on the circuit and construction.

5 Meter "Sender"

(*Continued from page* 345)

one needs is a good deal of time to work the outfit, so fascinating is the operation of phone on this band that one can depend on spending a lot of time at it.

It must be borne in mind that a Federal Radio Commission license is necessary for the operation of this transmitter. Its use prior to obtaining a valid license is not permitted by the authorities.

Radio News Technical Information Service

The Technical Information Service has been carried on for many years by the technical staff of RADIO NEWS. Its primary purpose is to give helpful information to those readers who run across technical problems in their work or hobby which they are not able to solve without assistance. The service has grown to such large proportions that it is now advisable to outline and regulate activities so that information desired may come to our readers accurately, adequately and promptly.

Long, rambling letters containing requests that are vague or on a subject that is unanswerable take up so large a portion of the staff's working time that legitimate questions may pile up in such quantities as to cause a delay that seriously hinders the promptness of reply. To eliminate this waste of time and the period of waiting, that sometimes occurs to our readers as a consequence, the following list of simple rules *must* be observed in making requests for information. Readers will help themselves by abiding by these rules.

Preparation of Requests

1. Limit each request for information to a single subject.
2. In a request for information, include any data that will aid us in assisting in answering. If the request relates to apparatus described in RADIO NEWS, state the issue, page number, title of article and the name of the device or apparatus.
3. Write only on one side of your paper.
4. Pin the coupon to your request.

The service is directed specifically at the problems of the radio serviceman, engineer, mechanic, experimenter, set builder, student and amateur, but is open to all classes of readers as well.

All questions from subscribers to RADIO NEWS will be answered free of charge, provided they comply with the regulations here set forth. All questions will be answered by mail and not through the editorial columns of the magazine, or by telephone. When possible, requests for information will be answered by referring to articles in past issues of the magazine that contain the desired information. For this reason it is advisable to keep RADIO NWS as a radio reference.

Complete information about sets described in other publications cannot be given, although readers will be referred to other sources of information whenever possible. The staff cannot undertake to design special circuits, receivers, equipment or installations. The staff cannot service receivers or test any radio apparatus. Wiring diagrams of commercial receivers cannot be supplied, but where we have published them in RADIO NEWS, a reference will be given to past issues. Comparisons between various kinds of receivers or manufactured apparatus cannot be made.

Only those requests will be given consideration that are accompanied by the current month's coupon below, accurately filled out.

DECEMBER, 1933

Technical Information Coupon
RADIO NEWS Laboratory
222 W. 39th Street
New York, N. Y.
Gentlemen:

Kindly supply me with complete information on the attached question:

☐ I am a regular subscriber to RADIO NEWS, and I understand this information will be sent me free of charge.

☐ I am not yet a subscriber to RADIO NEWS.

☐ I wish to become a subscriber to RADIO NEWS, and enclose $2.50 to receive the magazine regularly for one year, and to receive this valuable technical information service free of charge.

Name.....

Address.....

The DX Corner

(*Continued from page 351*)

station might help by sending in such identifications to the DX Corner.)

He Misses W1XAZ

Mr. G. E. McJunkin of Kansas City, Kansas, mentions that he has missed station W1XAZ for the last three months and wonders what became of them.

Music from Buenos Aires

Mr. A. G. Taggart of Reedy Creek, Manitoba, Canada, reports that he has been hearing LSX on 28.9 meters broadcasting music between 8 and 9 p.m, E. S. T.

Short Waves Coming in Best

Mr. Frederick G. Hehr of Sayville, Long Island, New York, reports that in his location 19 meters is the best wavelength at present. The 31 meter band has been fluttering and is full of interference from local commercial stations. He mentions that EAQ's outfit must date from before the war because although they have plenty of power the quality of reception is invariably "punk." He uses a Midwest 16, coupled to a converter of his own design. Also he uses an Ozarka with a converter.

Best Bets at Binghamton

Mr. Roger Legge, Jr., of Binghamton, New York, sends us in the following list of best bets for his location: EAQ, DJA, DJB, GSB, GSD, GSF. Also well received but not as good as the first log are: DJC, FYA, VK2ME, HKV, XETE, VE9DR, VE9JR, VE9GW, and CGA. He has heard YV2BC, YVQ, LSY. His best United States stations are W8XK, W9XF, W1XAL, W1XAZ, W2XAF, W2XE, W3XAU, W3XL, W3XAL, W8XAL and W9XAA.

Another Report from British Guiana

Mr. E. S. Christiani, Jr., of Georgetown, British Guiana, reports that he has been picking up every day a Spanish station on about 49 meters between 11 and 12 a.m. He also logs W1XAL, W3XL, VE9JR, VK2ME and many other Spanish stations. He gets DJD and DJC. He states that W3XAL comes on spasmodically in the afternoons.

His First Report

Mr. Louis A. Taix of San Juan Bautista, California, recently purchased a Comet "Pro" super. He says the first day he tested the set he picked up Radio Coloniale. It was the station he most wanted to get. His report continues with a complete description of the type of schedules they transmit. The American stations came in exceedingly well—like locals—and also he gets J1AA and RV15 and the Australian stations VK2ME and VK3ME.

A Report from San Jose, California

Mr. Fred Corey of San Jose, California, using a Pilot Super Wasp receiver, picks up the following stations regularly in his location: W3XAL, W8XK, W1XAZ, W9XF, W2XAF, W8XAL, W3XL, RV15, VK2ME, W2XAD, W1XAL, W3XAU, W9XAA, VE9CS, VE9JR, W2XE, EAQ, VK3ME, PRADO, HJ2AVA, HJ3ABF, VE9GW, FYA, YV1BC, XETE, KEJ, WEJ, J1AA, WOA, KDK, GBU, KKP, KX, LSX, WKJ, W9XQ, W9XZ, PLV, KWZ, KAY, LST. He has also received the following "hams" on 'phone: X5N, X3B, X1G, K6BAZ, K6ALM, K6CMC, K6CIB, K6GNW, VE5HE,

VE4EA, VE5AI, VE5EE, VE5EF, VE5AI and K7AOC.

A Report from Chicago

Mr. John Brustman sends in the following list of best bets that he picks up regularly on a Howard superheterodyne with an RCA adapter: DJD, DJC, GSB, GSE, GSD, EAQ, I2RO, VE9JR. He writes that he is going to set up a National FB7 for the coming winter months.

Best Bets from Berkeley

Mr. Andrew J. Potter of Berkeley, California, sends in the following best bets received in his location: W3XAL, KKP, KWO, W8XK, WMF, FYA, I2RO, W1XAL, DJD, GSD, VE9JR, VE9BA, KKH, EAQ, XETE, VK2ME, GSC, DJA, W2XAF, WEF, KAZ, KEJ, WOA, W3XL, W2XE, YV1BC, W9XF, W3XAL, VE9GW, VE9CS, W8XAL, RV15. He uses a four tube superheterodyne converter described by Manson E. Wood in Radio News a couple of years ago.

Best Bets in Texas

Mr. Kent Deckard of Rusk, Texas, using a U. S. 7d short-wave receiver reports the following best bets: GSD, GSB, DJA, DJC, LSN, OCJ, OCI, VE9GW, XIG, EAQ, XETE, RXC, VPN, K6BAZ, TGX, XAM, LSX, OA2B, K4SA, TIU, WSBN, HC1DR, YV2AN, VK2ME.

A Report from Los Angeles

Mr. Werner A. Howald, a member of the Short Wave League, states that he hears XETE, W2XAF, YV1BC, J1AA, RV15 with exceptional volume. He asks us to be sure and not to drop "With the Experimenters" department, for with that department and the DX Corner, it is the best radio magazine in his opinion.

Readers Who Helped Log Stations for This Month's Report

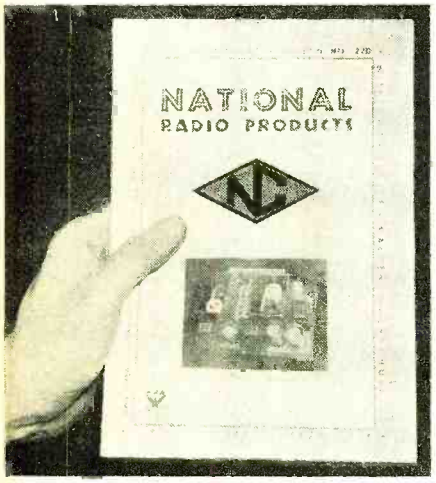
We are indebted to the following readers of Radio News who sent in reports of reception this month: Inna Marr, Moscow, U. S. S. R.; Dr. J. P. Watson, Hazlehurst, Miss.; F. G. Hehr, Sayville, L. I.; R. W. Evans, Lima, O.; S. H. Lawrence, Anamosa, Ia.; C. H. Armstrong, Atlanta, Ga.; J. E. Woolley, Evansville, Ind.; A. J. Leonhardt, Brooklyn, N. Y.; E. M. Law, Miami, Fla.; J. E. Brooks, Montgomery, Ala.; Walter Hardell, Rhinelander, Wis.; Andrew B. Alford, Bogota, Colombia; L. W. Hayes, London, England; Eugene S. Allen, Reedley, Cal.; R. LaRocque, Worcester, Mass.; D. E. Barne, Copiague, L. I.; R. A. Miller, Morganton, N. C.; H. Pugh, Asheville, N. C.; R. I. Keeler, West Scarboro, Me.; R. L. Weber, West McHenry, Ill.; G. E. McJunkin, Kansas City, Kans.; A. Smith, Dyersburg, Tenn.; G. Moraldi, Rome, Italy; E. J. Anzola, Caracas, S. A.; J. E. Baudino, Boston, Mass.; A. C. Marin, Heredia, Costa Rica, C. A.; H. J. Rud, Copenhagen, Denmark; D. A. Myer, Pittsburgh, Pa.; B. Barnes, Fairhaven, Mass.; K. C. Murray, Leonardo, N. J.; C. W. Lewis, Jr., Kennebunkport, Me.; W. A. Howald, E. Los Angeles, Cal.; K. Deckard, Risk, Tex.; A. J. Patter, Berkeley, Cal.; J. Brustman, Chicago, Ill.; F. Corey, San Jose, Cal.; L. A. Taix, San Juan Bautista, Cal.; E. S. Christiani, Jr., Charlestown, Georgetown, Demerara, British Guiana; R. Legge, Jr., Binghamton, N. Y.; F. G. Hehr, Sayville, N. Y.; A. G. Taggert, Reedy Creek, Man., Can.

The Editors acknowledge with thanks the assistance of public-spirited readers who have thus cooperated 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 logs of stations, their wavelengths and times of transmission. Readers will also help by stating what type of receiver they use in logging these stations.

Helpful Data for the Short-Wave Fan

Short-wave constructors, experimenters and radio dealers will find this new 16-page folder helpful in their work. The book contains information on the latest National products, which include power units, a.f. transformers, the many different styles of velvet-vernier dials, variable transmitting



and receiving condensers, high-voltage transmitter shaft couplings, a full line of inductances, both regular and band-spread type, tube and coil shields, sockets and r.f. chokes and the new air dielectric tuned i.f. transformers. The folder is complete with information on the National short-wave receivers, embracing the new models AGS and FB7 sets.

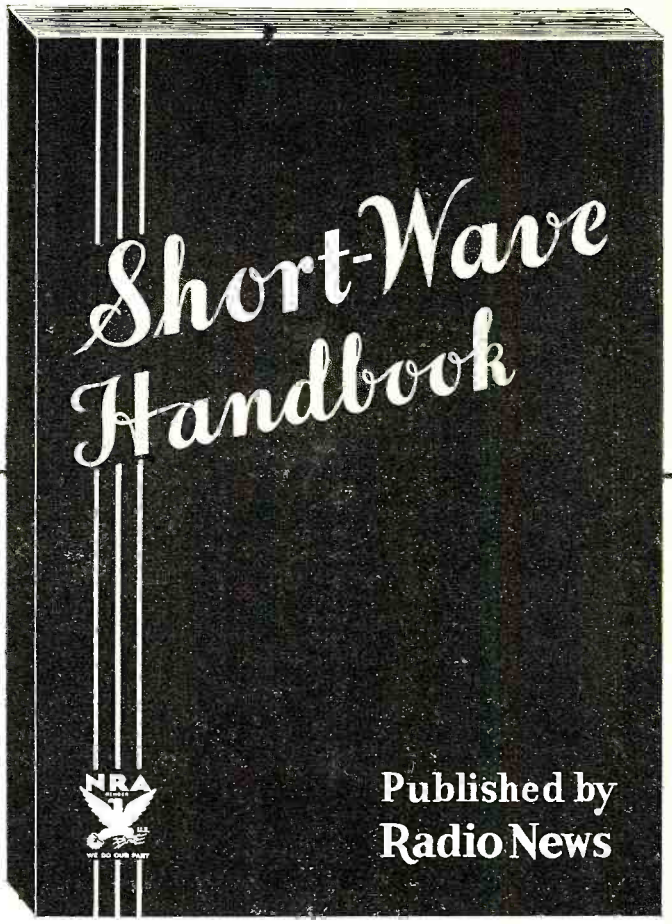
Readers may obtain this folder without charge by writing to the National Company, Inc., Malden, Mass., stating that they are RADIO NEWS readers.

DX Broadcasts

(*Continued from page 342*)

First Friday Each Month

3:00	1210	WJW	Akron, O.	100
	1310	KRMD	Shreveport, La.	100
3:10	1420	WPAD	Paducah, Ky.	100
3:20	1210	WSEN	Columbus, O.	100
	1310	KFXR	Oklahoma City, Okla.	100
3:30	1420	WELL	Battle Creek, Mich.	50
	1200	KGEK	Yuma, Colo.	100
3:40	1210	WALR	Zanesville, O.	100
	1310	KFPL	Dublin, Tex.	100
3:50	1420	WMBC	Detroit, Mich.	100
	1200	WCAT	Rapid City, S. D.	100
4:00	1310	WFDF	Flint, Mich.	100
	1240	KGCU	Mandan, N. D.	250
4:10	1200	WFBE	Cincinnati, O.	100
	1370	KCRC	Enid, Okla.	100
4:20	1310	WEXL	Royal Oak, Mich.	50
	1240	KLPM	Minot, N. D.	250
4:30	1200	WCLO	Janesville, Wis.	100
	1370	KGFG	Oklahoma City, Okla.	100
4:40	1310	WCLS	Joliet, Ill.	100
	1420	KABC	San Antonio, Tex.	100
4:50	1200	WJBL	Decatur, Ill.	100
	1370	KFLZ	Fort Worth, Tex.	100
5:00	1370	WJBK	Detroit, Mich.	50
	1420	KWCR	Cedar Rapids, Ia.	100
5:10	1210	WIBU	Poynette, Wis.	100
	1500	KGFI	Corpus Christi, Tex.	100
5:20	1370	WHDF	Calumet, Mich.	100
	1420	WLBF	Kansas City, Kans.	100
5:30	1210	WCRW	Chicago, Ill.	100
	1500	KGKB	Tyler, Tex.	100
5:40	1370	WRJN	Racine, Wis.	100
	1420	WMBH	Joplin, Mo.	100
5:50	1200	WLAP	Louisville, Ky.	100
	1500	KGFK	Moorhead, Minn	100



In Tune With Our Times

RADIO NEWS presents the *Short-Wave Handbook*, a handy volume of 136 pages, containing the information needed by every short-wave enthusiast. With RADIO NEWS and the *Short-Wave Handbook* as your guide you can travel the world over on the short waves. Seated in a comfortable living-room chair you can hear news-flashes from Cuba—delight in the atmosphere of a German waltz—thrill to the splendor of the opera from Rome—twist the dials and hear Big Ben toll the hour in London—listen to the chatter of busy American amateurs—and pick up the terse police reports.

This Book Given Free!

You can get a copy of the *Short-Wave Handbook* absolutely free by subscribing for 11 issues of RADIO NEWS at the bargain price of $2. And, renewal subscriptions will be accepted! Act now! Mail the coupon with your remittance *at once!*

Partial Contents

Fundamental Principles

The *Short-Wave Handbook* begins with a discussion of the principles underlying short-wave communication—explaining the various theories, atmospheric effects, and peculiarities.

Helpful Short-Wave Data

Foreign announcements are explained—a time chart is included—a brief discussion on receivers follows—and hints on tuning are given.

Short-Wave Receivers

Having explained the fundamentals, the *Short-Wave Handbook* follows with full instructions, diagrams and circuits for building five simple short-wave receivers ranging from two to four tubes and two more-complicated receivers of five and six tubes.

Popular Commercial Apparatus

For the man who wants to buy his receiver ready-made, brief descriptions and circuit diagrams of popular commercially-built short-wave apparatus are printed.

Short-Wave Accessories

Various short-wave antenna systems and noise-control circuits are described—with constructional details where necessary.

Short-Wave Station Lists

The *Short-Wave Handbook* contains an up-to-date list of the world commercial short-wave stations from 5 to 80 meters.

Best Bets For DX

Chapter 8 contains a list of the short-wave stations now being received daily in the United States and reception reports by short-wave listeners.

Learning The Code

The complete International Morse Code is shown in Chapter 9 and simple instructions are given for learning it. Details for building various code practice sets are included.

Amateur Transmitters

Building instructions for several good amateur transmitters and valuable hints on R. F. amplifiers are presented in Chapter 10.

Ultra-Short Waves

For the ultra-short-wave fan, constructional data for 5 and 10 meter transmitters and receivers appear in Chapter 11. Simple methods for accurate 5 meter measurements are included.

RADIO NEWS, 12
222 W. 39th St., New York, N. Y.

O. K. Send me RADIO NEWS for the next 11 issues at that money-saving $2. price and mail me a copy of the *Short-Wave Handbook* absolutely free. I enclose my remittance herewith. (Canada $2.50—Foreign $3.) If renewal, check here ( ).

Name.....

Address.....

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

Radio News

222 West 39th St. New York, N. Y.

Read Classified Advertising—It Pays

Advertisements in this section twenty-three cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisements for less than 10 words accepted. Objectionable or misleading advertisements not accepted. Advertisements for these columns should reach us not later than 1st of 2nd month preceding issue.

TECK PUBLICATIONS, INC.
222 West 39th St. New York, N. Y.

Correspondence Courses

FOR home-study courses in Radio Engineering, and other university branches, address Extension Bureau, Rogers, Ohio.

USED Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back agreement. Catalog listing 3000 bargains—FREE (Courses bought). Lee Mountain, Pisgah, Alabama.

Foreign Representation Wanted

FIRM 8 years established, selling to specialists all over Spain, solicits offers for radio sets, popular types. Churruca Y Salaverria, Eibar, (Spain).

Inventions

INVENTIONS, COMMERCIALIZED. Patented or unpatented. Write, Adam Fisher Mfg. Co., 278 Enright, St. Louis, Mo.

Patent Attorneys

PATENTS: Send for Free Book, "How to Obtain a Patent," and "Record of Invention" blank. Consult us about how to protect your ideas. Deferred Payments. Victor J. Evans & Co., 649M Victor Bldg., Washington, D. C.

PATENTS—Advice and booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 9th Street, Washington, D. C.

PATENTS. Instructions "How to Establish Your Rights" and form, "Evidence of Conception"—sent Free! Lancaster, Allwine & Rommel, 414 Bowen Building, Washington, D. C.

Radio Talent Wanted

UNDISCOVERED radio talent will be given encouragement, opportunity and management. Microphone and cabaret audience provided free at 11 West 51st St. in Radio City. Nellie Edwards, New York, N. Y.

Song, Poem Writers

SONG WRITERS WANTED Now. 50-50 Plan. Indiana Song Bureau, Salem, Indiana.

First Saturday Each Month

2:00	1420	WMAS	Springfield, Mass.	100
2:10	1210	WJBI	Red Bank, N. J.	100
2:20	1500	WWRL	Woodside, N. Y.	100
2:30	1210	WGNY	Chester Twp., N. Y.	50
2:40	1500	WMBQ	Brooklyn, N. Y.	100
2:50	1210	WGBB	Freeport, N. Y.	100
3:00	1430	WOKO	Albany, N. Y.	500
	1200	WJBC	La Salle, Ill.	100
	1120	KTRH	Houston, Tex.	1000
3:10	1370	WGL	Ft. Wayne, Ind.	100
	1210	KFPW	Ft. Smith, Ark.	100
3:20	1200	WWAE	Hammond, Ind.	100
	1120	WTAW	College Sta., Tex.	500
3:30	1310	WLBC	Muncie, Ind.	50
	1210	KASA	Elk City, Okla.	100
3:40	1200	WFAM	South Bend, Ind.	100
	1270	KWLC	Decorah, Ia.	100
3:50	1350	WCDA	Cliffside, N. J.	250
	1350	WBNX	Cliffside, N. J.	250
	1350	WMSG	Cliffside, N. J.	250
	590	WKZO	Kalamazoo, Mich.	1000
	1340	KGNO	Dodge City, Kans.	250
4:00	610	WJAY	Cleveland, O.	500
	1270	KGCA	Decorah, Ia.	100
4:10	1350	WAWZ	Zarephath, N. J.	250
	1210	KFVS	Cape Girardeau, Mo.	100
4:20	950	KGHL	Billings, Mont.	1000
4:30	1210	KDLR	Devils Lake, N. D.	100
4:40	920	KPRC	Houston, Tex.	1000
4:50	1200	KFXJ	Grand Junction, Col.	100
5:00	560	KFDM	Beaumont, Tex.	500
5:10	1210	KGCR	Watertown, S. D.	100
5:20	760	WEW	St. Louis, Mo.	1000
5:30	1380	WKBH	La Crosse, Wis.	1000
5:40	880	WSUI	Iowa City, Ia.	500
5:50	1230	KGGM	Albuquerque, N. M.	250

First Sunday Each Month

3:00	1290	KLCN	Blytheville, Ark.	100
3:10	1450	KTBS	Shreveport, La.	1000
3:30	1440	KXYZ	Houston, Tex.	250
3:40	1290	KTSA	San Antonio, Tex.	1000
3:50	1040	KOCW	Chickasha, Okla.	250
4:00	1260	KWWG	Brownsville, Tex.	500
4:10	1340	KGDY	Huron, S. D.	250
4:20	1260	KRGV	Harlingen, Tex.	500
4:30	1280	WRR	Dallas, Tex.	500
4:40	630	KGFX	Pierre, S. D.	200
4:50	890	KARK	Little Rock, Ark.	250
5:00	570	KGKO	Wichita Falls, Tex.	250
5:10	880	KPOF	Denver, Colo.	500
5:20	1010	WNAD	Norman, Okla.	500
5:30	880	KFKA	Greeley, Colo.	500
5:40	1260	KUOA	Fayetteville, Ark.	1000

DX Broadcasts

(*Continued from page 342*)

in. I neglected to mention that LR4 (990) can be heard interfering with WBZ and can be received fairly well when WBZ happens to fade sharply. LR4 could doubtless be heard reasonably well after WBZ signs off at 11:30 p.m. This and other South American stations should be delivering good signals in a few weeks.

"Here the main problem, as in the case of the European stations, is finding a loophole in the interference normally experienced from the North American stations, which are on at the same hours. On the other hand, for successful trans-Pacific reception, barring unusually good locations, such, for example, as the Pacific Coast, the principal requirement is the possession of receiving equipment having sufficient selectivity to cut out unwanted U. S. stations on adjacent channels and enough usable sensitivity to amplify to a sufficient degree without becoming noisy on the usually very weak signals."

500 Kilowatts for WLW

Word comes that the Crosley station in Cincinnati is progressing steadily with the construction of its new transmitting plant which, when completed, is expected to be the most powerful broadcasting station in the world. The transmitter will cost in the neighborhood of $400,000, and it is expected to provide a service radius of 2500 miles. The antenna to be employed is one of the vertical radiator type. This antenna, with its 31-foot tower, has been completed and is being used in conjunction with the 50 kw. transmitter now employed by this station.

It is expected that tests of the new transmitter will start early in December, and experimental transmissions will be carried on between 1 a.m. and 6 a.m. This will provide an excellent opportunity for the DX fans

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF MARCH 3rd, 1933, OF RADIO NEWS AND THE SHORT WAVE, published monthly at Dunellen, N. J., for October 1st, 1933.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Lee Ellmaker, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the RADIO NEWS AND THE SHORT WAVE and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Teck Publications, Inc., 222 West 39th Street, New York, N. Y.; Editor, L. M. Cockaday, 222 West 39th Street, New York, N. Y.; Managing Editor, None; Business Manager, Lee Ellmaker, 222 West 39th Street, New York, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Lee Ellmaker, 222 West 39th Street, New York, N. Y.; Teck Publications, Inc., 222 West 39th Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

LEE ELLMAKER, Publisher.

Sworn to and subscribed before me this 19th day of September, 1933.

ABNER GERMANN, Notary Public.
Queens County Clerk's No. 2417.
Queens County Register's No. 2138.
New York County Clerk's No. 504.
New York County Reg. No. 4G279.
My Comm. expires March 30, 1934.

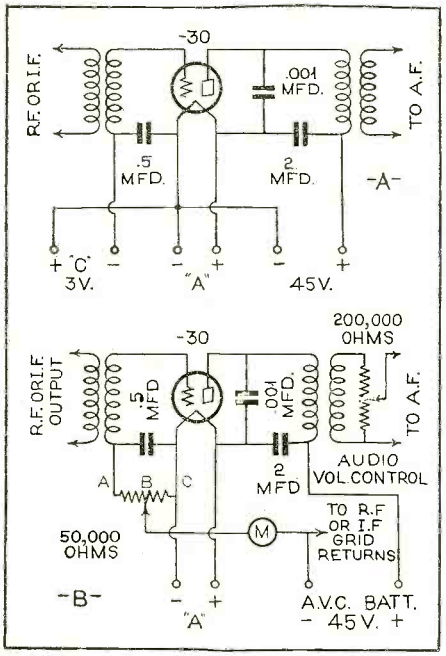
INDEX TO ADVERTISERS

of other countries to add another American station to their logs, because, with such high power, it is expected that WLW will be heard throughout the world with fair regularity.

With the Experimenters

(*Continued from page 363*)

should be an 0-1 ma. meter, as the amount of current used by the -30 type tube with no signal is only about 0.1 ma. and less than 0.5 ma. for a strong local signal. This meter serves as a tuning meter and also enables one to compare signal strength and percentages of modulation of various stations. Low percentage modulation gives a good meter reading, but a low speaker volume, and vice



versa. I believe this a.v.c. could be used on any sensitive battery set and requires only one 50,000-ohm potentiometer, one ½ mfd. by-pass condenser and one separate 45-volt block of B battery.

To adjust, tune where there is no signal and vary potentiometer to obtain maximum sensitivity as judged by the highest noise level. The exact point will vary with different tubes, but for a given tube will always be the same.

JOHN M. WELLS,
Moosemin, Sask., Canada.

The Service Bench

(*Continued from page 369*)

lead, with very good results. This is much easier than making a new transformer installation. Care should be observed in using resistors with ample power dissipation.

"The easiest way to adapt the set to standard tubes is to vary the heater resistors until the voltmeter reading shows slightly less than 2.5 volts. This is more simple than calculation. (I am still replacing type -01A's in battery sets with modern 2-volt tubes. I usually charge $2.00 for changing the sockets and rheostat if a new set of tubes is purchased. This fee, together with the profit on the tubes, nets me about $5.00, which is fair value.)"—H. D. Hooton, Radio Service Company, Beech Hill, W. Va.

Glenn Ellsworth, of Veronia, Oregon, has run into similar difficulties, while his treatment is somewhat different. He refers spe-

cifically to the Sparton model 301, and his notes apply equally well to receivers using either the –81's or –80 rectifiers.

"On inspecting the receiver, we found all voltages to be practically normal. The volume, however, was very low and accompanied with considerable noise. Oscillation was apparent over a section of the volume-control adjustment.

"The noise was found to be caused by a leaky 1 mfd. by-pass condenser in the r.f. amplifier. Low volume and oscillation were traced to an open primary in the plate circuit of the first r.f. tube.

"In another instance we found one of these receivers—with a type –80 rectifier tube—sadly in need of new tubes. We are about one hundred miles from the nearest source of supply, local dealers not stocking the Cardon tubes. An emergency repair was made by inserting suitable resistors in each leg of the power-tube filament leads and using –45's.

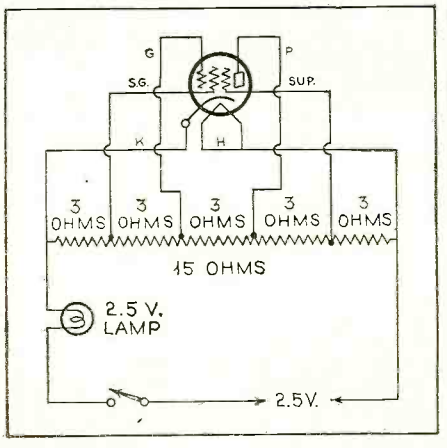
"They worked as well as the fifties, and thus encouraged, we rewound the r.f. filament winding for –27's, lowered the power-tube filament voltage to 2.5 volts (by removing turns) for the –45's, and made the indicated tube substitutions. The set worked satisfactorily without making any further alterations."

A few bouquets are handed the Sparton Equisonne circuit by Carl H. Tonsfeldt, Ogden, Iowa, and he suggests only one particular caution in the operation of the battery models 49 and 39.

"Be sure and match the tubes in the radio-frequency unit. These tubes are connected in three pairs of two tubes each, each pair being connected across the full 6-volts of filament battery. The tubes in each pair should be carefully matched for filament consumption. I plug a set analyzer into one of the paired sockets, a tube in the other, and of course a tube in the analyzer—switching tubes until I obtain three pairs showing the same filament IR drop. Then insert the tubes in the receiver, tune in a distant station (or a loosely coupled oscillator) and shift the tubes, *in pairs*, until best reception is obtained."

A Simplified "Short" Tester

Boiling down the tube short-circuit indicator to its ultimate simplicity, Allen James, of Brooklyn, N. Y., evolves the circuit shown in diagram. The arrangement consists of a 2.5-volt lamp lighted through a 15-ohm resistor tapped every 3 ohms. The taps are connected to the prongs of the test socket. When a tube is plugged in, a short-circuit between any of the elements will short-circuit a corresponding section of the resistor and the bulb will burn more brightly. The location of the short-circuit will not, of course, be indicated. But who cares?

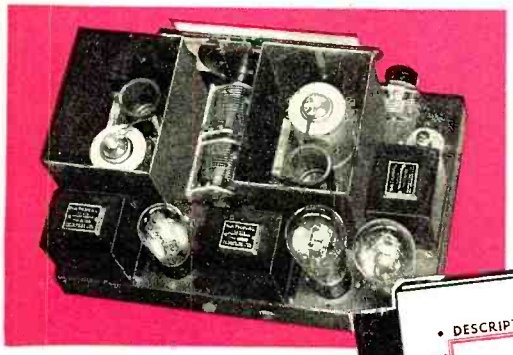


As Mr. James observes, "This type of 'short' tester can be made compact because of the few parts needed.

PRECISION H F PARTS

for Amateur, Experimenter and Constructor

AC SW58 RF TUNER

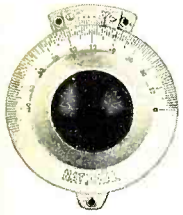


To those who prefer TRF, the ACSW-58 offers extremely low background noise and high usable sensitivity, together with unequalled flexibility and ease of control. The thoroughly engineered circuit employs five tubes with push-pull output. A D.C. model, Type SW-34, is also available.

AIR-DIELECTRIC SHIELDED PADDING CONDENSER

Almost as small as a walnut, the NATIONAL Air-Dielectric Padding Condenser is designed to replace the inefficient mica condensers commonly used. Isolantite insulated, and thoroughly shielded, it occupies a space 1¼ inches in diameter and 1¼ inch high. It is described on Page 15 of the General Catalog No. 220.

PRECISION TYPE N SHORT WAVE DIAL



One phrase, "Precision High Frequency Dial," describes the character and purpose of this thoroughly engineered product. "Precision," because of its accuracy makes tuning easy and calibration authoritative, and "High Frequency" because every detail has been designed to fit it for this most difficult service. Thoroughbred in appearance as well as action, it will improve the appearance of your receiver as much as it will improve the accuracy of your wavemeter.

FRONT-OF-PANEL-CHANGE COIL FORMS AND SOCKETS

Bring your short-wave receiver up to date with coils wound on NATIONAL Regular and Band Spread Coil-Forms with grounded and shielded cast-metal handles, and built-in air-dielectric padding condensers—as used in FB-7 and FB-X Receivers. These forms are made to fit the NATIONAL special 6-prong front-of-panel coil-socket with aluminum shield and external terminal strip.

COIL & TUBE SOCKETS

These new NATIONAL Isolantite sockets, designed specifically for short-wave service, will reduce losses at this point to a minimum. Made with convenient prong-guiding channel, and in 4, 5, 6 and 7-prong styles.

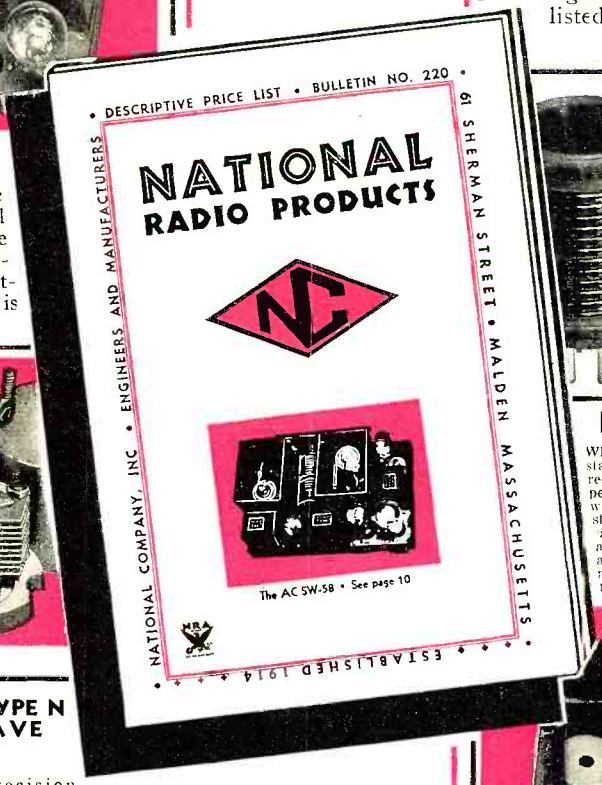
RF CHOKES

TYPE R100 RF CHOKE

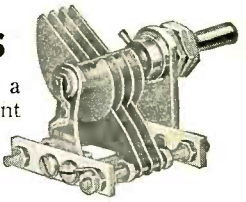
And completing the NATIONAL line of High Performance R.F. Chokes, the type R-100 is particularly effective for short-wave receivers. Rating: 125 milliamperes, 2½ millihenries, 50 ohms D.C. resistance.

SEND COUPON TODAY

Clip the coupon below. It will bring the NATIONAL General Catalog No. 220, containing complete information and prices on National radio products.



MIDGET H.F. CONDENSERS



NATIONAL makes a full line of 52 different models of short-wave and ultra-short wave variable condensers. All midgets have Isolantite Stator insulation, no shorted turns, constant impedance rotor-connections to eliminate crackle and noise, mechanical rigidity and electrical stability. Fully listed in Catalog No. 220.

STANDARD R-39 FORMS

These forms are made of R-39, the special high-efficiency dielectric for short-wave work. Reduces losses—will not deteriorate. Made in 4, 5 and 6-prong models. Fit NATIONAL sockets.

FB-7 SHORT-WAVE SUPER

When you see and operate the FB-7 you will understand why this seven-tube short-wave superheterodyne receiver has become so popular not only with the experienced amateurs, for whom it was designed—but with short-wave broadcast listeners everywhere. Two stages of high-gain air dielectric tuned I.F. amplification (six tuned circuits) give very high sensitivity and selectivity. Class A Pentode audio output assures ample volume and quality. Full range 9 to 200 meters. Our catalog gives all the features—many of them exclusive—of this outstanding receiver.

NATIONAL COMPANY, INC., 61 SHERMAN STREET, MALDEN, MASSACHUSETTS

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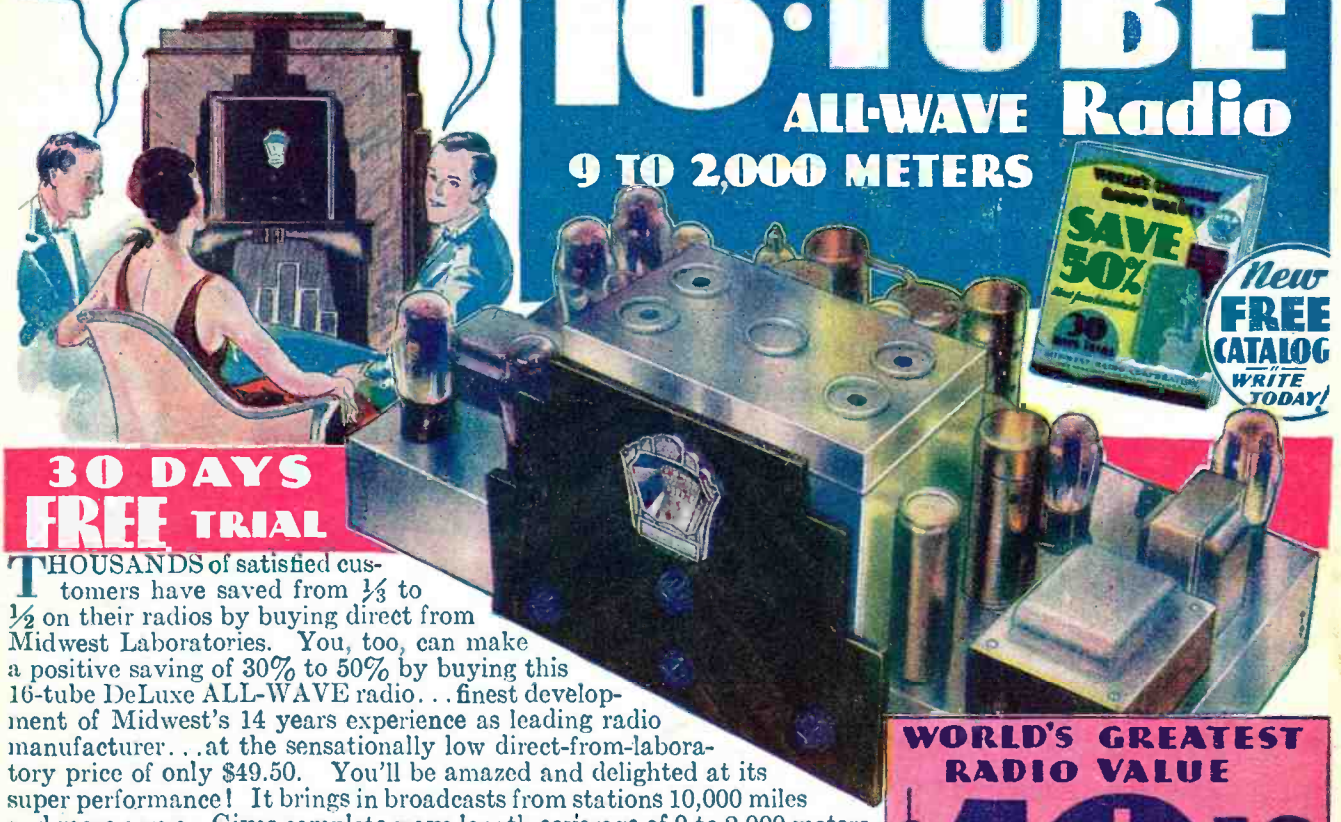

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