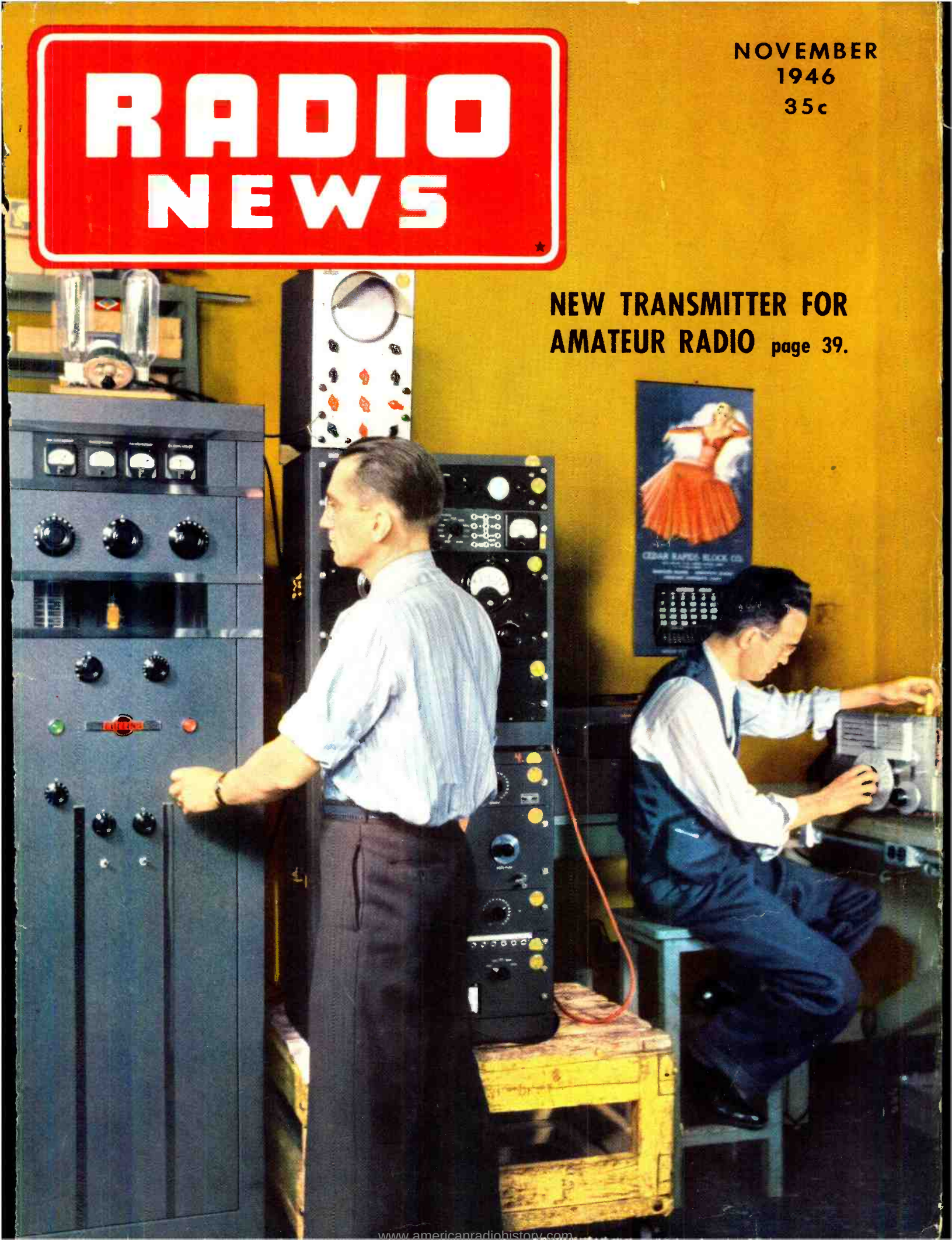
RADIO NEWS

NOVEMBER
1946
35c

NEW TRANSMITTER FOR AMATEUR RADIO page 39.



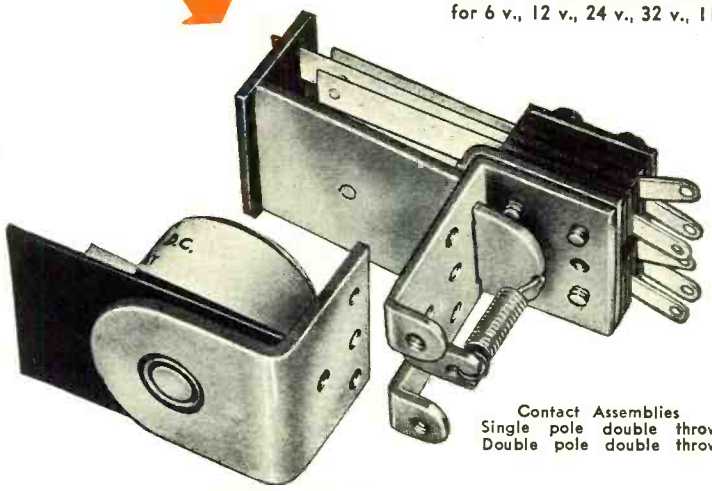
New! Series 200

A RELAY BY GUARDIAN with Interchangeable Coils

BUILT IN TWO PARTS

A.C. Coil Assemblies available for 6 v., 12 v., 24 v., 115 v.
D.C. Coil Assemblies available for 6 v., 12 v., 24 v., 32 v., 110 v.

★ Two basic parts—a coil assembly and a contact assembly—comprise this simple, yet versatile relay. The coil assembly consists of the coil and field piece. The contact assembly consists of switch blades, armature, return spring, and mounting bracket. The coil and contact assembly are easily aligned by two locator pins on the back end of the contact assembly which fit into two holes on the coil assembly. They are then rigidly held together with the two screws and lock washers. Assembly takes only a few seconds and requires no adjustment on factory built units.



Contact Assemblies
Single pole double throw
Double pole double throw

SERIES 200 RELAY

On Sale at Your Nearest Jobber NOW!

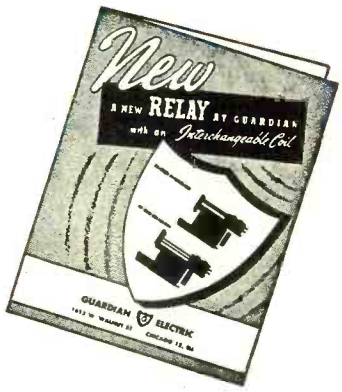
See it today! . . . this amazing new relay with interchangeable coils. See how you can operate it on any of nine different a-c or d-c voltages —simply by changing the coil. Ideal for experimenters, inventors, engineers.

TWO CONTACT ASSEMBLIES

The Series 200 is available with a single pole double throw, or a double pole double throw contact assembly. In addition, a set of Series 200 Contact Switch Parts, which you can buy separately, enables you to build dozens of other combinations. Instructions in each box.

NINE COIL ASSEMBLIES

Four a-c coils and five d-c coils are available. Interchangeability of coils enables you to operate the Series 200 relay on one voltage or current and change it over to operate on another type simply by changing coils.



Your jobber has this sensational new relay on sale now. Ask him about it. Or write for descriptive bulletin.

GUARDIAN ELECTRIC

1630-M W. WALNUT STREET CHICAGO 12, ILLINOIS

A COMPLETE LINE OF RELAYS SERVING AMERICAN INDUSTRY

I WILL TRAIN YOU TO START

A SPARE TIME OR FULL TIME

RADIO SERVICE BUSINESS WITHOUT CAPITAL

J. E. SMITH, PRESIDENT
National Radio Institute
32nd Year of Training Men for Success in Radio

You Build These and Many Other Radio Circuits with 6 Kits of Parts I Supply

By the time you've conducted 60 sets of Experiments with Radio Parts I supply, made hundreds of measurements and adjustments, you'll have valuable PRACTICAL Radio experience for a good full or part-time Radio job!

You build MEASURING INSTRUMENT above early in Course, useful for Radio work to pick up EXTRA spare time money. It is a vacuum tube multimeter, measures A.C., D.C., R.F. volts, D.C. currents, resistance, receiver output.

You build the SUPERHETERODYNE CIRCUIT above containing a preselector oscillator-mixer-first detector, i.f. stage, diode-detector-a.v.c. stage and audio stage. It will bring in local and distant stations. Get the thrill of learning at home evenings in spare time while you put the set through fascinating tests!

Building the A. M. SIGNAL GENERATOR at right will give you valuable experience. Provides amplitude-modulated signals for test and experimental purposes.

The men at the right are just a few of many I have trained, at home in their spare time, to be Radio Technicians. They are now operating their own successful spare time or full time Radio businesses. Hundreds of other men I trained hold good jobs in practically every branch of Radio. Doesn't this PROVE my "50-50 method" of home training can give you BOTH a thorough knowledge of Radio principles and the PRACTICAL experience you need to help you make more money in the fast-growing Radio industry?

Let me send you facts about opportunities in the busy Radio field. See how knowing Radio can give you security, a prosperous future . . . lead to jobs coming in Television, Electronics. Send coupon NOW for FREE Sample Lesson and 64-page, illustrated book. Read how N.R.I. trains you at home in spare time. Read how you practice building, testing, repairing Radios with SIX BIG KITS of Radio parts I send you.

Many Beginners Soon Make Extra Money in Spare Time While Learning

The day you enroll I start sending EXTRA MONEY JOB SHEETS. You LEARN Radio principles from my easy-to-understand, illustrated lessons—PRACTICE what you learn by building, testing and experimenting with parts I send—USE your knowledge to make EXTRA money fixing neighbors' Radios in spare time while still learning! From here it's a short step to your own full-time Radio Shop or a good Radio job!

Future for Trained Men is Bright in Radio, Television, Electronics

It's probably easier to get started in Radio now than ever before, because the Radio Repair Business is booming. Trained Radio Technicians also find profitable opportunities in Police, Aviation, Marine Radio, Broadcasting, Radio Manufacturing, Public Address work. Think of even greater opportunities as Television, FM, and many new, war-developed Electronic devices become available to the public! Soon, there will be more Radio equipment to install, operate, maintain and repair than ever before in all history! Get the facts on all these opportunities. Send for FREE books now!

Find Out What NRI Can Do For You

Mail Coupon for Sample Lesson, "Getting Acquainted with Receiver Servicing," and my FREE 64-page book. It's packed with facts about Radio's opportunities for you. Read the details about my Course. Read letters from men I trained, telling what they are doing, earning. See how quickly, easily you can get started. No obligation! Just MAIL COUPON NOW in an envelope or paste it on a penny postal. **J. E. SMITH, President, Dept. 6MR, National Radio Institute, *Pioneer Home Study Radio School*, Washington 9, D. C.**

I Trained These Men — SPARE TIME RADIO BUSINESS

"I have a spare time Radio and Electrical business of my own which has been very profitable, due to the efficient training I received from your Course. Last year I averaged over $50 a month."—FRED H. GRIFFIE, Route 3, Newville, Pa.

"I am doing radio work in my spare time, and find it a profitable hobby. My extra earnings run about $10 a week. I certainly am glad I took your N.R.I. Course."—FERDINAND ZIRBEL, Chaseley, North Dakota.

"About six months after I enrolled I started making extra money in radio. I am a farmer and just work on radios evenings and stormy days. That brought me a profit of $600 in the last year."—BENNIE L. ARENDS, RFD 2, Alexander, Iowa.

I Trained These Men — FULL TIME RADIO BUSINESS

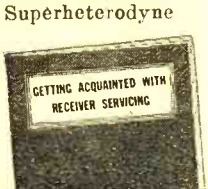
"Not long ago I was working 16 hours a day in a filling station at $10 a week. Now I have my own radio business and average over $60 a week. The N.R.I. course is fine."—ALBERT C. CHRISTENSEN, 116—10th Avenue, Sidney, Neb.

"Previous to enrolling for your radio training I made $12 per week in a hardware store. Now I operate my own repair shop, and often clear $35 to $45 a week."—FREDERICK BELL, 76 Golf Ave., St. Johns, Newfoundland.

"Am making over $50 a week profit from my own shop. Have another N.R.I. graduate working for me. I like to hire N.R.I. men because they know radio."—NORMAN MILLER, Hebron, Neb.

SAMPLE LESSON FREE

I will send you a FREE Lesson, "Getting Acquainted with Receiver Servicing," to show you how practical it is to train for Radio at home in spare time. It's a valuable lesson. Study it—keep it—use it—without obligation! Tells how Superheterodyne Circuits work, gives hints on Receiver Servicing, Locating Defects, Repair of Loudspeaker, I.F. Transformer, Gang Tuning, Condenser, etc. 31 illustrations.



My Radio Course Includes
TELEVISION • ELECTRONICS
FREQUENCY MODULATION

GOOD FOR BOTH 64 PAGE BOOK SAMPLE LESSON FREE

J. E. SMITH, President, Dept. 6MR
National Radio Institute, Washington 9, D. C.

Without obligating me, mail your Sample Lesson and 64-page book. FREE. I am particularly interested in the branch of Radio checked below. (No salesman will call. Please write plainly.)

- ☐ My own Radio Service Business
- ☐ Spare Time Radio Servicing
- ☐ Service Technician for Radio Stores or Factory
- ☐ Aviation Radio
- ☐ Operating Broadcasting Station
- ☐ Industrial Electronics
- ☐ Public Address Systems
- ☐ Ship, Harbor, Gov't, Military Radio

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

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

Address .....

City ..... Zone..... State.....

Approved for Training under GI Bill

RADIO NEWS
REG. U.S. PAT. OFF.
First in radio

NOVEMBER, 1946
VOLUME 36, NUMBER 5

Average Paid Circulation over 130,000

***For the* AMATEUR**

All Wave Signal Generator.....*A. A. Goldberg,* W2HKU 32
Converting the SCR-522 Transmitter.....*Ray Frank,* W9JU 35
New Transmitter For Amateur Radio.....
.....*W. Bruene,* WØTTK *and N. Hale,* WØJIH 39
200 Watt All-band Transmitter.....*Harry D. Hooton,* W8KPX 40
A Linear Sweep Generator .....*W. J. Haywood,* W2OQB 78
10-Meter Vertical Coaxial Antenna .....*C. V. Hays,* W6RTP 88

***For the* SERVICEMAN-DEALER**

Planning an Aircraft Radio Installation.....*J. D. Scalbom* 25
Sound Conditioning Spurs Sales.....*J. J. Rowland* 30
New Selenium Rectifiers for Home Receivers.....*George Eannarino* 45
High Fidelity Receiver.....*J. C. Hoadley* 46
Low Cost Audio Oscillator.....*Robert W. Ehrlich* 50
Trouble Shooting the Television Receiver.....*Edward M. Noll* 52
Subscription-Lease Plan.....*Paul H. Wendel* 54
Income Tax Saving Facts For Radio Dealers.....*Harold J. Ashe* 58
The RN Circuit Page..... 64
Should Agencies be Used to Collect Delinquent Accounts?..*J. A. Harold* 126

***Of* GENERAL INTEREST**

Electronic Metal Analyzer.....*S. R. Winters* 28
Try this 1946 Treasure Finder.....*W. E. Osborne* 36
Possibilities of Home Facsimile.....*Sidney Feldman* 49

DEPARTMENTS

For the Record....*The Editor* 8
Spot Radio News.*Fred Hamlin* 12
QTC.....*Carl Coleman* 38
What's New in Radio..... 66
International Short-Wave.....*Kenneth R. Boord* 44
Letters from Our Readers.... 94
Technical Books..... 125
Within the Industry..... 128
Manufacturers' Literature..... 158

BRANCH OFFICES: NEW YORK, WASHINGTON, LOS ANGELES, TORONTO

WILLIAM B. ZIFF
Publisher

B. G. DAVIS
General Manager

C. R. TIGHE
Asst. to the Publisher

GEORGE BERNER
Advertising Director

HERMAN R. BOLLIN
Art Director

H. G. STRONG
Circulation Director

H. J. MORGANROTH
Production Director

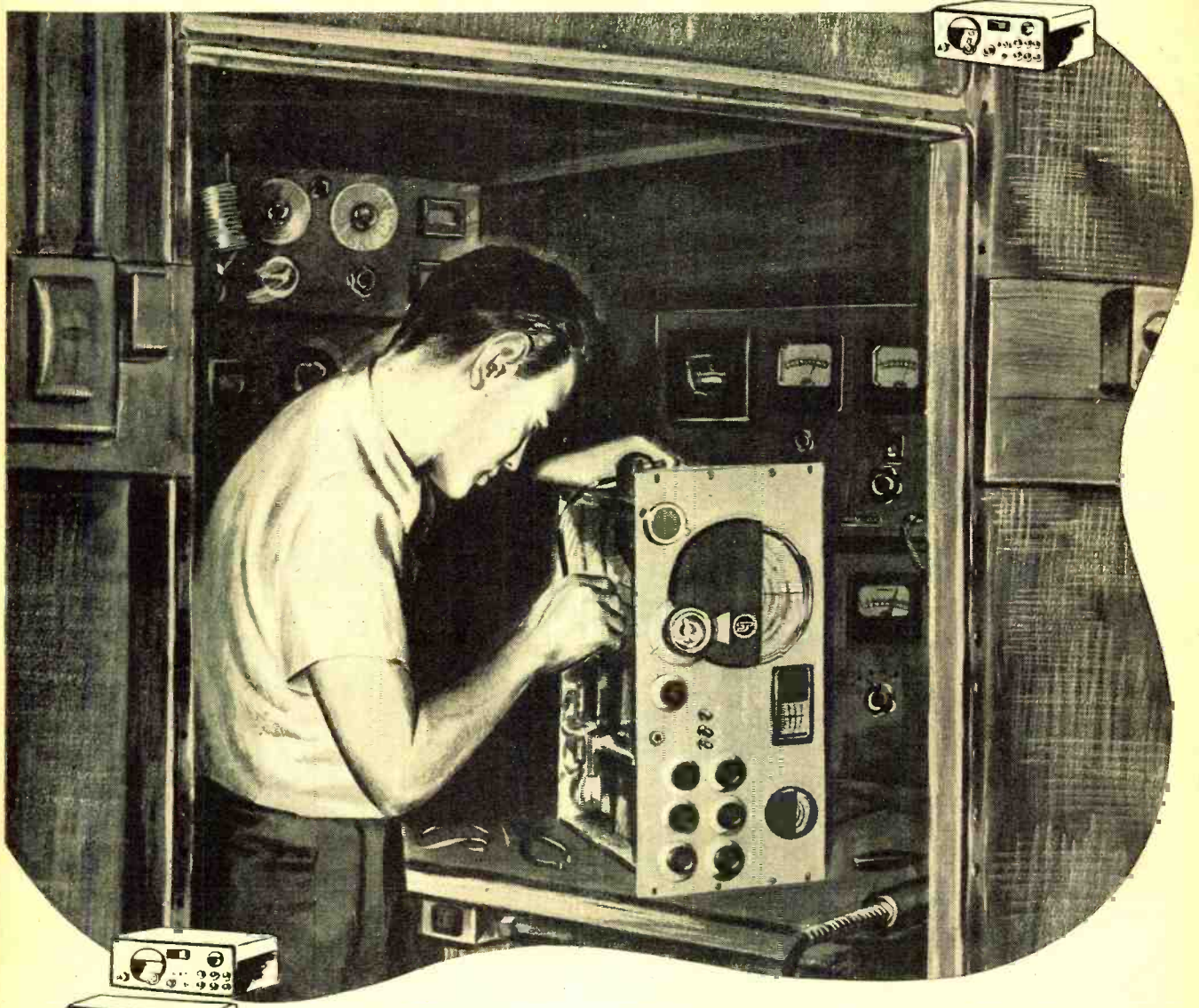
COVER PHOTO
BY JOHN RIDGE

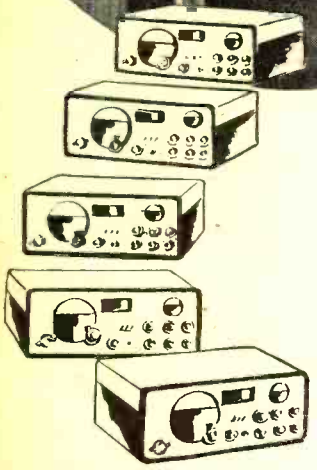
Testing the new Collins 30K, 500 watt amateur transmitter. WØEIT is running the performance test while WØJIH is shown at right adjusting a Collins 310Z amateur band exciter unit.

RADIO NEWS is published monthly by the Ziff-Davis Publishing Company, 185 N. Wabash Ave., Chicago 1, Ill. Subscription Rates: in U. S. and Canada $3.00 (12 issues), single copies 35 cents; in Mexico, South and Central America, and U. S. Possessions, $3.00 (12 issues); in British Empire, $4.00 (12 issues)—all other foreign countries $4.00 (12 issues). Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Entered as second class matter at the Post Office Dept., Ottawa, Canada. Contributors should retain a copy of contributions and include return postage. Contributions will be handled with reasonable care but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions and by-line changes that are necessary. Payment made at our current rates, covers all authors', contributors', or contestants' rights, title, and interest in and to accepted material, including photos and drawings.

Other Ziff-Davis Publications: Radio-Electronic Engineering, Plastics, Flying, Popular Photography

The first hundred sets are the hardest . . .



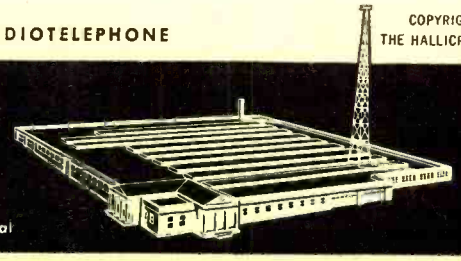


YOU can take it from Hallicrafters: the first hundred radio sets of any new model are the hardest. Hallicrafters is completing a run of 100 of the new Model SX-42. This extraordinary set has been more than a year in the making and behind it are more than 20 years intensive experience in the manufacture of high frequency communications equipment. The first 100 SX-42's have been checked, re-checked in a thousand and one testing operations. Because the set covers from 540 kc to 110 Mc continuously in six bands it must be as delicately balanced and precisely aligned as an expensive watch. One out of every five persons on the SX-42 assembly line is an inspector, watchdog over the strictest Hallicrafters standards. The first 100 SX-42's are now being placed in the hands of radio technicians, engineers, amateurs all over the world. These qualified critics will submit to Hallicrafters detailed reports. This final field testing of this great new receiver will bring the SX-42 one step closer to reality for you. Watch for the SX-42, wait for the SX-42 . . . the radio man's radio . . . the radio that's remembered by the veteran . . . preferred by the amateur . . .

BUILDERS OF *Skyfone* AVIATION RADIOTELEPHONE

hallicrafters RADIO

THE HALLICRAFTERS CO., MANUFACTURERS OF RADIO
AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.
Sole Hallicrafters Representatives in Canada: Rogers Majestic Limited, Toronto - Montreal

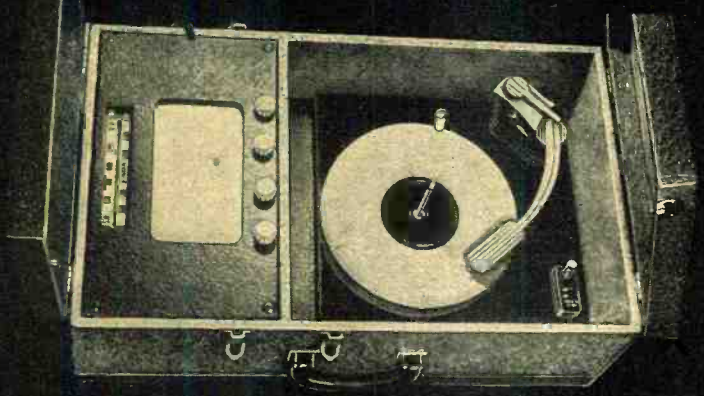


AGAIN FADA SHOWS THE WAY!

Now

THE FADA DELUXE PORTABLE RADIO AND PHONOGRAPH COMBINATION with AUTOMATIC RECORD CHANGER

Superheterodyne AC deluxe portable radio phonograph with automatic record changer. Durable and attractive! New fidelity of tone both in recordings and broadcasts.



COMING SOON.... Additional Attractive Combinations in Beautiful Mahogany veneer with non-warping Mahogany Top. *"Another FADA FIRST!"*

Enthusiastic Consumer Acceptance!

FADA's lovely table models are tops in consumer acceptance. They combine beauty of appearance and tone.

6 TUBES
1000 SERIES

6 TUBES
652 SERIES

YOU CAN ALWAYS DEPEND ON

FADA *Radio*

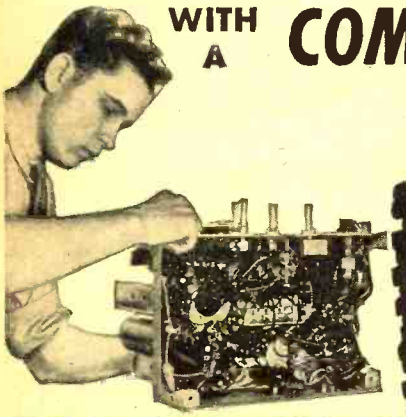
Famous Since Broadcasting Began!

FADA *Sensive-Tone*

FADA 6 tube models are equipped with the new FADA "Sensive-Tone" . . . assuring greater sensitivity and clearer reception.

FADA RADIO AND ELECTRIC COMPANY, INC., LONG ISLAND CITY, N. Y.

NOW SPRAYBERRY RADIO TRAINING GIVES YOU 8 BIG KITS OF RADIO EQUIPMENT WITH A COMPLETE 6 TUBE SUPER-HETERODYNE RECEIVER



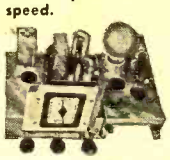
YOU LEARN RADIO SERVICING THROUGH INTENSIVE "SHOP-BENCH" PRACTICE

YOU DO EXPERIMENTS, CONSTRUCTION, TROUBLE-SHOOTING

I'll show you how to perform over 175 instructive Experiments—how to build countless Radio Circuits. You'll learn a new, fast way to test Radio Sets without mfg. Equipment.

I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional accuracy and speed.

You'll get valuable experience and practice building this Signal Generator and multi-purpose Tester. Makes a breeze out of fixing Radios and you don't have to spend money on outside, ready-made equipment.



Soldering, wiring, connecting Radio parts . . . building circuits with your own hands—you can't beat this method of learning. When you construct this Rectifier and Filter, Resistor and Condenser Tester, etc., you get a really practical slant on Radio that leads to a money-making future.

HERE'S THE LATEST, SIMPLEST WAY TO TRAIN at HOME for a GOOD LIVING in RADIO-ELECTRONICS & TELEVISION

I train your *mind* by putting you to work with your *hands* on a big 6-Tube Superheterodyne Receiver. And, believe me, when you get busy with real Radio Parts — 8 big Kits of them — you really LEARN Radio and learn it RIGHT! You get the practical stuff you need to be *useful* in Radio, and that's what it takes to make money. You don't have to worry about what to do with these 8 Kits of Parts. Step by step, I show you how to build circuits, test, experiment, trouble-shoot. And you don't need any previous experience. The Sprayberry Course starts right at the beginning of Radio! You can't get lost! Simplified lessons, coupled with real "Shop" practice, makes every subject plain and easy to understand and remember.

A BUSINESS OF YOUR OWN . . . OR A GOOD RADIO JOB

Soon after you begin Sprayberry Training, I'll send you my sensational BUSINESS BUILDERS. You'll find out how to get and do neighborhood Radio repair jobs for nice profits and rich experience while learning. This sort of work can easily pave the way for a Radio Service business of your own. But with Sprayberry Training, you're not limited. You can swing into any one of the swiftly expanding branches of Radio-Electronics INCLUDING Radio, Television, FM, Radar, Industrial Electronics. Be wise! Decide now to become a fully qualified RADIO-ELECTRONICIAN. Get full details about my Training at once! Mail coupon below for my 2 big FREE Books.

SEND FOR THESE FREE BOOKS

"How to Read Radio Diagrams and Symbols"

Here's a valuable and wonderfully complete new book which explains in simple English how to read and understand any Radio Set Diagram. Includes translation of all Radio symbols. Send for this volume at once! It's free! Along with it, I will send you another Big Free book describing in detail my Radio-Electronic Training.

MAIL COUPON TODAY!

SPRAYBERRY ACADEMY OF RADIO
F. L. Sprayberry, President, Room 25116, Pueblo, Colorado

Please rush my FREE copies of "How to MAKE MONEY in RADIO, ELECTRONICS and TELEVISION," and "HOW to READ RADIO DIAGRAMS and SYMBOLS."

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

Address .....

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

(Mail in envelope or paste on penny postcard)

For the RECORD

BY THE EDITOR

IN A few densely populated areas of these United States the fortunate possessors of prewar television sets are able to see and hear the passing parade of important events, as they occur, while comfortably seated in the privacy of their own homes. Each evening when the whim impels they can relax comfortably at home and enjoy a theatrical presentation which, to all practical purposes, is presented for their exclusive enjoyment.

Commercial television has been with us for several years now—black and white television. After struggling through the morass of technical difficulties for several years, television began to find firm ground by 1940 when several manufacturers were in production on video receivers which were being well received by the buying public.

War-born necessity practically froze television activities at the peak of their 1941 advance. However, the technical demands of a scientific war challenged the most fertile thinking of the best of Yankee and Allied electronic experts. Electronic mapping, radar scanning, and a host of radio applications contributed a new fund of knowledge and fact to television's backlog of experience. These advances will be reflected in the first of the postwar television sets which soon will be appearing on the market.

Those of us who have been privileged to see the postwar models which will soon be produced on a quantity basis, and sold at prices that the least affluent of us can afford, have been very much impressed with the excellent pictures we have seen. Pictures with the sparkling clarity of fine screen cuts on good coated stock paper, will be available in comparatively low-priced sets.

Technically, commercial black-and-white television has been proven successful in the area of the originating station's operations. The economically feasible way to relay these programs for rebroadcast throughout the country is yet to be fully developed and proven.

Into this picture now has been thrust television in color. We long ago learned not to fear new developments. We have also learned not to let the vision of something new for tomorrow rob us of the pleasures of what is available for us today. We welcome the advances being made in color television.

But, how close are we to having color television at prices that can be afforded by the common man? Let's "look at the record" and see how far color television has advanced as a practical means of entertainment.

Last December, members of the Press were invited to Princeton, N. J., to a preview of *RCA's* television advances. We were shown a series of black-and-white television receivers including representative models of the best of *RCA's* prewar receivers, the production models of their first postwar TV receivers and a research model of the *RCA* projection receivers which, it was hoped, would be in production by 1947.

The tremendous advances in the post-war TV receivers over the best prewar receivers was strikingly obvious. In passing, it should be mentioned that all of these receivers were reproducing a program then being telecast from the WNBT transmitter forty-odd miles away. The reception was excellent.

The second part of this preview was to witness the *RCA* developments in color television. The receiver was a laboratory model. The studio and transmitter were located two miles away. The operating frequency of the transmitter was way upstairs in the microwave spectrum — 10,000 megacycles. *RCA* made this test the hard way—they telecast a live show. Further, they threw the book on colors used in the program.

Most of us who witnessed this demonstration considered the *RCA* color images only slightly inferior to technicolor film productions. We also recognized that *RCA* had, in televising a live talent show, colorfully staged, endeavored to show the present limitations of this medium in the form of the ultimate requirements that will be demanded of it by those who will eventually buy home receivers for color television programs.

At the conclusion of the demonstration *RCA* officials said, in effect, "That's our story on color television, boys. We feel that it will not be ready for the public for about five years."

During the first week of February *CBS* invited the members of the Press to a preview of the much-heralded *CBS* color television. Ushered into one of the *CBS* studios, the writers were shown three television receivers housed in very attractive, streamlined cabinets. Then there followed a demonstration of *CBS* color television.

The *CBS* demonstration consisted of one motion picture film and a series of slides—both in color. The program was telecast from the *CBS* television antenna atop the Chrysler building. The carrier employed was in the 490 megacycle region, with a modulated video bandwidth of 10 megacycles.

(*Continued on page* 167)

Salute to W5SH

Post-war W5SH—equipped by ALLIED. Listen for him on 10 and 20 meter phone.

This month, our hats are off to Edwin C. Shaw, W5SH, Ft. Worth, Texas . . . first, for his fine-looking rig; second, for his stimulating activity on the air. And we want to add our thanks, too, for his recent friendly note that expresses, among other things, his "complete satisfaction not only with the equipment but also with the extremely courteous treatment I have received from your good company."

No need to thank us, W5SH. That's what we're here for. We get *our* satisfaction out of serving *you*. Whether you're an amateur starting "from scratch," rebuilding, or newly licensed, you can count on ALLIED for all the help you need—for earliest delivery of the latest available gear, for guaranteed quality at the lowest prevailing prices, for preferred personal service from ALLIED'S staff of licensed hams, each of whom shares your interest in amateur radio.

Communications Equipment

for earliest delivery order from **ALLIED**

Time Payments Available

Trade-Ins Accepted

NEW! HALLICRAFTERS SX-42 . . . $250.00. Order yours now!

Hallicrafters S-38	$39.50	RME DB-20 Preselector	$ 68.20
Hallicrafters S-40	79.50	Hammarlund HQ-129X	168.00
National NC-46	97.50	RME-45	186.00
NC-46 Speaker	9.90	National HRO	274.35
RME-84	98.70	National NC-240D	225.00
RMV VHF-152 Converter	86.60	Hammarlund SPC-400X	342.00

Net F. O. B. Chicago. Prices subject to possible change.

ALLIED HAM "SCOOP"!

MECK T60-1 60-WATT TRANSMITTER

IMMEDIATE DELIVERY— A REAL BUY!

Here's a great performer for use on any amateur band, 10 to 80 meters, phone or CW. Compact, single unit design, only 15" x 11" x 9". Features: Combined plate and screen modulation; any crystal or high impedance dynamic mike may be used; 2 complete built-in 60-cycle power supplies, 1 for final RF, and 1 for Modulator, Speech Amplifier and Oscillator; built-in antenna changeover relay; provision for plug-in battery or vibropac operation; meter switching to final amplifier grid or plate circuits for tuning; crystal socket on front panel. Complete with 1 set of coils covering 10 and 11 meter bands (coils for other bands available at $5.50 per band); includes 5-6LG6, 2-6SN7 GT/G, and 2-5U4G tubes. Only $150.00

Send for Allied's 1946 Radio Catalog FREE

Here's the latest, most complete Buying Guide to everything in radio! Includes newest communication receivers, Ham gear, code apparatus, parts, kits, tubes, tools, books, test instruments, public address and other equipment. Get your FREE copy now!

ALLIED RADIO CORP., D. L. Warner, W9IBC
833 W. Jackson Blvd., Dept. 1-LL-6
Chicago 7, Illinois

☐ Enter order for . . . . . Model . . . . .

☐ Enclosed $ . . . . . ☐ Full Payment
☐ Part Payment (Balance C.O.D.)

☐ Send full information on Communication Receivers and Time Payment Plan, without obligation.

☐ Send FREE 1946 ALLIED Catalog.

Name . . . . . .

Address . . . . . .

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

ALLIED RADIO
Everything for the HAM

Here they are

THE WORLD'S OUTSTANDING RADIO and ELECTRONIC BOOKS

...all from a single source...with "instant service"

RUSH SERVICE—Same-day shipment from Illinois or Calif.

Send orders only to Santa Barbara; those of $10 or more for Eastern and Central points will be TELETYPED to Illinois warehouse for SAME-DAY shipment; smaller orders teletyped for 35c extra; others forwarded by AIR MAIL to warehouse. Complete stocks at Santa Barbara for Western orders.

THE OUTSTANDING PRACTICAL HANDBOOK

NEW, ENLARGED, TENTH EDITION

Radio's outstanding practical text. How-to-build-it descriptions of dozens of tested-and-tried types of transmitting, receiving, and test equipment. Supplemented by basic electrical and radio theory in the simplest possible language for those without mathematical or technical training.

Illustrated with hundreds of diagrams and large photographs showing details of construction. Has the most complete tube tables to be found in any book.

New edition contains expanded U.H.F. sections, more test equipment which can be home-built, enlarged and modernized receiving and transmitting tubes tables, Krounded-grid amplifier data, speech clipping, splatter suppressor, cathode follower data, pulse-time modulation, transformerless power supplies, wave guides, cavity resonators, butterfly circuit, klystron, U.H.F. crystal diode, radar, and highly-efficient mobile antennas.

The ideal text for the practical radioman

Over 700 pages, durably clothbound, gold-stamped
Book No. RH $2.00 postpaid in continental U.S.A.
$2.25 elsewhere, postpaid.

Leading Engineering Handbooks

RADIO ENGINEER'S HANDBOOK
by F. E. Terman

The wealth of technical data contained in this handbook makes it indispensable as a complete reference work on radio and electronics. Charts, tables, circuit diagrams, and concise text material simplify the solution of complex, as well as simple problems.

Tables, Mathematical Relations, and Units. Circuit Elements. Circuit Theory. Vacuum Tubes and Electronics. Vacuum-Tube Amplifiers. Oscillators. Modulation and Demodulation. Power Supply Systems. Radio Transmitters and Receivers. Propagation of Radio Waves. Antennas. Radio Aids to Navigation. Measurements.

Book No. TH10 1019 pages $7.00*

RADIO ENGINEERING HANDBOOK
by Keith Henney and Others

An extensive reference book prepared by 28 specialists. Contains abundant explanatory material, diagrams, formulas, and tables in each branch of the radio field.

Mathematical and electrical tables. Electric and Magnetic Circuits. Resistance. Inductance. Capacitance. Combined L, C and R Circuits. Measurements. Vacuum Tubes. Oscillators. Modulators. Detection. A. F. and R. F. Amplifiers. Receiving Systems. Power Supplies. High Frequencies. Code Transmission and Reception. Aircraft Radio. Antennas. Television. Facsimile. Broadcasting. Loud speakers and Acoustics.

Book No. HH10 945 pages $6.00*

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS
by A. E. Knowlton and a staff of specialists

This 2303-page volume is the leading reference work for electrical engineers. Prepared by a staff of over 100 specialists, it contains 26 sections covering every phase of electrical engineering from units and conversion factors to electrophysics.

Book No. KH10 2303 pages $9.00*

Commercial Operating

PRACTICAL RADIO COMMUNICATION
by A. R. Nilson and J. L. Hornung

A complete radio manual covering subjects of interest particularly to the commercial radio operator. Topics include basic electricity; transmitters, receivers, and associated apparatus; and operating instructions. FM and ultra-high frequencies are included in this new edition. May be mastered by the average high school or trade school student.

Book No. NC10 927 pages $6.50*

HOW TO PASS RADIO LICENSE EXAMINATIONS
by C. E. Drew

A well illustrated and long-used question and answer manual for the coaching of candidates for the commercial radiotelegraph and radiotelephone operator license examinations.

Book No. DH20 320 pages $3.25*

RADIO OPERATING QUESTIONS AND ANSWERS,
by A. R. Nilson and J. L. Hornung

A practical study guide of the question-and-answer type useful for preparing for any of the radiotelegraph, radiotelephone, or amateur operator license examinations.

Book No. NQ10 415 pages $3.50*

U.H.F., F.M., and Television

U.H.F. RADIO SIMPLIFIED, by Milton S. Kiver

U.h.f. radio simply and clearly explained, in plain English, without mathematics. Covers principles, applications, and equipment; adapted for home study.

Book No. KU30 242 pages $3.25*

TELEVISION SIMPLIFIED, by Milton S. Kiver

A simplified explanation of modern television, especially as it pertains to the operation and maintenance of television receivers. A "simple language" text readily understood by those with fair radio knowledge.

Book No. KT30 432 pages $4.75*

Theory

FUNDAMENTALS OF RADIO, by F. E. Terman

A first book and also a good refresher for all radio students and workers. This text has been widely used in civilian and military classes. Requires no knowledge of complex mathematics.

Contents: The Fundamental Components of a Radio System. Circuit Elements. Resonant Circuits and Circuit Analysis. Fundamental Properties of Vacuum Tubes. Vacuum-tube Amplifiers. Power Amplifiers. Vacuum-tube Oscillators. Modulation. Vacuum-tube Detectors. Sources of Power for Operating Vacuum Tubes. Radio Transmitters. Radio Receivers. Propagation of Radio Waves —Antennas. Radio Aids to Navigation. Television. Acoustics.

Book No. TF10 458 pages $4.00*

PRINCIPALS OF RADIO, by Keith Henney

A basic course in radio which may readily be comprehended by high-school or trade-school students and may be used in independent home study. Well illustrated.

Contents: Fundamentals. Direct-Current Circuits. Electrical Meters and Measurements. Production of Current. Magnetism and Electromagnetism. Inductance. Capacitance. Properties of Alternating-Current Circuits. Resonance. Properties of Coils and Condensers. Vacuum Tubes. The Tube as an Amplifier. Rectifiers and Power Supply Apparatus. Audio Amplifiers. Detection. Receiver Systems. Oscillators. Transmitters. Antennas and Electromagnetic Radiation. Frequency Modulation. Ultra-High Frequency. Phenomena. Electronic Instruments.

Book No. HP20 534 pages $3.75*

Radio Mathematics

RADIO ENGINEERING, by F. E. Terman

Probably the most popular foundation engineering textbook for all serious radio courses and libraries. Thoroughly revised.

Contents: The Elements of a System of Radio Communication. Circuit Constants. Properties of Resonant Circuits. Fundamental Properties of Vacuum Tubes. Vacuum-tube Amplifiers. Power Amplifiers. Vacuum-tube Oscillators. Modulation. Vacuum-tube Detectors. Sources of Power for Operating Vacuum Tubes. Radio Transmitters. Radio Receivers. Propagation of Waves. Antennas. Radio Aids to Navigation. Television. Sound and Sound Equipment.

Book No. TE10 813 pages $6.00*

MATHEMATICS FOR ELECTRICIANS AND RADIOMEN, by N. M. Cooke

This book presents all of the mathematics needed for a clear understanding of a. c., d. c., and high-frequency circuit and of electron tube operation. The text material covers the entire subject from simple arithmetic to logarithms, trigonometry, and vectors. It is an excellent book for the radioman who wishes to prepare himself for a more rigorous mathematical course. A wealth of illustrative examples and problems demonstrate applications of mathematical processes and reasoning to radio circuit investigation.

Book No. CM10 604 pages $4.50*

We Also Regularly Stock These Books
Send stamp for complete catalog

Elementary Theory

"Basic Elec. for Commun.," Timble	$3.75*
"Elements of Radio," Marcus	4.00*
"Fundamentals of Radio," Everitt	5.00*
"Understanding Radio," Watson	2.80*
"Electrical Commun.," Albert	5.50*
"Electrical Fundamentals," Albert	6.00*
"Basic Radio," Hoag	3.50*
"Basic Radio Principles," Suffern	3.50*
"Radio Physics Course," Ghirardi	5.00*
"Electrical Essentials of Radio," Slurzberg and Osterheld	4.50*

Intermediate and Advanced Theory and Engineering

"Radio Engineering," Terman	$6.00*
"Fund. of Engng. Electronics," Dow	5.50*
"Prin. of Radio Commun.," Morecroft	8.50*
"Engineering Electronics," Fink	4.00*
"Applied Electronics," M.I.T. Staff	6.50*
"Communication Engineering," Everitt	5.50*
"Electronics," Millman and Seely	5.50*
"Electronics for Engineers," Markus	6.50*
"High-Frequency A.C.," Mattwain	6.50*
"Radio Receiver Design," Sturley	5.00*
"Technique of Radio Design," Zepler	4.00*
"Prin. of Radio Engineering," Glasgow	4.50*
"Electronic Engineer's Handbook," Pender	6.50*
"Radiotron Designer's Handbook"	1.00*

Electron Tubes and Industrial Electronics

"Electron Tubes in Industry," Henney	$5.50*
"Industr. Electr. Control," Cockrell	2.75*
"Electronics in Industry," Chute	5.00*
"Theory and Appl. of Electron Tubes"	5.50*
"Principles of Electron Tubes," Reich	4.00*
"Inside the Vacuum Tube," Rider	4.50*
"Fund. of Vacuum Tubes," Eastman	5.00*
"High Freq. Thermionic Tubes," Harvey	3.50*
"Theory of Thermionic Vacuum Tubes"	6.50*
"Electric Circuits," M.I.T. Staff	7.50*
"Photocells and Their Application," Ives	4.00*
"Electr. Optics and the Electr. Micro."	10.00*
"Gaseous Conduction and Electronics"	5.00*
"Electronic Control," Chute	4.50*

Radio Mathematics

"Mathematics of Radio Commun.," Wang	$3.30*

Ultra-High Frequencies

"Communication Circuits," Ware	$3.75*
"Hyper and U.H.F. Engr.," Sarbacher	6.00*
"Fields and Waves," Ramo	5.50*
"Transm. Lines, Antennas, and W. Guides"	3.50*
"Electromagnetic Engr.," King	6.00*

Commercial Operating Practice

"Radio Direction Finders," Bond	$3.50*
"Prin. Aero. Radio Engr.," Sandretto	4.00*
"Aeronautic Radio," Eddy	4.50*
"Radio Navigation for Pilots"	2.75*
"The Radio Manual," Sterling	6.50*
"Radio Code Manual," Nilson	2.75*

Radio Servicing

"Modern Radio Servicing," Ghirardi	$5.00*
"Prin. and Prac. of Radio Servicing," Nicks	4.00*
"Radio Service Trade Kinks," Simon	3.50*
"Radio Troubleshooter's Handbook"	5.00*

F.M. and Television

"Television Standards and Prac.," Fink	$5.50*
"Frequency Modulation," Hund	4.50*
"Electron Optics in Television," Maloff	4.00*
"Television Simplified," Kiver	4.75*
"Microwave Transmission," Slater	4.00*
"Ultra High Frequency Techniques"	5.00*
"Television," Zworykin and Morton	7.00*
"Principles of Television Engineering," Fink	3.50*

Miscellaneous

"Ref. Data for Radio Engineers"	$2.00*
"The Inductance Authority," Shiepe	2.50*
"Electronics Dictionary," Coke	5.00*
"Meas. in Radio Engineering," Terman	4.50*
"High-Frequency Measurements," Hund	5.50*
"Radio-Freq. Electrical Meas.," Brown	4.50*
"Radio-Freq. Measurements," Hartshorn	4.75*
"Pulsed Linear Networks," Frank	3.00*

*Add 3% (minimum, 10c) for postage and packing; foreign, 10%. In Ill. and Calif. add sales tax. Prices are in U. S. dollars and are subject to change without notice.

HOW TO ORDER: TO AVOID ERRORS give both author's surname and book title. REMIT by draft, money order, or check; currency, etc., is at your risk; foreign remittance, must be in U. S. dollars. FASTER SERVICE when full remittance accompanies order; C.O.D.'s accepted but take longer to handle, and cost an extra fee.

Editors and Engineers LIMITED 1302 KENWOOD ROAD Santa Barbara CALIFORNIA

CALRAD "hard-to-get" RADIO VALUES!

WEBSTER RECORD CHANGER

Model 56

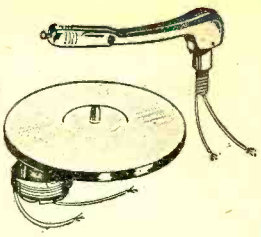
Complete

$25.95 each

Built to last. Fast change cycle. Simple, foolproof operation. Automatic shut-off. Feather light needle pressure. Longer life for records. Quiet running Webster 4 Pole motor-cushion mounted.
Webster Model 50 . . . . . $19.95 ea.

A. C. PHONO MOTOR

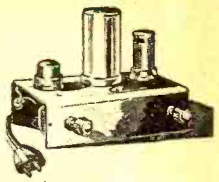
60 Cycles, 115 Volts with Turntable and Standard Make Crystal Pickup.



$5.95 pair

SPECIAL

Make any record player wireless with brand new
TWO-TUBE PHONO OSCILLATOR KIT

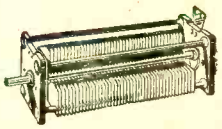


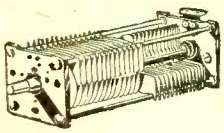
Operates as far as 100 ft. from a radio and can be used with Automatic Record Changers, Players or Microphone. Uses 1-12SH7 and 1-12H6 Tubes. Complete with tubes.
Supplied in kit form with "easy-to-follow" instructions for assembly.
Complete with all parts, instructions and tubes.

Net $4.95

VARIABLE CONDENSERS

Single Gang 440 Mfd Variable Condensers . 95¢ ea.





Dual Spaced 110, 110 Mfd Variable Condensers. 95¢ ea.
Dual Spaced 170, 170 Mfd Variable Condensers. 95¢ ea.

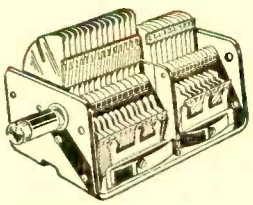
SIGNAL CORPS DUAL HEADSETS

8000 ohms high impedance, with two rubber ear cushions, cord and phone plug, individually boxed, $12.50 list.

$1.85 each

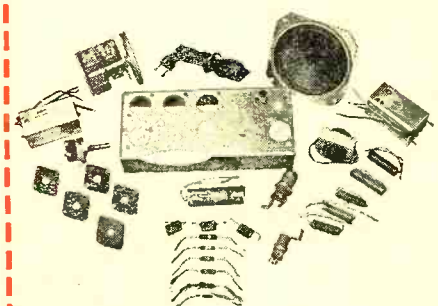
TWO GANG SUPERHET VARIABLE CONDENSERS

Cut Oscillator Section Standard Capacity.



$1.35 each

5 TUBE SUPER AC-DC PARTS KIT



Kits include: Stamped Chassis—Dynamic Speakers — Output Transformer — Volume Control and Switch—2 Shielded I.F. Coils—Antenna and Osc. Coils—Two-gang Super Variable—5 Octal Sockets 20x20 Mfd. 150 Volt Filter—5 Tubular Condensers —3 Mica Condensers—6 Resistors—6 ft. AC Cord and Plug—Circuit Diagram.

WHILE THEY LAST $8.95 ea. LOTS OF 6 $50.00

BRAND NEW WILLARD #20-2 2 VOLT STORAGE BATTERY

Used in General Electric model #530 charge A PACK portables. Suitable for all Farm Radio Sets. Individually boxed. List price $8.95

Special $3.95 each

T-17B MICROPHONE

Made of durable plastic. Complete with 5 ft. rubber coated cord and plug PL-68. Press-to-talk button. Can be used with most radio sets as home broadcaster mike for entertainment.

$1.85 each

SUPPLY IS LIMITED! ACT QUICKLY

V. M. TWO POST AUTOMATIC RECORD CHANGER

This Record Changer is a well made mechanism, will play either 10 in. or 12 in. records. The pickup uses a crystal cartridge. Size 14 in. x 14 in. Packed 2 to a factory sealed carton, factory guaranteed.

CARTON OF 2 $35.00 Special ea. $18.95

Limited Quantity

Brand New WESTON VOLT Ohmmeter MODEL 663

Complete with carrying case and leads.

List $71.50 Special $39.50

TURNER CRYSTAL MIKE

With 100 ft. Shielded Mike Cable. $6.95 ea.

4 PRONG 6 Vo. UNIVERSAL AUTO VIBRATOR

Choice of Electronic, or Utah. Individually boxed. Fits 80% of all replacements.

each $1.25

Push Pull 6L6 Shielded Output Transformer 30 Watt Peak, to 2-4-6-8-16-250 and 500 ohm line. $3.45 ea.
Lots of 12 . . . . . $3.25 ea.
Push Pull Input Transformer, 10,000 ohm plate to push pull 6L6—$1.10 ea. Lots of 12, $1.00 ea.
Midget Universal Output Transformer, push pull plate to 2-4-6-8-10-16 ohm voice coil. 95¢ ea.
Lots of 10 . . . . . 85¢ ea.
10 Watt Large Universal Output . . . $1.35 ea.
Lots of 10 . . . . . $1.20 ea.
Single Pentode Midget Output—for 50L6, 6V6, 6F6, etc. . . . . 55¢ ea.
50 Mill Filter Choke 300 ohm . . . . 65¢ ea.
Lots of 10 . . . . . 60¢ ea.
75 Mill Filter Choke 250 ohm . . . . 95¢ ea.
Lots of 10 . . . . . 85¢ ea.
100 Mill Filter Choke 250 ohm . . . . $1.10 ea.
Lots of 25 . . . . . $1.00 ea.

DYNAMIC AND P.M. SPEAKERS

4 in. 450 Ohm Dynamic . . . . . $1.75 ea.
4 in. P.M. Heavy Slug . . . . . $1.50 ea.
5 in. P.M. Heavy Slug . . . . . $1.55 ea.
6 in. P.M. Heavy Slug . . . . . $2.25 ea.

TUBULAR ELECTROLYTIC CONDENSERS

10 Mfd. 50 Volt . . . . . 21¢ ea.
25 Mfd. 50 Volt . . . . . 24¢ ea.
50 Mfd. 50 Volt . . . . . 28¢ ea.
100 Mfd. 50 Volt . . . . . 35¢ ea.
16 Mfd. 150 Volt . . . . . 25¢ ea.
20 Mfd. 150 Volt . . . . . 29¢ ea.
24 Mfd. 150 Volt . . . . . 30¢ ea.
30 Mfd. 150 Volt . . . . . 32¢ ea.
50 Mfd. 150 Volt . . . . . 35¢ ea.
10 Mfd. 450 Volt . . . . . 39¢ ea.
20x20 Mfd. 150 Volt . . . . . 43¢ ea.
30x20 Mfd. 150 Volt . . . . . 47¢ ea.
40x20 Mfd. 150 Volt. . . . . 55¢ ea.
50x30 Mfd. 150 Volt . . . . . 65¢ ea.

FINEST QUALITY MIDGET MICAS

.001-.0001 .005-.00005 } $ 5.00 per 100
.002-.00025 .006-.0005 } $40.00 per 1000

Astatic Low Pressure, Curved Arm, Crystal Pickup with Sapphire Stylus Permanent Needle, has cartridge which replaces LP6-LP21-LP23. $3.50 ea.
Lots of 10 . . . . . $32.50....
456 K.C. Antenna, Oscillator and R.F. Coils 25¢ ea.
456 K.C. I.F. Coils Input & Output, medium size can. 59¢ ea.
Kit of 50 Assorted Bakelite Knobs for ¼" shaft, with set screws. . . . . $2.50 per kit
Midget Ceramic Trimmers—3-30 mmf . . 6¢ ea.
Rubber Sheathed "Mike" Cable, shielded, single Conductor. . . . . 100 ft. for $ 5.95
500 ft. for $25.00
Single Bearing Midget Condenser 14 plate—100 Mfd. 50¢ ea.
10 Watt Wire Round Resistors, your choice of sizes 25 Ohm to 25,000 Ohm 20¢ ea. 17.50 per 100
Buffer Condensers (Famous Make) .005, .01, .02, 1700 Volts. . . . . 19¢ ea.
Lots of 50 . . . . . 15¢ ea.
Signal Corps Telegraph Keys. Lots of 10 60¢ ea.
Lots of 50 50¢ ea.

MAIL ORDERS FILLED: 25% Deposit, Balance C.O.D., F.O.B. Los Angeles. Orders Under $10.00 Please Remit in Full. References—Bank of America, Santa Monica & Vermont Aves., Los Angeles, California

CALIFORNIA RADIO & ELECTRONICS CO.

Dept. No. N. 711 No. Vermont Ave., Los Angeles 27, California

Spot Radio News

★ ***Presenting latest information on the Radio Industry.***

By FRED HAMLIN

Washington Editor, RADIO NEWS

HOTTEST POTATO on the fall Congressional investigation calendar may turn out to be work by the Slaughter committee on the disposal of Army electronics surpluses. The committee figured in the late-summer news when it investigated charges made in Atlanta, Ga., that some million dollars worth of electronics materiel had been sold for $600 as junk from the Warner Robins Air Materiel Area with approval of the War Assets Administration. In September, committee chairman Roger C. Slaughter and his colleagues investigated the charge that Thunderbird airport had been "given away" to a private citizen. They planned to return to radio equipment as soon as Thunderbird was disposed of and the talk in Washington is that electronics may keep the committee busy for the rest of the winter.

RADIO WAR SURPLUS having thus reached the headlines, WAA has begun to clean house and to turn for advice on the problem to experts in the industry. This was done effectively in the Slaughter investigation of the Atlanta case, when both hams and small radio dealers were called on to testify. What they said, in effect, was that the least expensive way for the government to get rid of the Atlanta surplus was to do exactly what was done—sell it as junk. To be sure, there were some salvage parts in the materiel that was junked. But to separate it from the useless equipment would have cost more than it was worth. The materiel which was sold as junk, it was brought out, had already been screened repeatedly for valuable parts. The Slaughter committee came back to Washington convinced that the disposal had been one of those inevitably wasteful but practical jobs that always are necessary at the end of a war. Committee members went further and stated that the public should be made aware that war-built electronics equipment was expensive, that commercial specifications make little of it valuable for peacetime use, and that salvaging usable parts is often too difficult to be worth-while.

WAR ASSETS, fountain-head of surplus disposal policies, following the first news stories on the Atlanta case, and even before the Slaughter committee swung into action, began to clean house. Administrator Robert M. Littlejohn ordered "drastic changes" in the administration of electronics disposal. Complete reorganization of the electronics division, which sells surplus radio and radar equipment, followed. Short-cuts were authorized in the handling of inventories, sales agents' agreements were revamped or, if too raw, completely abrogated, and the division was put under James A. Mollison, a deputy administrator who had already gained a reputation in WAA for cleaning up the once-dubious administration of aircraft disposal. George H. Moriarty, formerly in charge of aircraft component sales, was made Mollison's assistant in carrying out the work, and scores of field workers were fired. Both administrators announced that the new program called for "close coordination with industry, and frequent conferences with industry representatives." The industry, which had been watching the Federal disposal program in electronics with skepticism, willingly volunteered experts to help clean up the mess. Everything considered, the Slaughter committee may turn up a negative but heartening fact — electronics disposal is at last being put on a business-like, honest basis.

FIRST GOOD by-product of the investigation and WAA's housecleaning was the WAA announcement that "top priority" would be given veterans in purchasing surplus materiel. Veterans, however, were warned that, while there are huge stacks of unwanted surpluses, wanted items have proven far short of even the veteran demand.

ANYONE IN RADIO, ham or professional, can open up a radio station on the moon and welcome to it, according to our best War Department and FCC sources. War Department is particularly generous in the offer after recent news stories stating that Army planned to shoot a rocket to the moon in about eighteen months and another yarn saying a radio station might be sent aboard the rocket. Army spokesmen, when queried for particulars on these stories, became as hot as the noonday sun on the moon (estimated at 250 degrees F). They say that they'll not shoot at the moon because we have no enemies

MOST-OFTEN-NEEDED RADIO DIAGRAMS

1946 4 OUT OF 5 DIAGRAMS YOU WILL EVER NEED

Find radio faults quickly. Make the needed repairs in any radio in minutes instead of hours. Save time on every job. This large, inexpensive diagram manual has the circuit for every popular 1946 radio set made since V-J day. Large manual, 8¼x11 inches, 192 pages. Just out. Price postpaid, only..... **$2.00**

1942

Clearly printed circuits, alignment data, parts lists, service hints are the facts you need to speed up radio servicing. Repair radios quickly and properly—follow the factory instructions given in these manuals. 1942 Manual has 351 models of 40 largest manufacturers. 192 fact packed pages. Large size. 8½x11 in. Manual style binding. Order manuals you need today..... **$2.00**

LOW-PRICED DIAGRAM MANUALS

1941

These easy-to-apply, inexpensive manuals will help you repair radios faster. This volume covers 1941 models, with alignment data, I.F. peaks, and replacement parts lists. Compiled by M. N. Beitman, radio serviceman for many years, author and teacher. Be an expert in radio servicing; simplify your work. 192 pages, 8½x11 inches. Only **$2.00**

Most Popular Models Made By:

Philco, RCA, Zenith, Sears, GE, Emerson, Belmont Radio, Detrola, Fada, United Motors, Westinghouse, Arvin, Majestic, Stewart-Warner, Admiral, Delco, Stromberg-Carlson, Western-Auto, Sparton, Wards, Motorola, Gamble, and many others.

1940

Let this important manual give you over 80% of all 1940 circuits you will ever need, acquaint you with new developments, train you to service quickly and efficiently millions of sets. Data on F.M., portables, recording, etc. 417 models of 43 manufacturers. 208 large pages of helpful data **$2.00**

1939

Another handy manual of most-popular diagrams you need. Circuit data, hints and information are time-savers and money-makers for you. Let these diagram manuals guide you to easier service work. Why try to get along without helpful diagrams? Use this volume with 192 pages of diagrams of 39 makes. Order these manuals today. The 1939 Manual is priced at only..... **$2.00**

1926-1938

The most popular volume of the series. Will pay for itself with the time saved during the first day of use. Includes all the popular old timers. Save hours on every job. 427 diagrams of the most-serviced radios of this period, with parts lists and alignment information. 240 pages, 8¼x11 inches. Sold with a money back guarantee. Price..... **$2.50**

Compiled by M. N. Beitman, radio engineer, teacher, author, and serviceman.

SAVE HOURS ON EVERY JOB

Be ready to make repairs in minutes instead of hours. You will be called upon to fix hundreds of models listed in these easy-to-use manuals. Tackle each job with the needed help found in these service manuals. Greatest bargain in diagram books. Send your order today. Plan to use these manuals this week.

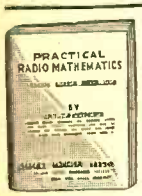
Other Practical Radio Manuals

RADIO SERVICING COURSE

Learn new speed-tricks of radio fault finding, case histories of common troubles, servicing short-cuts, extra profit ideas. Many large lessons on the use of regular test equipment, explanation of signal tracing, television to the minute, recording dope. Many active servicemen used this reduced price radio training for brush-up and study of new service methods. Reprinted in 1945 with new information on signal-tracing, television, visual alignment, P.A., photocells, and every other fact you must know to be more expert in your work. Complete, 22 lessons, size 8½x11 in. With self-testing questions. Great bargain in home-study radio training. Postpaid, only..... **$2.50**

SIMPLIFIED RADIO SERVICING BY COMPARISON

New, revolutionary different COMPARISON technique permits you to do expert work on all radio sets. Most repairs can be made without test equipment or with only a simple meter. Many point-to-point, cross-reference, circuit suggestions locate the faults instantly. Covers every radio set—new and old models. This new servicing technique presented in handy manual form, size 8½x11 inches, 84 pages. Over 1,000 practical service hints. 24 large, trouble-shooting blueprints. Charts for circuit analysis. 114 tests using a 5c resistor. Six editions, 48,000 copies sold to date. Only..... **$1.50**



PRACTICAL RADIO MATHEMATICS

Introduces and explains the use of arithmetic and elementary algebra in connection with units, color code, meter scales, Ohm's Law, alternating currents, ohmmeter testing, wattage rating, series and parallel connections, capacity, inductance, mixed circuits, vacuum tubes, graphs, curves, the decibel, etc., etc., and has numerous examples. Low price, only..... **25c**

See Your Radio Jobber or Send Coupon →

Supreme Publications

PUBLISHERS OF RADIO BOOKS, MANUALS, AND DIAGRAMS

NO RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 9 S. Kedzie Ave., Chicago, Ill.

Ship the following manuals: (Money back guaranteed). ☐ Radio Math
☐ 1946 ☐ 1942 ☐ 1941 ☐ 1940 ☐ 1939 ☐ 1926-38
☐ Radio Servicing Course. ☐ Simplified Radio Servicing by Comparison
☐ I am enclosing $....., send postpaid.
☐ Send C.O.D. I am enclosing $..... deposit.

Name: .....

Address: .....

there. As for the radio station, they want to be left out—nothing official to say. Dr. J. A. Hutcheson, associate director of the *Westinghouse Research Laboratories,* on the other hand, has plenty to say. In fact, he is already designing a 100-watt, 50 pound short-wave transmitter, battery-powered and capable of signalling from moon to earth. He wants to rig it so that it will broadcast only one minute every hour and to accompany it with other instruments that will broadcast signals telling what the lunar weather is. Just to round out the picture, we checked with FCC to see if Dr. Hutcheson or anybody else with a moon station would need a license. The answer is no—FCC has no jurisdiction over the moon to date. And for whatever it's worth, this may be added; we talked to a number of very serious gentlemen, in and out of uniform, in collecting this information—the kind of men who take things very seriously and never heard of Superman or Buck Rogers. Pop questions to them ten years ago about rocketing to the moon and broadcasting therefrom, and they would undoubtedly have laughed at you or called for a straitjacket. But nowadays it's different.

EVEN THE SIDEWALKS seem destined to share in the current radio fantasia — don't be surprised if the silent man at your elbow as you go to the office some morning suddenly bursts into sounds like, "Calling Dr. Kildare!" That is the dream of one Sherman Amsden of New York City, who has been granted a construction permit by FCC for an experimental station to test a radio signalling service in the vicinity of his home town. Amsden plans a specialty — "radio paging" service for doctors and other professional clients. If you're a client, you'll carry a special vest-pocket-sized receiver tuned to Amsden's frequency. Listening in at stated times, you'll be able to hear your code number if you're wanted for dinner, bridge, or the emergency ward. You can find out which by calling Mr. Amsden from the nearest 'phone booth. He's going to call the service the "Telephone Answering Service."

HAMS LISTENING IN on this column are begged herewith to answer a couple of questions which came in the mail recently from our favorite correspondent, Mrs. Frances G. Mulchahey, of Westfield, New Jersey. Mrs. Mulchahey, an avid short-wave listener, reports that "in my eighty-two years on this heaving old world" she has been unable to discover the answers, and we admit we're stumped. Here they are: "When hams want to leave the air, why don't they go? One ham will say he is going to bed, then he talks for ten or more minutes on all things he forgot to say—then the other one does the same. They give calls, stations, and stand at the front door shaking hands until I want to give them a push out and shut the door." Number two: "Before the war, about 2 a.m. one night, a young chap was talking to an older man about his true love. The girl evidently tried to put over a severe reconstruction job and he rebelled. The boy said he liked to dance, he liked to drink once in a while, but he didn't like to spend all his time in church, as his girl demanded. I have often wondered what ever happened to that youngster." Any answers to either question will be transmitted to Mrs. Mulchahey.

OPA, AS INDICATED in last month's column, approved retail price increases averaging 3 per-cent on radios and electric phonographs toward the end of the summer. As was also indicated, further price increases are not imminent, and decontrol is still a thing of the dim future. In announcing the late-summer advances in retail prices, Price Administrator Paul A. Porter summed up OPA's attitude when he stated that the Administration's action to increase prices was "mandatory" under the Price Control Extension Act. "There appears to be some misapprehension in the minds of the public that these increases are being granted at OPA's discretion," he said. "This is not the case. The public should understand that these increases are necessary to comply with the law." It follows that OPA policy will accentuate holding ceilings where they now are. Says Porter: "OPA will follow the standards laid down by Congress in such a manner as to afford the maximum protection to the buying public that is possible. We anticipate that this is the last adjustment that will be necesary because of the new law. Where we are obligated to carry out other provisions of the statute, we will hold increases to the minimum." He adds that prices resulting from the increases "are still considerably below what prices would be if they were permitted to rise to the full extent of today's heavy demand and limited supplies." In sum, OPA will oppose further price rises in the radio field.

CHALLENGING THE OPA attitude against decontrol in the foreseeable future is the production score being marked up by the radio industry, a record which another government agency—the Civilian Production Administration—has hailed as indicating the arrival of a near-peacetime economy. "The stop-and-go output of materials and parts which has been obstructing volume manufacturing," said John D. Small, CPA administrator, recently, "has now been replaced by continuous, high-level production. That means that industry is within sight of full production of finished goods if industrial peace continues." Radio production bears out his statement, the monthly totals still being

(*Continued on page* 102)

SOON WE'LL PHONE HOME FROM AUTO

RADIO INDUSTRY POISED FOR BIG

Big Boom in FM Broadcasting Seen

MARKET FOR 100 MILLION RADIOS REVEALED BY SYLVANIA SURVEY

OVER FIVE- OR SIX-YEAR PERIOD, RESULTS

COAST TO COAST NETWORK BEING PLANNED FOR FM

RADAR FUTURE

Let TODAY'S HEADLINES Guide You to TOMORROW'S OPPORTUNITIES

Learn RADIO ELECTRONICS this MODERN "A-B-C" WAY ..at Home

Plan your future the way business men do: Watch the headlines! Pick a field that's *"in the news"*—one with many opportunities for interesting, PROFITABLE EMPLOYMENT or a good chance for establishing a BUSINESS OF YOUR OWN with little capital. Pick a field that offers a variety of interesting opportunities—a field with one of America's most promising futures . . . and see how you may MAKE YOUR START TOWARD A PLACE IN THIS FIELD BEFORE JOB COMPETITION BECOMES ACUTE. *Write for Our Big, Free, Illustrated Book*—"VICTORY FOR YOU." Learn how DeForest's Training, Inc. prepares you at home, in your leisure time—without interfering with the work you are now doing—then helps you make your start in the vast BILLION DOLLAR Radio-Electronics field.

You Get EMPLOYMENT SERVICE

Our Employment Service offers you the advantage of long and favorable contacts with some of America's foremost Radio-Electronics concerns. "VICTORY FOR YOU" tells you how this service has helped many to their start in Radio-Electronics. You'll see how our students and graduates are prepared to win and to hold good paying jobs—how they start businesses of their own with little, if any, capital.

A You "LEARN-BY-DOING" at Home with Practical Equipment

Enjoy a "Home Laboratory." We provide you with 8 BIG KITS OF RADIO ASSEMBLIES AND PARTS to give you valuable practical experience at home. Build modern Radio Receivers and Circuits that operate. Build Electric Eye Devices, an Aviation Band Receiver, a Public Address System, a Wireless Microphone and numerous other fascinating experiments—in fact, 133 in all, in your spare time at home. NEW colorful Kit Supplement tells you about our "Home Laboratory," and how you use valuable Radio parts and sub-assemblies to get real practical experience as you learn.

VETERANS!
Big things are happening at DeForest's Training, Inc. for *veterans!* See how you can prepare yourself WITHOUT COST for a GOOD JOB or a BUSINESS OF YOUR OWN in the vast Radio-Electronic opportunity field.

C ILLUSTRATED LOOSE-LEAF LESSONS

You also receive modern loose-leaf lessons that are easy to read and are well illustrated with many helpful pictures and diagrams. ACT PROMPTLY! See how you can learn radio this modern A-B-C way by Reading . . . by Doing . . . by Seeing—at Home. Mail Coupon Now!

B Home MOVIES Help You Learn FASTER...EASIER

You also use a 16 mm. Motion Picture Projector and exciting training films to help you learn some of Radio's fundamentals FASTER . . . EASIER. SEE what happens inside of many circuits you are working on. SEE how electrons function. SEE how RADIO waves are changed into sound. Get our big, free book! Use it as a key to show you the way to Radio-Electronics job opportunities of *today* and *tomorrow*—the opportunities the headlines tell about.

SEND FOR FREE BOOK & SUPPLEMENT TODAY!

DeFOREST'S TRAINING INC., Chicago, Ill.

DeFOREST'S TRAINING, INC.,
2533-41 N. Ashland Ave., Dept. RN-C11
Chicago 14, Illinois, U. S. A.
Send me both your big book "VICTORY FOR YOU" and Kit Supplement, showing how I may make my start in Radio-Electronics with your modern A-B-C home training plan. No obligation.

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

Address.....*Apt*.....

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

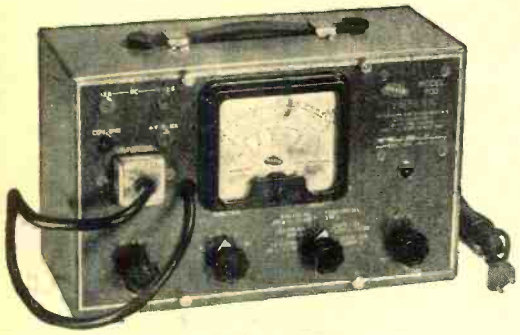
☐ If under 16, check here for special information

☐ If a discharged veteran of World War II, check here.

SILVER

"VOMAX"

Proved Best and... Cheapest



Thousands upon thousands of "VOMAX", the truly universal vacuum-tube volt-ohm-milliammeter . . . . in service today in ranking laboratories ranging from the U. S. Bureau of Standards on through the roster of radio's elect . . . . bought by Veterans Administration and other school training programs . . . . consistently selected by America's top-profit service organizations . . . . conclusively prove it is the best.
"VOMAX" is also the cheapest . . . . not only because the best is always cheapest in the long run . . . . but in first cost, too! Increasing production in response to increasing demand enables us . . . . despite continually increasing material costs . . . . to hold its price down.

"VOMAX" alone gives you the profit-priceless ability to measure every voltage in radio servicing . . . . at meter resistance so astronomically high it does not upset measured circuits . . . . 24 d.c. voltage ranges 0 through 3000 volts at 51 and 126 megohms input resistance . . . . 6 ranges 0-1200 volts a.c., a.f., i.f., r.f. to over 100 megacycles at 6.6 megohms honest input resistance . . . . decibels from —10 through +50 . . . . resistance from .2 ohms through 2,000 megohms . . . . direct current from 50 microamperes through 12 amperes. No other instrument at any price gives you all that "VOMAX" does. Its value is unequalled . . . . it's the standard of comparison . . . . the overwhelming choice of those "in the know" . . . . is radio's outstanding buy . . . . at only $59.85.

"SPARX" DYNAMIC SIGNAL TRACER

Next to the universal volt-ohm-milliammeter . . . . "VOMAX" is the ideal universal d.c. through u.h.f. meter . . . . what the radio service profession most needs is a good dynamic signal tracer. Ability to trace the signal through every successive receiver circuit reduces "trouble-shooting" to basic fundamentals . . . . banishes forever the hard-to-service "toughies" . . . . turns loss jobs into quick profits.
Designed by radio's only International Grand Prize winner, "SPARX" is the aural-visual signal tracer you have been clamoring for. Not only does "SPARX" trace r.f., i.f., a.f. signals from 20 cycles to over 200 megacycles . . . . it is your shop test-speaker as well. It also tests microphones, phono pickups, P.A. amplifiers, speakers . . . . registers presence or absence of d.c. and a.c. operating voltages, too.
With new radar crystal diode probe, 3-stage 65 db. gain a.f. amplifier, ground-insulating transformer power supply and PM dynamic speaker, it's the instrument you've dreamed of . . . . like all SILVER instruments will earn its cost in no time at all. Yet "SPARX" costs you only $39.90.

"904" LABORATORY CAPACITANCE RESISTANCE BRIDGE

Not only does Model 904 C-R Bridge cover the tremendous range of ¼ mmfd./ohm up through 1000 mfd./megohms . . . . give you truly laboratory accuracy in measurement of capacitors and resistors . . . . provide 0-500 volts continuously variable built-in d.c. polarizing voltage for electrolytic and other capacitors . . . . give power factors measurement 0-50% . . . . but it brings something quite new to radio measurements.
With Model 904 C-R Bridge you can at last measure capacitance of any type of condenser . . . . air, paper, oil, electrolytic, ceramic . . . . with d.c. operating voltage applied during measurement! Think what this means in increasing your efficiency . . . . in finding those "intermittents" which cause so much trouble . . . . in speeding your work and increasing your profits.
Measuring capacitors and resistors to ±3% laboratory accuracy . . . . matching "VOMAX" and "SPARX" in size, post-war style, top quality components and construction . . . . it's the same amazing bargain at only $49.90 net as "VOMAX" . . . . value which has forced 500% expansion in our plant facilities in less than one year.

And

See these "must" instruments . . . . and new SILVER amateur transmitters, receivers, kits, parts which were sensations at the 1946 Trade Show at your favorite jobber. Act fast . . . demand continues far in excess of supply . . . . for SILVER products are the profit tools used by your smart competitors. Send postcard for new post-war catalog.

OVER 35 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McMurdo Silver Co., Inc.

1249 MAIN STREET • HARTFORD 3 • CONNECTICUT

. . for awhile, I was saying:

I'm Being Gypped!

I was paying a high-priced technician to test my tubes, and he didn't even work up a sweat .

So I called the bird aside and asked him, "How come?" Then he told me about the time-saving RCP Tube Tester #322. He can test more tubes, more quickly with less effort than ever before. He saves me money on equipment bills, too, because of this instrument's unique versatility and low-obsolescence features.

DYNOPTIMUM TUBE TESTER

MODEL 322

★ Checks all types of receiving tubes on market today. ★ Especially adapted for checking individual sections of multi-purpose tubes. ★ Headphone for noisy, swinging, or high resistance connections. ★ Closer tolerances are obtained due to extremely low voltage drop of test circuit. ★ 4½" square meter with high torque Alnico movement. ★ Compact, sturdy construction. ★ Neon lamp for rapid short and leakage tests between elements.

RCP's DYNOPTIMUM circuit, an exclusive RCP feature, eliminates waste switching motion. Fewer controls, jacks and switches permit speedy yet accurate testing of all tubes, including miniatures and sub-miniatures. Incorporates the newest tube developments to provide a low-cost, long range utility tube-tester for the laboratory, inspection booth or service shop.

COUNTER MODEL NO. 322 { complete with sloping steel case, about $41.50

PORTABLE MODEL NO. 322P { complete with oak case and handle, about $45.50

NOW AVAILABLE

ORDER FROM YOUR LOCAL JOBBER OR WRITE DIRECT FOR OUR NEW CATALOG NO. 129.

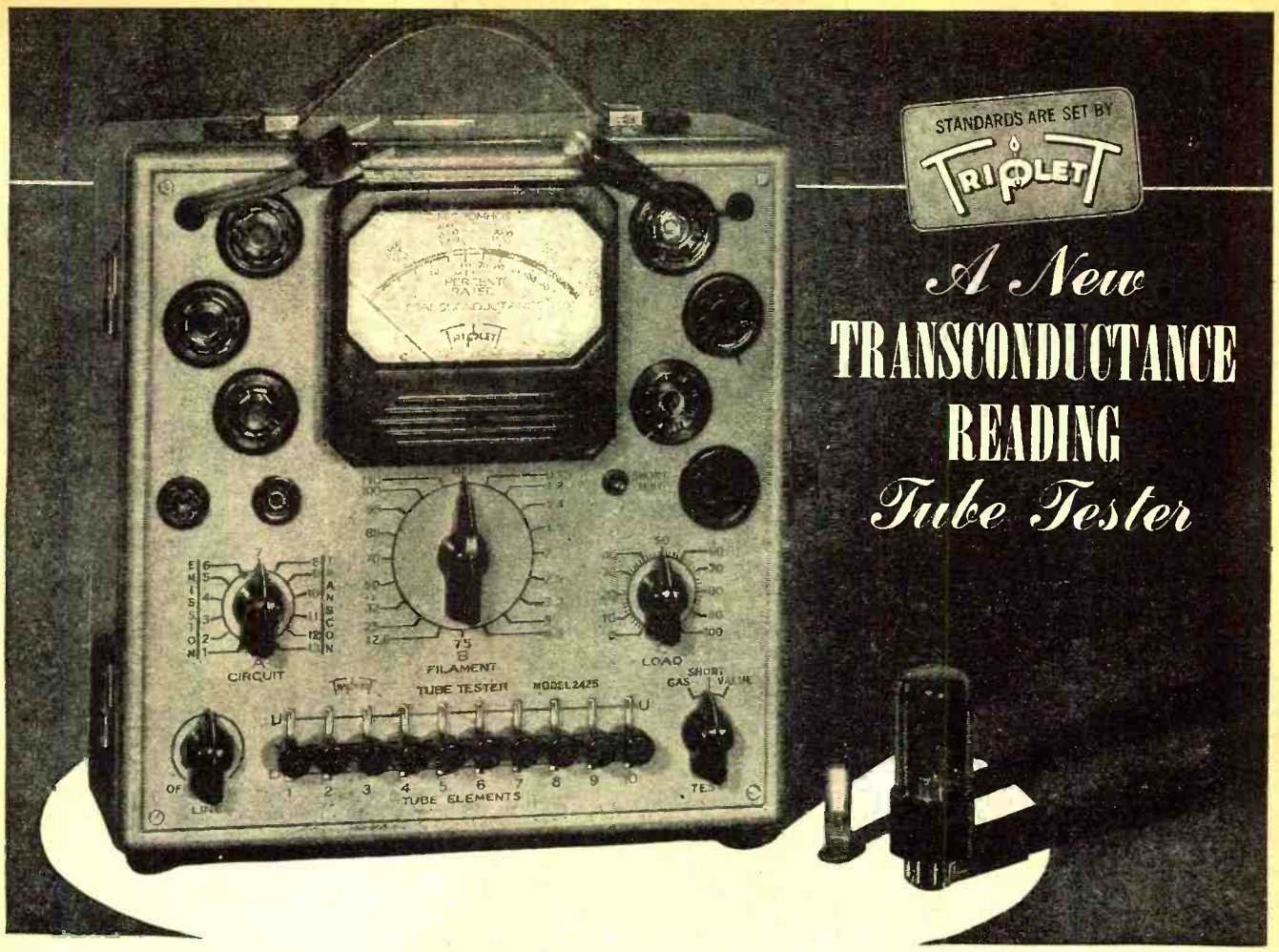
RCP TEST INSTRUMENTS—BEST FOR EVERY TEST

RADIO CITY PRODUCTS COMPANY, INC.

127 WEST 26th STREET — NEW YORK CITY 1, N.Y.

MANUFACTURERS OF PRECISION ELECTRONIC OHM-MILLIAMMETERS, SIGNAL GENERATORS

LIMIT BRIDGES, VACUUM TUBE VOLTMETERS, VOLT-ANALYZER UNITS, TUBE TESTERS, MULTI-TESTERS.



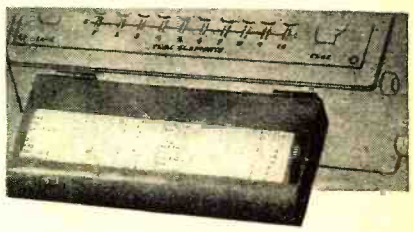
For the Man Who Takes Pride in His Work

Microhmo (Dynamic mutual conductance) readings and simplified testing—are two of the 20 exclusive features in the new model 2425 tube tester. A new approach to transconductance checking is made possible through a simple measurement directly proportional to Gm and a properly calibrated measuring instrument. There is no possibility of grid overloading due to excessive signal. **"Short" and "open"** tests of every tube element, including shield, inter-element connections and taps. **Gas Test** rounds out full check of all tubes. **R.M.A. numbering** of three-position lever switches gives instant reference for special tube testing. **Switching flexibility** allows full coverage of present and future tubes. **No hunting**—individual socket for each tube base type eliminates error. Excellent design, portability and appearance, amplified by Triplett engineering through all 20 features, make Model 2425 the outstanding 1947 tube tester.

New Easy-Test

ROLL CHART ATTACHMENT

Has all the advantages of both roll chart and book chart in adding new data. The location is right and settings can be made easily and quickly. Fits in carrying compartment in tester cover when not in use.



Precision first **Triplett** *...to last*

ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO

The Collins 32V-1 Ham-band Transmitter

You CAN take it with you!

The Collins 32V is the last word in compact, efficient, and versatile transmitters for amateur radio. It is small enough to set right on your operating desk. It is light enough to take anywhere—all you need to put it on the air are a 115 volt a-c power source, key or microphone, and an antenna. The 32V has more desirable features per cubic inch than any previous equipment.

For instance, compare these features with your desires: 150 watts input on CW, 120 watts on phone, v.f.o. control, band switching, direct frequency reading dial, push to talk, clean keying, 6 bands. A pi network is included for output coupling—and it's easy to use. One control tunes the final and another control loads it into the antenna.

The v.f.o. is so accurate you'll be using it to calibrate your receiver. It's permeability tuned, and can be set to within 500 cycles on the 80 meter band. The overall accuracy and stability are within one dial division.

Be one of the first to own this brand new job. You'll be proud of its excellent performance and attractive appearance. $475.00 with tubes. Let us send you an illustrated bulletin with complete details.

FOR RESULTS IN AMATEUR RADIO, IT'S . . .

COLLINS

COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA

11 West 42nd Street, New York 18, N. Y. • 458 South Spring Street, Los Angeles 13, California

MAKE MORE MONEY IN Radio TELEVISION & ELECTRONICS

Now!

GET THESE 2 BIG BOOKS FREE!

You men already in Radio know how great the demand is for **trained, experienced servicemen,** operators and technicians. You know how fast the field is growing and how important it is to keep up with developments — F.M. Receivers, Electronics and Television. You know, too, a fellow cannot learn too much about any industry for REAL SUCCESS. Whether you have experience or are merely INTERESTED in radio as an amateur, you must recognize the WONDERFUL OPPORTUNITY right within your grasp to **cash in on your natural abilities.** Make them pay dividends. Get into the EXPERT RADIO SERVICE FIELD. Be an F.M. and TELEVISION specialist—OWN A BUSINESS OF YOUR OWN, if you prefer. Fill out and mail the coupon below for all the details of our plan.

Get the Latest Inside Information—Short Cuts—Trade Secrets by

Here's Just a Few of the Interesting Facts you Learn with the FREE MANUAL.

1. Routine for Diagnosing Radio Troubles.
2. Preliminary Inspection of Receivers.
3. How to Check Power Supply.
4. How to Identify Various Stages of Receiver.
5. How to Trace the Circuit and Prepare Skeleton Diagram.
6. How to Test and Measure Voltages.
7. How to Test Speaker in Audio Stages.
8. How to Test Detector, I. F., R.F., and Mixer Stages.
9. Complete Reference Table for Quickly Locating Receiver Troubles.

SHOP METHOD HOME TRAINING

FROM A REAL ESTABLISHED RESIDENT SCHOOL

Now the famous National Schools brings its exclusive Shop-Method of training right into your own home. You can learn the most up-to-date, approved projects, systems and circuits step by step in **your spare time.** This is the sound practical training you want and need—the development of experienced instructors working with thousands of students right in shops, NEW F.M. broadcast studios and experimental laboratories of NATIONAL SCHOOLS—**one of the most advanced trade educational centers in the world.**

National Trained Men Now Making the Best Money in History

The real value of National training shows up on the quick progress our men make on the job. **Incomes that seemed fantastic** only a short time ago are now being reported by National graduates. And this is only a sample of **what the future holds** for the MAN WHO KNOWS RADIO, ELECTRONICS, F.M., TELEVISION and allied subjects. National is proud of the **progress its graduates are making** all over the world. Read the facts—the actual proof in the books we send you FREE.

LEARN BY DOING

Work with Real Experimental Equipment Furnished without Extra Cost as Part of Your National Training

Experience is the best teacher. You learn by experience with the exclusive National Shop-Method of Home Training. In the course of your study you actually build various types of receivers —a powerful superheterodyne, a signal generator, an audio oscillator and others—You make tests and conduct experiments that *show you the why and how of things.* You understand what makes the various elements of electronics operate because you actually see them work for you. Not only do you gain marvelous experience by this method of learning but you receive valuable equipment you will use on the job in the practice of your profession as an electronics expert. *Mail the coupon* and learn what this means to you.

Send the Coupon and prove to yourself what YOU can do in RADIO!

Be Sure of Your Success And Security

Don't let your post-war ambitions lag. Don't let YOUR future depend on **others. Build a career for yourself.** Never in all history has the returning serviceman, or war worker been confronted with such a great future if he reaches out and grasps it NOW. Here is a new world opening before you. You can soon step into an essential, well paid position or, **with little capital,** GET INTO BUSINESS FOR YOURSELF. It isn't a bit too soon to start now. Radio men are vitally needed. Fill out and mail the coupon immediately and examine the NATIONAL SHOP METHOD HOME TRAINING COURSE carefully, without obligation.

FREE LESSON INCLUDED

Examine the exclusive National Shop Method of Home Training. See for yourself how sound and practical it is. Be convinced that **you can learn Radio, Electronics, Television**—quickly and easily in your spare time. You can't tell until you try. This trial is ABSOLUTELY FREE. Fill out the coupon immediately while you are thinking about it and drop it in the mail at once.

Mail the coupon here for the books that tell you the complete story of the marvelous new system of training in Radio, Electronics and Television. Learn the facts of this exclusive shop-method of home training. **See for yourself!** DECIDE FOR YOURSELF!

This is the MODERN SYSTEM OF TRAINING: it matches the rapid progress constantly being made in Radio, Television and Electronics. It is TIME TESTED, too. National Schools has been training men for more than a third of a century. **It is the very same training that has helped thousands to more pay and greater opportunity.**

You owe it to yourself—your future—to read the book "Your Future in Radio, Electronics and Television"—FREE to you when you send in the coupon.

NATIONAL SCHOOLS

LOS ANGELES 37, CALIFORNIA EST. 1905

MAIL OPPORTUNITY COUPON FOR QUICK ACTION

National Schools, Dept. RN-11 (Mail in envelope or paste on penny post card)

4000 South Figueroa Street, Los Angeles 37, California.

Mail me FREE the two books mentioned in your ad, including a sample lesson of your course. I understand no salesman will call on me.

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

ADDRESS.....

CITY.....ZONE.....STATE.....

☐ Check here if Veteran of World War II.

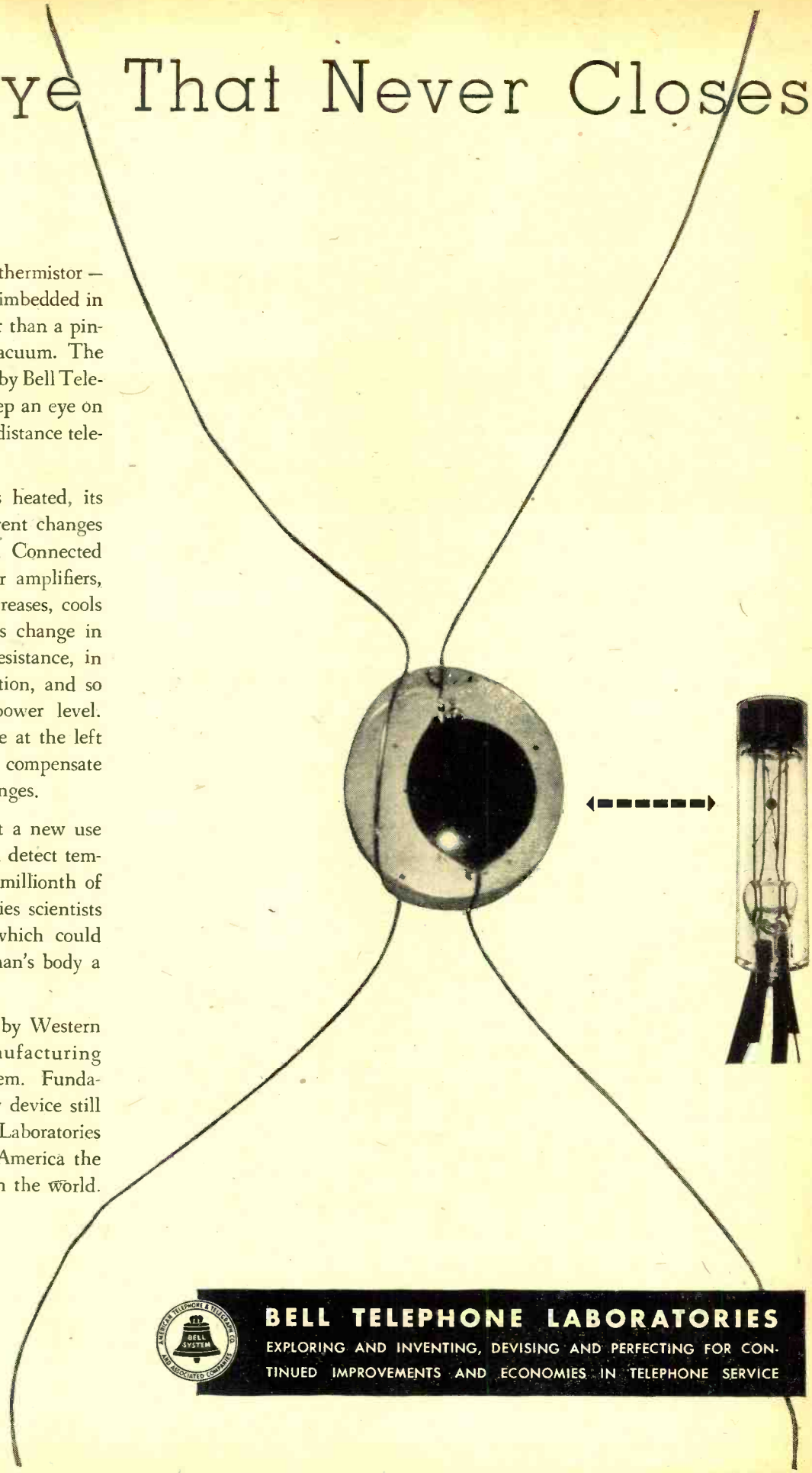
The Eye That Never Closes

You are looking at a thermistor — a speck of metallic oxide imbedded in a glass bead hardly larger than a pinhead and mounted in a vacuum. The thermistor was developed by Bell Telephone Laboratories to keep an eye on the amplification in long-distance telephone circuits.

When a thermistor is heated, its resistance to electric current changes rapidly. That is its secret. Connected in the output of repeater amplifiers, it heats up as power increases, cools as power decreases. This change in temperature alters the resistance, in turn alters the amplification, and so maintains the desired power level. Current through the wire at the left provides a little heat to compensate for local temperature changes.

Wartime need brought a new use for this device which can detect temperature changes of one-millionth of a degree. Bell Laboratories scientists produced a thermistor which could "see" the warmth of a man's body a quarter of a mile away.

Thermistors are made by Western Electric Company, manufacturing branch of the Bell System. Fundamental work on this tiny device still continues as part of the Laboratories program to keep giving America the finest telephone service in the world.



BELL TELEPHONE LABORATORIES

EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

Fig. 1. Beechcraft model D185 all-metal, twin-engine 6 to 10 place monoplane.

Planning an Aircraft RADIO INSTALLATION

By J. D. SCALBOM
Sales Eng., Bendix Radio Division of Bendix Aviation Corporation

The owner's desires, facilities available, and the type of plane are factors which must be carefully considered.

THIS discussion is planned to bring to the reader's attention the practical points to be considered in the planning of an aircraft radio installation. With large fleets of identical aircraft, such as in airline operations, it is possible to arrive at a set of highly useful and accurate data. When the variety of aircraft types encountered increases, the most practical results are obtained through the application of good sense and ingenuity, coupled with past experience and acquaintanceship with the equipment being considered for the installation. This is particularly true of the antenna types and placement.

The problems involved in planning an installation of radio gear in the small, two or three place "family" type aircraft requires considerable care and thought. The entire problem is not nearly so complex as with the larger aircraft that are being put into use for private transportation by many large organizations. This latter group will be dealt with because the former class will then be covered automatically. *The first phase of the planning resolves into what choice of facilities is required or desired by the owner;* and these specifications must then be met as completely as is practical, considering the aircraft in question, etc.

The aircraft used as "executive" transports are comparable to the commercial airline craft in speed and their ability to fly under very adverse weather conditions. Due to the nature of the flight operations these aircraft must be equipped with a radio "system" which will allow full use to be made of the government and private navigational and safety facilities. The high degree of reliability achieved in commercial airlines operations is very dependent upon these same aids. Without a complete coverage of the available aids much of the usefulness of the aircraft is sacrificed. The "executive" transport must be capable of going anywhere, and at any time that commercial airlines are operating.

Radio Facilities Available

Navigational and safety aids operating within the frequency range of 200 to 400 kilocycles include several types. Airways range stations are the best known of these. Each range station consists of an antenna system keyed by "A" (di-dah) and "N" (dah-dit). In the "quadrants" either an "A" or "N" is received while along a range leg or "beam" the field strengths of the antenna towers approach equality. With equal signals the "A" and "N" keying blends into a steady audio signal. At regular, short intervals an identification code is transmitted. Airways charts show the placement of each range station and the direction of the range legs from that station.

At designated times during each hour weather broadcasts are made from these stations. They may also be contacted for weather and traffic information. Emergency services are handled, too, but not messages of a personal nature. Much has been written covering this highly important network so that no more need be said here concerning it. In addition to the range stations non-directional homing stations are located at strategic points to provide aural-null direction finding (DF), or automatic direction finder (ADF) fixes. These are of particular use for traffic "holding" points adjacent to large airports. Airways and airport control towers also operate in this frequency range, 200 to 400 kilocycles.

Very-high frequency (v.h.f.) facilities are being installed to serve the same purposes as just mentioned. To date only a small portion of the airways have been converted for v.h.f. navigational usage. However, the CAA (Civil Aeronautics Authority) towers are equipped and are standing by for communications on v.h.f. By July, 1946 all CAA towers and at least 100 range stations were ready with v.h.f. for communications. Navigational facilities will require some time for completion, however. The low frequency radio ranges are still entirely intact, and will remain in service for an indeterminate period. Of course new radio gear must also be developed to make full use of the potentialities which v.h.f. offers. The frequency range of 108 to 132 megacycles has been assigned for this service. Immediately available for use by the itinerant or private pilot are 131.9 megacycles for air-to-ground airport control tower contacts and 131.7 megacycles for air-to-ground airways communications station contacts. For the time being ground-to-air transmissions remain in the 200 to 400 kilocycle band.

These v.h.f. itinerant flyer's frequencies were assigned on a temporary basis, but final permanent allocations

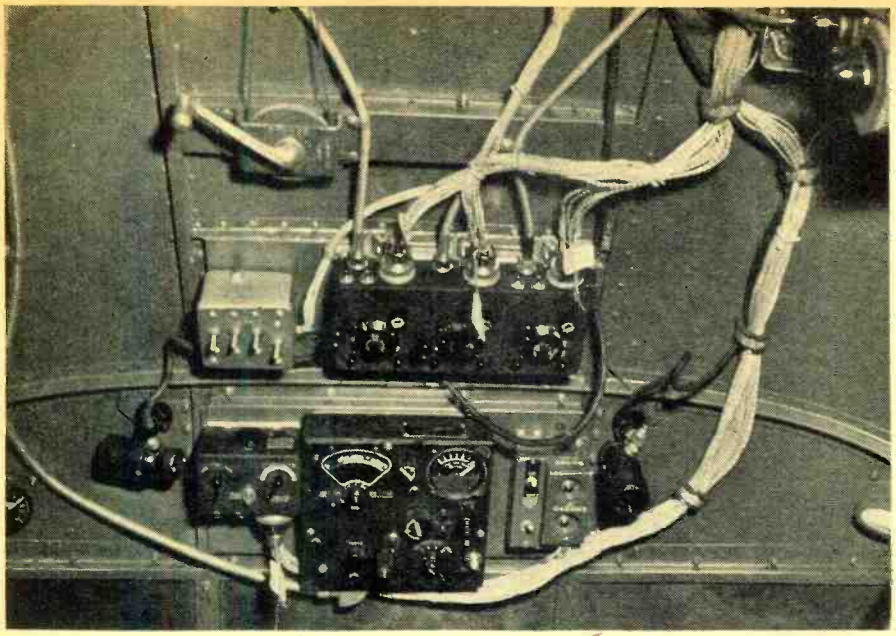
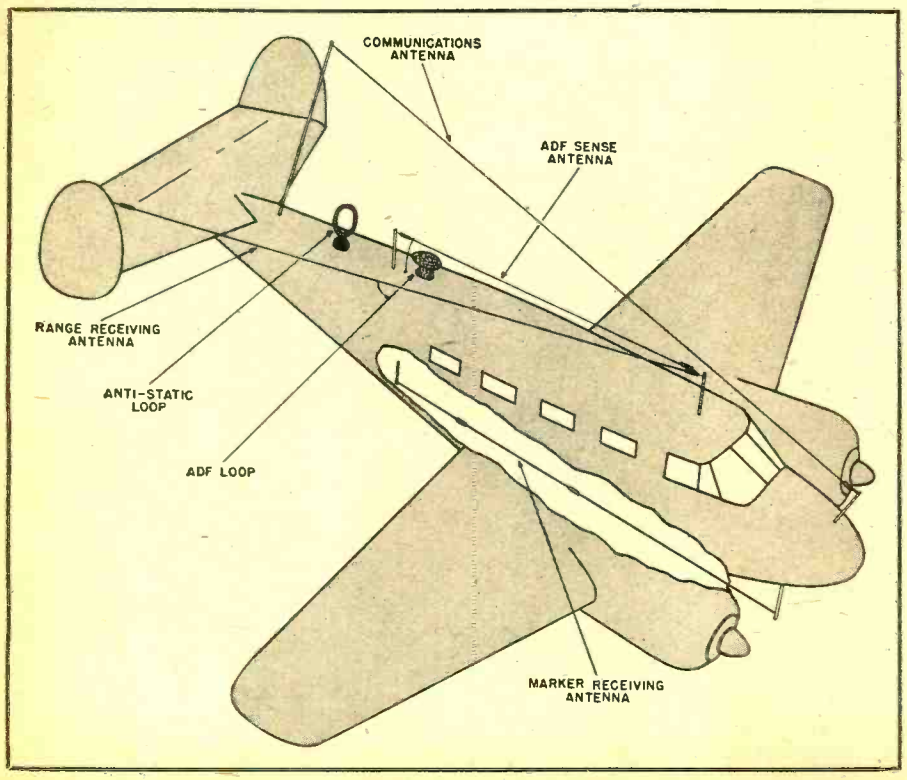


Fig. 2. Beechcraft C-45 cockpit with military type radio controls installed.

have been recently announced by the FCC. The permanent assignment for airport control towers is 122.5 mc. and for airways communications stations, 122.1 mc. The CAA has announced that as of January 1, 1947 its facilities will be guarding these new frequencies, but until that date guard will be maintained on 131.9 and 131.7 mc. Aircraft radio station licenses in force on v.h.f. at the time of changeover will be automatically carried over to the permanent frequencies without reapplication by the license holder.

Of great importance to navigation and safety is the system of "marker beacons" operating on 75 megacycles. Several functions are served by these marker beacons. The "Z" marker located at the range station site has a field strength pattern vertical and conical so as to give a positive indication of range station location. (This is opposite to the "cone of silence" which is a negative indication in that the range receiver signal momentarily reduces over the range station. This phenomenon is due to signal cancellation between the radio range station antenna field patterns.) "Fan" markers located at distances varying between approximately 10 and 30 miles from range stations adjacent to major airports and along the range legs provide the pilot with absolute "fixes" especially useful in instrument approach problems. The "Airways" or "Fan" and the "Z" markers are modulated by 3000 cycle audio and by means of audio filters, etc., employed in the marker receiver a white "Airways" indicator light is made to light up giving a visual indication in addition to the audio signal. A marker receiver is indispensable to instrument flight operations. In like manner "Outer" and "Inner" markers are located on the instrument approach path to an airport. The "Outer" marker is distinguished by a 400 cycle audio note and a blue indicator light; the "Inner" marker by a 1300 cycle audio tone and an amber light.

Fig. 3. Antenna arrangement on typical executive and light transport type aircraft.



3105 kilocycles and 6210 kilocycles are the itinerant flyer frequencies in addition to the recently allocated v.h.f. channels. The commercial airlines operate on frequencies between 2.8 and 12.5 megacycles.

Little use has been made of the "ship-to-shore" radio network linking shipboard telephones with landlines, but it is expected that advantage will be taken of the personal type of service offered since no personal messages can be handled by the facilities so far mentioned. Most of these stations operate in the 2.0 to 2.5 megacycle range.

A Proposed Minimum Radio System

The preceding outline of services has been made to show the need for each of the pieces of gear recommended as a complete, minimum radio "system" to be carried aboard the "executive" class of aircraft. Additional v.h.f. instrument approach gear might be considered in the large aircraft in the DC-3 class; however, such equipment is far beyond practical consideration for the medium sized 6 to 8 place aircraft. The following units comprise a minimum for "night instrument" operations:

1. An ADF (automatic direction finder) covering a frequency range of at least 200 to 400 kilocycles. (550 to 1200 kilocycles in addition is desirable). ADF bearings on frequencies higher than approximately 1200 kilocycles are questionable although "homing" is usually satisfactory.

2. A second receiver having a frequency range of at least 200 to 400 kilocycles for tower and airways contacts while the ADF is used for navigation, and for range flying. The use of a fixed or rotatable antistatic loop antenna, too, is highly recommended for use with this receiver. Aural-null bearings may be taken with such a loop antenna.

3. A 75 megacycle marker receiver having audio as well as visual indication. At least a single indicator light which responds to all of the marker

beacons ("Airways," "Inner" and "Outer" markers) without giving spurious indications (as when passing over power lines, or showing a light when the transmitter aboard the aircraft is operated), must be part of this piece of gear.

4. A transmitter operating on 3105 and 6210 kilocycles having a reliable range equal to 20 minutes flight at cruising speed of the aircraft. Antenna efficiency rather than transmitter power is a limiting factor in fulfilling this requirement.

5. A control, or set of controls and associated parts which tie the above four equipments together in such a way as to allow complete selection of the desired functions from at least the pilot and co-pilot positions. Selection without interference between either station must be attained. These controls must be easily accessible and easily seen from either position.

Depending upon the past experiences of the pilots who are in charge of the aircraft, the radio system may be either increased or decreased and otherwise modified according to the type of operations these men expect to carry on. Obviously it would be foolish not to equip an aircraft of unlimited operating ability with a complete set of radio gear—and the opposite also holds true.

Very-high frequency is rapidly being put into use and a complete system will require the addition of a low power v.h.f. transmitter having five channels. Two of these can be used immediately, 131.9 megacycles for air-to-ground control tower contacts, and 131.7 megacycles for air-to-ground airways communications station contacts. The three additional channels will be designated for congested areas as soon as traffic warrants it. An output power of less than one watt will give complete reliability at 40 to 50 miles at altitudes of 1500 to 2000 feet. Range naturally increases with increase in altitude over the terrain. Ground-to-air contacts will remain in the 200 to 400 kilocycle band and present equipment is far from being obsoleted since a gradual transition period of at least five to eight years is contemplated.

Modification of Military Equipment

Most of the aircraft purchased from the military have a radio system installed in them which is unsatisfactory from several standpoints. The failings can be overcome in some degree by modification and rework, however it is almost impossible to obtain a completely satisfactory radio setup. Compromises of more or less consequences must be made in every case. The transmitters require modification to provide crystal control. But then the power is often low and modulation is seldom a full 100%. Coverage is usually far below that required by high speed aircraft. The receivers themselves are very good and have adequate frequency coverage. The ADF's are fully satisfactory.

Perhaps one of the greatest difficulties of the military radio system aside from the transmitter is the inflexibility of the switching of the audio circuits and the range-voice filters. Paralleling of the pilot and co-pilot audio outputs cannot be prevented when each receiver has only a single audio output channel. This is the case with each of the military radio receivers, and transmitter sidetone and interphone. In addition, the control boxes and switches are in several separate units that are placed throughout the cockpit. A clean appearance and fully satisfactory cockpit arrangement is practically out of the question. This is not disparaging to the modifications that have been made since it is simply a fact that the "tools" available do not lend themselves to the job as well when they have been designed to do many things, as when they are designed to do a particular job.

Illustrated in Fig. 5 is a C-45 *Beechcraft* which was modified to overcome as far as possible the failings just pointed out. The new rectangular control box takes the place of the triple control formerly used for three military type receivers. Within this new control box are the following controls:

1. Individual range-voice filter switches, located at each end of the box.

2. "On-Off," channel selector and "Transmit-Interphone" switches, and indicator lights for a ten channel, crystal controlled, communications unit,

(*Continued on page* 134)

Fig. 4. Radio gear mounted in the nose of a Lockheed Lodestar.

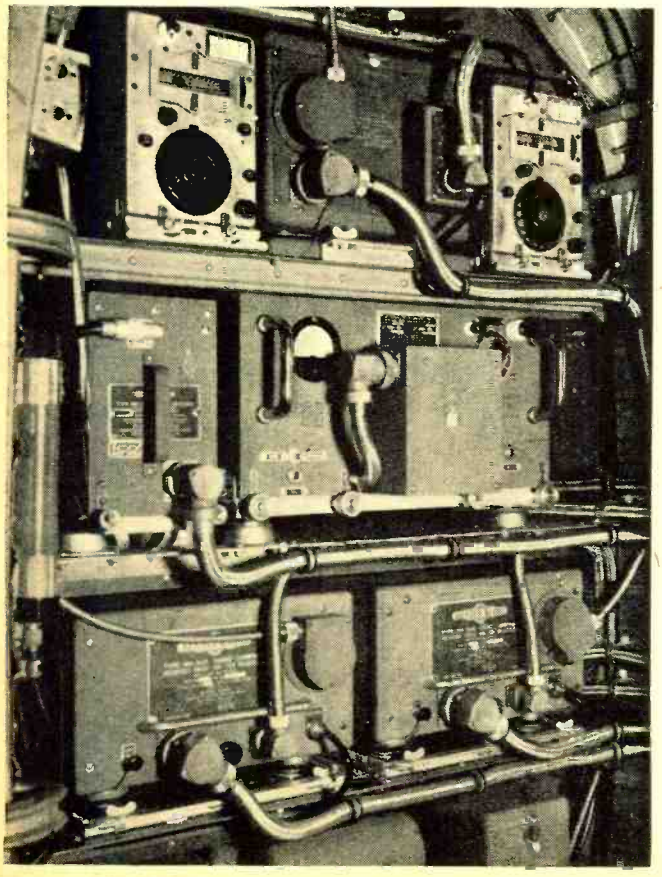
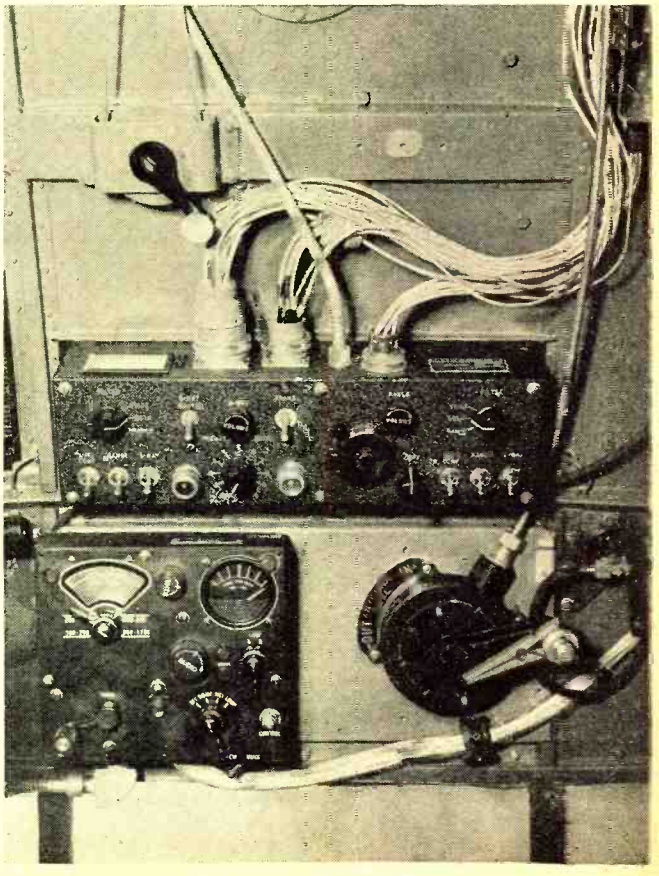
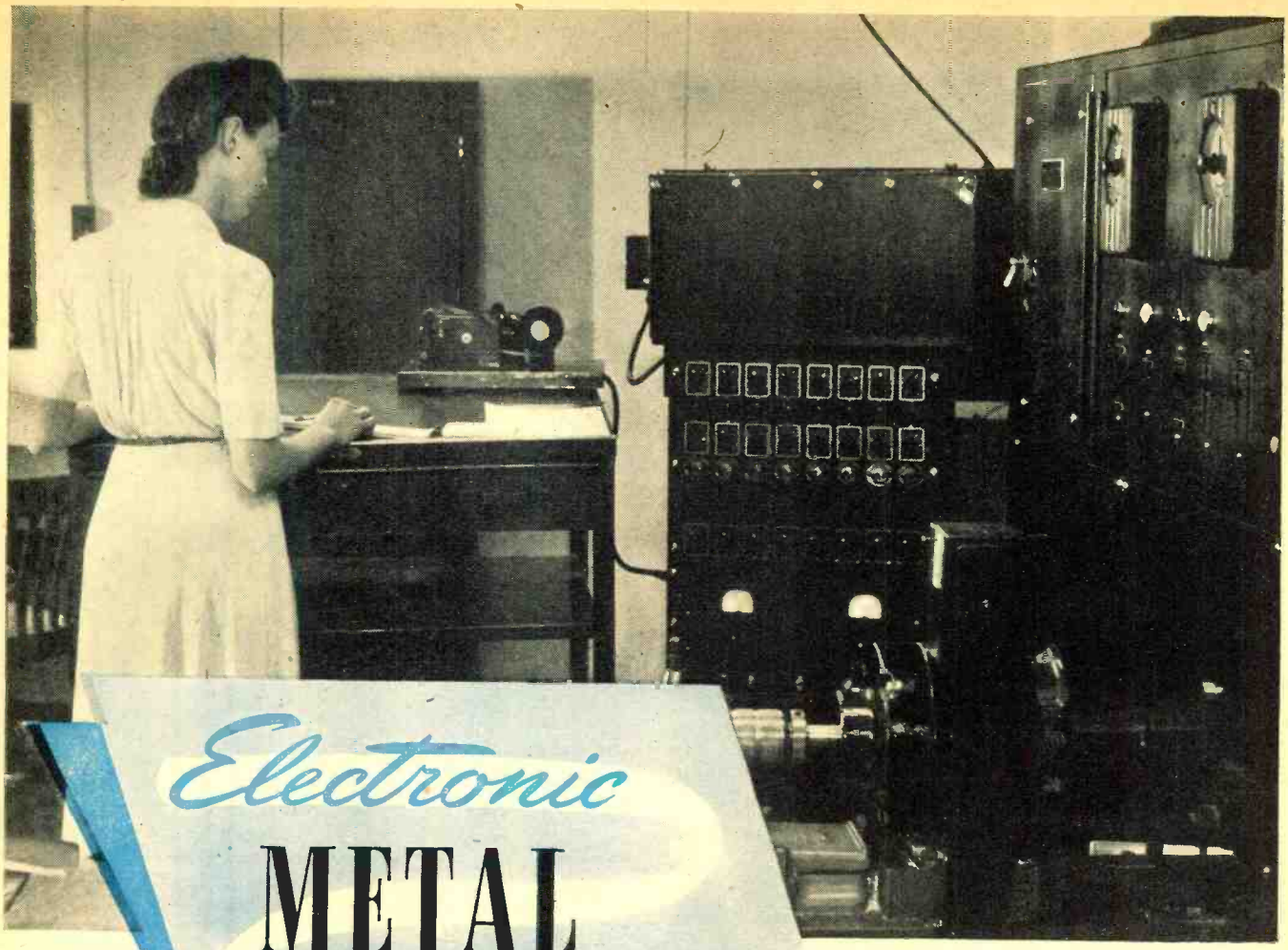


Fig. 5. Bendix MS-106 control panel in modified Beechcraft C-45.





Electronic METAL ANALYZER

Operator notes results of final test made by using spectrometer to analyze alloys.

By
S. R. WINTERS

Newly developed direct-reading spectrometer makes possible analysis of a maximum of 14 different elements found in industrial alloys.

CONVERTING rays of light into electricity, by using an electric spark generated on a strip of metal, a new electronic apparatus critically examines steel or other metal and defines the precise percentage of each element present—a process requiring only 40 seconds. This novel spectrometer, or electronic meter, was designed by *The Dow Chemical Company* of Midland, Michigan and inasmuch as it is a direct-reading device it may render obsolete the conventional spectrograph.

Originally chemical methods were employed in metal industries to determine the exact amounts of each of several elements in an alloy; then the spectrograph displaced the chemist's test tube as a means of analysis. The latter method proved more accurate and a greater time saver than chemical analysis. But somewhat analogous to the flippant expression of going around your elbow to get to your thumb, spectrographic analysis involved a roundabout process of photographing the spectral lines on a film, developing and calibrating it, and after placing it in a microphotometer, the percentage of each element then had to be calculated. These successive steps of operation were time-consuming—the complete process requiring from 15 to 30 minutes.

The new direct-reading spectrometer is a hybrid product of a combination of recent developments in electronics and the optical science, resulting in an electronic measuring instrument which automatically records the precise concentration of each of several metals in the form of a chart. It is capable of measuring the presence of at least 14 different elements, and the device may be so constructed as to enlarge its capacity to include an analysis of even more elements. The spectrometer, the only one of its kind, was built jointly by J. L. Saunderson, V. J. Caldecourt and E. W. Peterson of the Spectroscopy Laboratory of *The Dow Chemical Company*. Currently, determinations are being made for the following elements in the magnesium alloys: aluminum, manganese, zinc, beryllium, iron, calcium, silicon, and copper.

In the new spectrometer, as well as in the conventional spectrograph, the source of light is an arc or spark generated on the sample of metal subject to critical examination. This rainbow of light is broken up into the lines of the spectrum by use of a prism or grating. Instead of taking a photograph of the spectrum, this direct-reading spectrometer provides a slit for each element, through which the lines for that particular element are

given passage. A special photoelectric tube is situated behind each slit, an arrangement which permits of converting light into electricity and then amplifying it approximately 200,000 times. Then, this electronic energy is stored in condensers, which is the first step in the process, requiring only 20 seconds. At this juncture, the arc is stopped automatically, a paper roll begins to move, and the electric condensers are discharged slowly. Electronic amplifiers, designed especially for this purpose, determine the time element in the discharge of each condenser. The usual design of amplifier would require standardization for each sample of metal examined, but this unusual amplifier is adjusted, only once a week, by use of a "magic eye." The length of the lines for each element in the metal corresponds to the time of discharge for each condenser. Calibrated scales convert these length of lines into percentages of metal or alloy composition.

Scientists of *The Dow Chemical Company* outline the following steps in this method of analyzing metals and alloys; (a) generating a source of radiation with the unknown material as electrodes; (b) passing a beam of this radiation into a multiple-exit-slit spectrometer, which is equipped with energy collecting and amplifying instruments; (c) measuring the relative energy contained in each of several predetermined spectrum lines; (d) comparing this measured energy with the energy similarly received from standard samples; (e) and thereby determining the composition of the unknown sample.

The arc or spark between two electrodes, as the source of light, carries a current of a few amperes, at electromotive forces varying from 2000 to 27,000 volts. The slit through which this beam of light passes does not differ materially from a slit in any scientifically-built spectrograph. The slit must be sufficiently narrow to allow the beam to resolve itself logically into its various wavelengths without overlapping. Too, the slit must be long enough to admit of an appropriate quantity of energy. Ordinarily, the length and width of the slit should be comparable to the dimensions of the usual monochromator.

The beam of radiation is split into its integral wavelengths by use of a prism or, preferably, a grating. A plane grating of either the reflection or transmission design may be employed, although transmission gratings are practically obsolete. The prism or grating is in a fixed position in comparison with the rotating mounting, ordinarily employed in a monochromator. A concave reflecting diffraction grating has been found quite satisfactory. With the beam of light resolving itself into its different wavelengths, certain spectral lines may be selected, such as those which will be measured in arriving at the desired analysis. Optimum lines, for example, for each of the specific components may be selected with respect to the orthodox principles of spectroscopy. In some instances, however, it will be well advised to employ the electronic energy from more than one line for a particular component. In such case, the energy will be assembled by optical methods into a single collecting and measuring unit.

The particularly novel aspect of this direct-reading electronic "analyzer" is the process of assembling and determining the energy contained in the spectrum lines for each of the components being assessed. More specifically, the energy from one or more lines of each element subject to analysis is collected in an electron multiplier photoelectric tube, of the *RCA* type No. 931A, sensitive to light radiation down the spectrum to about 3400 Angstroms. This design of electronic tube may be obtained, if a special order is authorized, with a particular glass envelope, capable of transmitting light radiation down to 2400 Angstroms. Nine stages of amplification are present within the tube itself; therefore, the output of current is enlarged to 230,000 times that of the input energy. Moreover, the electronic output is of sufficient magnitude to be used for some purposes without additional amplification.

Various methods are available for determining the energy from each of the photoelectric tubes (one for each element), as the means of finding out the composition of the unknown source. This current could be measured with a galvanometer, which would indicate the amount of current flowing and, thus, the quantity of energy present in a certain spectrum line. The galvanometer scale could be calibrated to afford a direct reading but, as is customary in spectroscopic work, it would be an instantaneous reading and thus would vary appreciably from one moment to another. Therefore, we are advised that dependable results would only be obtainable by integrating such a galvanometer reading over a specified period, a sufficient time to "iron out" all these instantaneous variations.

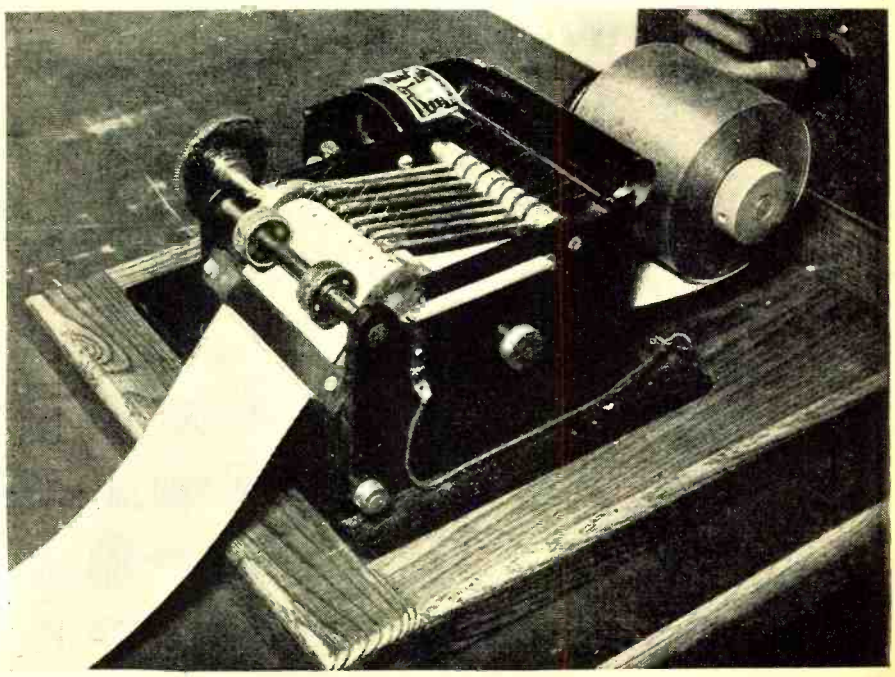
The process for assembling and measuring the energy over a fixed period involves charging a condenser from the photoelectric tube during a definite time of exposure. The energy stored in such a condenser is the total energy received during an exposure, which is of sufficient duration to average out any slight instantaneous variations of relative intensity. A determination of the energy so "packed" into the condenser may be employed to indicate the metal composition sought.

This volume of current is determined by discharging the condenser through a fixed resistance unit of such character that the condenser will be deprived of the electric current over a measurable period, say, from 5 to 60 seconds. To vouchsafe such accuracy, the condensers must be capable of almost complete discharge. These condensers should be able to discharge nearly 100 per-cent of their stored energy in order to approximate conformity with the so-called "expotential decay law." Because, if this law is not heeded, intensity fluctuations and slight variations in time of exposure do not strictly cancel in the determination of relative intensities.

"By measuring the original charge put in a condenser which collects the energy representing a given unknown constituent of an alloy and comparing it with the charge put in a reference condenser by the spectrum line or lines used for internal control, the amount of the unknown constituent can be determined," points out *The Dow*

(*Continued on page* 164)

Close-up view of the recording device used in The Dow Chemical Company equipment.



SOUND CONDITIONING Spurs Sales

By
J. J. ROWLAND
Acoustical Dept., The Celotex Corp.

Fig. 1. Modern sound conditioning makes this radio store an inviting place to shop.

Harsh, irritating noises in your sales rooms can lose sales for you. This article tells you easy ways to hush unpleasant sounds by use of modern acoustical treatment.

NOW that production of radio receivers has reached peacetime proportions and more and more sets are appearing on the market, the wise serviceman-dealer is beginning to think in terms of competition ahead—if he has not already done so.

Manufacturers are lending vital support to their distributors and dealers in the way of promotional material, and consumer advertising. The market is ready, but whether or not the dealer is successful depends on a great number of factors. One of the important customer decisions will be *"Where* shall I buy my new radio?" A pleasing and restful atmosphere in the dealer store will be one the considerations which will carry weight with prospective customers.

While hundreds of retailers have, in the past, been in contact with architects, builders and sales engineers, and have been getting set for the time when they could modernize their stores, many have neglected to even consider such a program because of the lack of merchandise and experienced sales help which characterized the war period. It can be assumed that soon the public will settle down and be more selective in their choice of merchandise and the retail outlets.

To this end, the modern, up-to-date radio store will strive to include in its modernizing program a favorable combination of all elements, such as, floor, walls, ceiling, entrance, store proper, lighting, air conditioning, ventilation and sound conditioning.

Sound Conditioning

Sound conditioning is the art and practice of treating rooms and the interiors of buildings so as to minimize the annoying effects of noise—"unwanted sound."

This is done by the use of sound absorbing materials. When a sound wave strikes a wall, its energy is partially reflected, partially absorbed, and partially transmitted. Any absorption at the point of reflection will tend to decrease the different components and minimize the characteristics of direct sound. Acoustical treatment and the shape of the room must be such that reflected sound is thoroughly diffused.

Sound travels in spherical waves at a speed of 1120 feet per second, in all directions from the source. Within the store area when the sound strikes the walls, ceilings or floor, some is absorbed, the balance is reflected back into the room. The absorption coefficients of some well known materials and furnishings are as follows.

Material	Absorbs	Reflects
Plaster	.025	.975
Concrete	.015	.985
Wood	.03	.97
Glass	.027	.973
Carpet	.20	.80
Acousti-Celotex. C-9	.70	.30

One can easily see from the above why noise can build up to such a volume as to be exceedingly irritating.

Materials are available today which are made especially to quiet excessive noise within all types of areas. These

are called "acoustical materials" and are made of various basic materials. All are porous in construction. They absorb more sound than they reflect. They are tested and rated for their absorption coefficients at a number of frequencies by both the Acoustical Materials Association and by the National Bureau of Standards. The efficiency of an acoustical material is expressed in simple percentage of sound absorbed at various frequencies.

Installing Acoustical Tile

Acoustical tile for sound conditioning may be applied directly to an existing ceiling by means of adhesive, or nailed to wood strips attached to the ceiling. In order to lower an exceptionally high interior, or in the case of loose, falling plaster or scaling paint, a suspended ceiling is installed by attaching 1" x 3" wood strips 12" on center to 2" x 4" wood strips 30" on center suspended from ceiling to desired height by means of straps or hangers. Acoustical tile not only quiets sound, but insulates, decorates and provides excellent light reflection as well.

It is not at all necessary to close shop while installing acoustical tile. In fact, it is good policy to advertise same, acquaint customers with the fact the improvements are being made for their benefit. Everything done in the way of store modernizing is reflected in merchandise display and increased sales.

Results of Sound Conditioning

Various types of store equipment, i.e., telephones, typewriters, and office machines generate as much sound in one location as another. By use of sound absorbing material the loudness is cut down because the original sound dies out faster. It is not amplified by repeated reflections from wall-to-wall and from ceiling-to-floor as in an average untreated room, but is quickly absorbed.

In a radio store, noise quieting is an essential feature. In playback or demonstration rooms sound conditioning is coupled with sound insulation in order to insure an ideal hearing condition and also to eliminate sound transmission.

A common acoustical problem in building construction is the transmission of sound through walls, floors and ceilings. In practically all types of construction, sound transmission from one room to another through the dividing wall takes place as a result of diaphragmatic vibration. The surface may be set into vibration either by direct mechanical impact, as by a footstep on a floor, or by the alternating air pressure due to sound waves incident on the surface. The former is called impact transmission and the latter is termed airborne transmission. In either case the vibrating surface generates new sound waves of reduced intensity in the room on the other side.

The transmission loss of any wall is a physical property of that wall just as is its weight or rigidity, and depends only on the materials and method of construction used in erecting the wall and not on the loudness of the sound striking it nor on the size or acoustical properties of the room on either side of it.

The playback or demonstration room plays a very important part in the merchandising of radios and records and record playing instruments.

Fine radio-phonographs, FM, and standard broadcast sets, free from fading, static and station interference are now being built. Superb instruments in beautiful cabinets, built by master craftsmen to meet the exacting demand of the most discriminating buyer are on the way. Prospective buyers will be assured of crystal clear reproduction of every wave in the wide range of recorded sound frequencies whether it be speech, instrumental music, song or sound effect.

Among the requirements for good listening are that volume should be adequate, however, it should not be "loudness" resulting from reverberation. The components of complex sound should maintain their proper relations, and successive sounds, in fast moving speech or music, should be clear and distinct.

Sound conditioning the playback or demonstration room is particularly desirable. Musical tones seem clearer and softer, and the result is a highly effective demonstration under ideal conditions. This room should be treated with a sufficient amount of acoustical material to prevent sound energy from building up to an uncomfortably high level. In general, due to the average size and shape of listening rooms, treatment should be distributed on both wall and ceiling areas. In this type room it is often the tendency for a large part of the sound energy created therein to be reflected back and forth between the walls themselves without striking the ceiling or the floor covering at all.

SOUND INSULATION DETAILS	WT. IN LBS. PER SQ. FT.	TRANSMISSION LOSS IN DB.	RATING
1/2" PLASTER 1/2" INSULATING LATH 2"X4" STUDS STAGGERED 16" O.C. ON 2"X6" PLATE	13.0	53.7 *	EXCELLENT
3/4" INSULATING BOARD 1/2" INSULATING BOARD STOOD LOOSE 6" LAP 2"X2" STUDS 16" O.C. ON 2"X6" PLATE	6.8	42.8**	VERY GOOD
1/2" PLASTER 1/2" INSULATING BOARD 1/2" INSULATING BOARD STOOD LOOSE 6" LAP 2"X2" STUDS 16" O.C. ON 2"X6" PLATE	12.2	52.3**	EXCELLENT
DOUBLE 3" HOLLOW GYPSUM TILE 2" AIR SPACE 1/2" INSULATING BOARD STOOD LOOSE 6" LAP 1/2" PLASTER	32.0	47.8 *	(FIREPROOF) EXCELLENT

* = TEST DATA BY RIVERBANK LABORATORIES
** = TEST DATA BY INSULATING BOARD INSTITUTE

Fig. 2. Average transmission losses for different types of partitions.

The acoustically correct playback room assists materially in decreasing the toughest sales resistance by contributing to the richness of tone of the instrument being demonstrated.

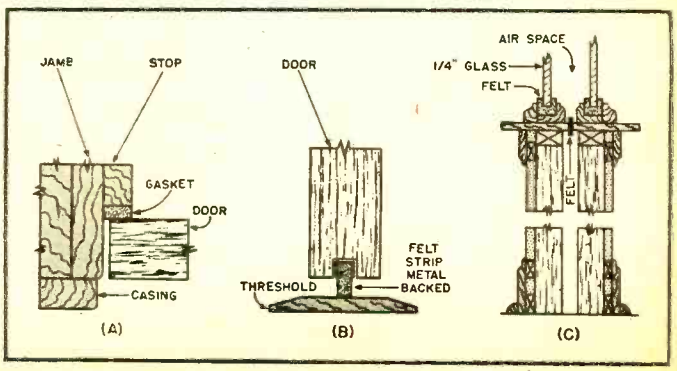
An acoustical treatment, properly applied, will produce a satisfactory effect in the room in which it is installed, and will, naturally, reduce the amount of sound to be transmitted, thus indirectly increasing the apparent sound insulating efficiency of the wall. However, experience has shown that considerably greater reduction in the transmitted sound is usually necessary for satisfactory results than is possible to obtain by acoustical treatment alone. Playback rooms should be free from extraneous noise and by the same token should not transmit noise to adjacent areas.

Construction

Both from an acoustical and economical standpoint the cubical content of a playback or demonstration room should be consistent with the required end for which it is to be used.

(*Continued on page* 165)

Fig. 3. (A) Details of a felt or rubber gasket installation for use around door jambs. (B) Construction details for a threshold-closer for playback booth. (C) One method of constructing sound insulated windows to be used between booths or on door of playback room.

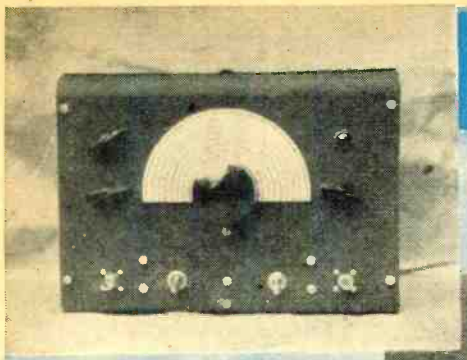


All Wave SIGNAL GENERATOR

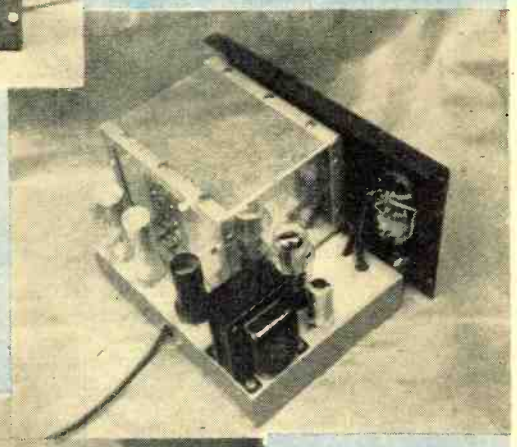
By

A. A. GOLDBERG, W2HKU

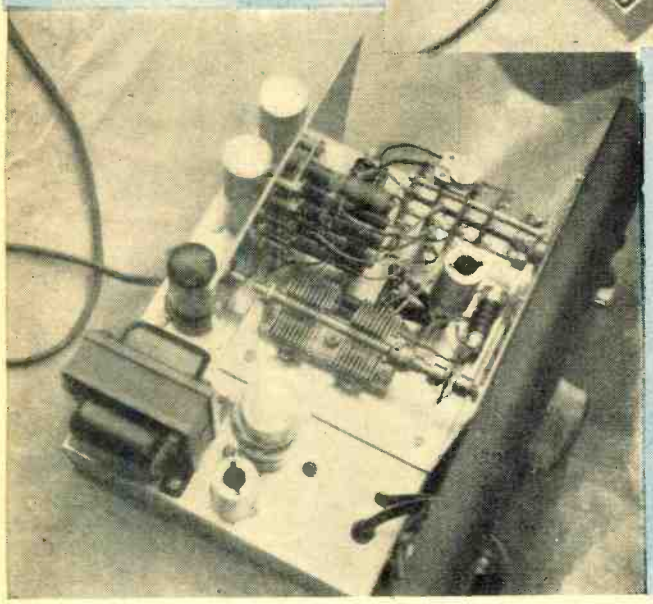
This easy-to-build signal generator covers 400 kc. to 25 mc. in seven ranges.



Front panel shows neat layout arrangement.



It is important that the r.f. section be well shielded. Aluminum is used in the construction of entire housing.



Metal housing has been removed to show details of the r.f. section. Coils of the various bands are all connected in the circuit and then selected by means of a rotary type switch.

SIGNAL generators have been used since the advent of radio. When radio frequency circuits are to be aligned and peaked, a constant, calibrated source of r.f. voltage is necessary. Means must be made to alter the voltage output from zero to full voltage in a smooth and precise manner. An a.f. modulator is useful for providing modulated r.f. Most readers are familiar with this serviceable test equipment item and the uses to which it may be put.

This signal generator was designed and built while test equipment was still scarce. It is the author's contention that, for the average experimentor, a *good* commercial instrument is the better investment. For those who may like to "roll their own," here it is.

Certain requirements had to be met in the design of this signal generator: 1—Simplicity, 2—Dial directly calibrated in frequency, 3—Low, constant impedance output, 4—Good bandspread, 5—Good shielding, 6—Voltage regulated power supply.

The first requirement of simplicity is met by omitting a calibrated voltage output. Voltage calibration usually cannot be relied upon over a period of time. A separate v.t.v.m. may be used for this purpose. By using iron core tuned coils, trimmer capacitors are eliminated. Several contemplated economies, such as a transformerless power supply and omission of voltage regulation were rejected since the gain far outweighed the saving.

Unlike a frequency meter, the signal generator does not require extremely accurate frequency calibration. The convenience of a directly calibrated dial rather than the calibration curve chart method can only be appreciated by those who use the instrument continuously. Dials like the *National* ACN and *Bud* No. D-1729 allow direct calibration. The main tuning dial in the described signal generator is a "home brew" as the aforementioned dials were too large. With mechanical modification, however, the "store bought" variety may be used.

Many signal generators are guilty of crowding in the higher frequencies. This is brought about by the use of the same tuning capacity for all bands. It is, of course, possible to design an r.f. section that will cover all frequencies with only three bands. The two lower bands are satisfactory but the highest is practically useless because of frequency crowding. A total of seven bands and three different tuning capacities cover the frequency range of 400 kc. to 25 mc.

During recent years, the trend has been toward low impedance r.f. outputs. Although it is true that high r.f. voltages are difficult to obtain with a low impedance loading, levels above 100 millivolts are rarely used. One advantage of a low impedance output is that a more efficient and smoother attenuator can be designed because of less capacity leakage. A second reason is that a low impedance coaxial cable may be used for introducing the r.f. into the apparatus being worked on. At the higher radio frequencies, there is difficulty in transferring the r.f. to the receiver without introducing resonance effects. This may be corrected by terminating the low impedance coaxial cable with a resistor equal to the cable's characteristic impedance.

Oscillator stability depends, to a large degree, upon the steadiness of the plate and screen voltages being applied. A well regulated power supply and voltage regulator tube makes for smooth, stable plate power.

Good r.f. shielding is necessary in a signal generator. If r.f. leakage exists to any degree, erratic and incor-

rect results may occur. For example, if a high gain i.f. amplifier is being checked for gain, it is important that a known voltage input to the amplifier be compared to the amplifier output voltage. If uncontrollable r.f. due to generator leakage exists in the vicinity, it is obvious that a correct measurement cannot be obtained. Another objectionable result of r.f. leakage is the limiting of the output attenuation. When 100 microvolts leakage exists, the minimum signal from the generator cannot be any less than this amount, regardless of attenuator setting.

The two points through which the r.f. leakage can occur are through the line cord and through the generator shield. A low pass filter will adequately take care of line leakage. Leakage because of defective shielding can be minimized by correct shield design. The principal considerations are:

1. Shielding be of sufficient thickness and good r.f. conductivity, such as copper or aluminum. Iron, unless copper plated, is inefficient as an r.f. shield.

2. Bring all grounds within the shield to a common point, thus minimizing shield currents.

3. Use filters on all outgoing leads such as filament, plate, etc. Good shielding is of no avail if radiating "antennas" are projecting outside.

4. Spaced, concentric shields that are connected together electrically at only one point.

A 6AK6 midget power pentode is used as the r.f. oscillator. For the sake of stability, an electron-coupled oscillator circuit is employed. With only 150 volts on the plate and screen, drift due to heating is kept at a minimum. Any lower voltage would tend to prevent an adequate r.f. voltage across the low impedance output load.

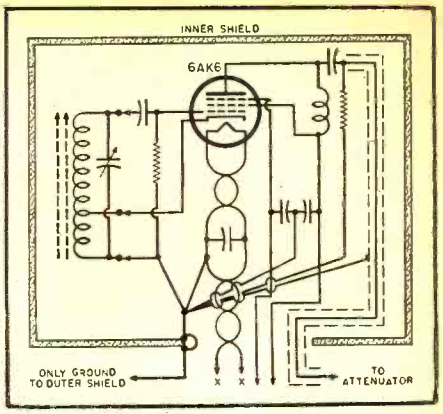
Although a straight line capacity tuning capacitor is used, much less frequency crowding at the high end of each band would occur with a straight line frequency or wavelength capacitor. By means of two extra wafers on the bandswitch, the main tuning capacity is 280 $\mu\mu$fd., 140 $\mu\mu$fd., or 70 $\mu\mu$fd. In the three lowest bands, both sections of the capacitor are in parallel. For the fourth band, only one 140 $\mu\mu$fd. section is used. In the three highest bands, both sections are in series, providing an effective tuning capacity of 70 $\mu\mu$fd.

In order to prevent the unused coils from resonating and causing dead spots, a shorting type wafer (wafer A) grounds all coils except the one in use.

The attenuator has been calculated to provide a nearly constant, low input and output impedance. With the values shown, the input impedance varies between 75 to 95 ohms, approximately. The output impedance ranges from 75 to 115 ohms.

Notice that the output coupling capacitor is only .001 μfd. and works into the low impedance attenuator load. This value of capacity attenuates the low frequencies where the r.f. oscillator output is greater and, inversely, has less attenuation for the higher frequencies where the generated r.f. is weaker. The result is a more constant r.f. output with changes in frequency.

Radio frequency chokes do not have a constant high impedance to changing frequencies, the reason being that the choke's inductance and the capacity across it, both distributed and external, cause resonance and anti-resonance effects. The plate load r.f. choke, being no exception, would cause the r.f. output voltage to vary considerably as the dial was tuned across the band. One method of eliminating this annoying effect is to lower the "*Q*" of the choke with a low shunt resistance. This is taken care of automatically by the low input impedance of the attenuator.

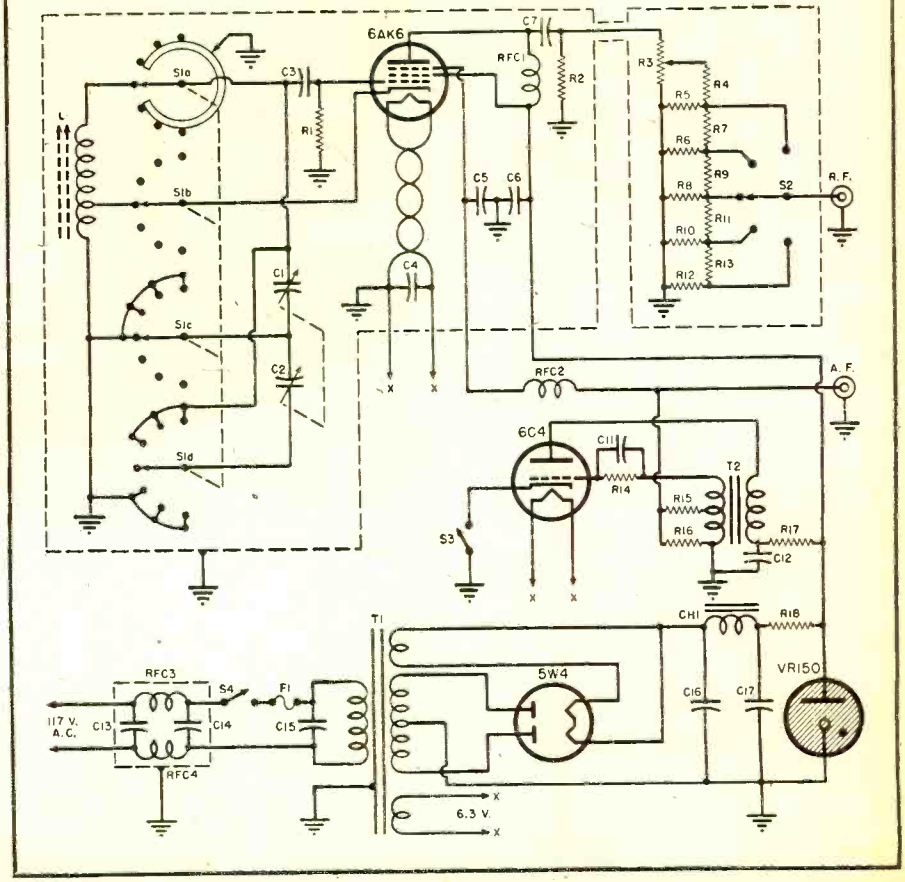


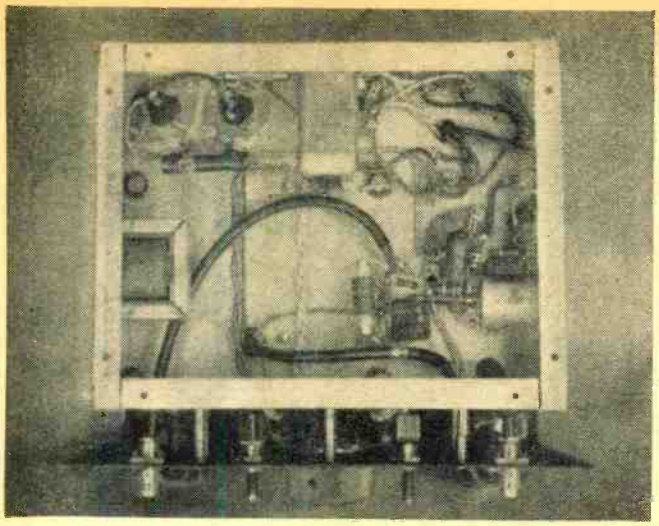
As illustrated in the diagram, the author stresses the importance of tying, at one point, all ground leads. This is considered good practice in any instrument.

Schematic diagram of signal generator. In order to simplify the drawing only one coil (L) is shown. Coils for other six ranges must be similarly wired to switch.

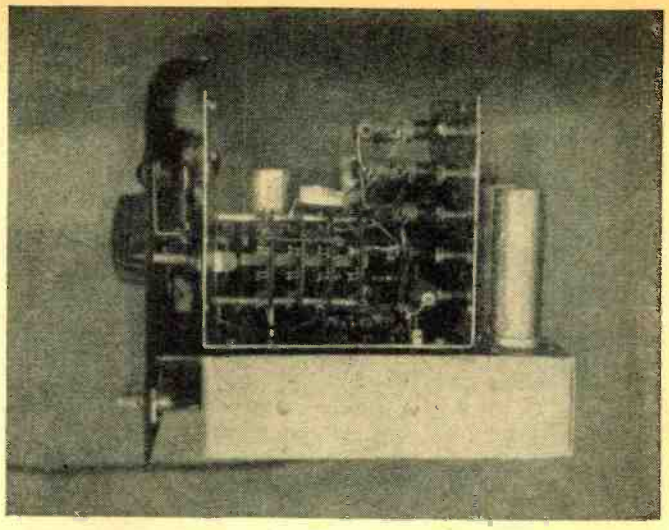
R_1, R_{14}—50,000 ohm, ½ w. res.
R_2—100 ohm, ½ w. res.
R_3—2000 ohm pot.
R_4, R_5, R_6, R_7, R_8, R_9, R_{10}, R_{11}, R_{12}, R_{13}—200 ohm, ½ w. res.
R_{15}—100,000 ohm, ½ w. res.
R_{16}—10,000 ohm, ½ w. res.
R_{17}—4700 ohm, 1 w. res.
R_{18}—9000 ohm, 10 w. res.
C_1, C_2—Dual 140 $\mu\mu$fd. var. cond.
C_3—250 $\mu\mu$fd. mica cond.
C_4—.01 μfd., 200 v. cond.
C_5, C_{11}, C_{13}, C_{14}—.006 μfd., 400 v. cond.
C_6, C_{12}, C_{15}—.01 μfd., 400 v. cond.
C_7—.001 μfd., 400 v. cond.
C_{16}, C_{17}—40 μfd., 400 v. cond.
S_{1a}, S_{1b}, S_{1c}, S_{1d}—4 pole, 7 pos. sw.
S_2—S.p., 5 pos. sw.
S_3, S_4—S.p.s.t. sw.
RFC_1, RFC_2—2.5 mh., r.f. choke
RFC_3, RFC_4—100 μh., r.f. choke
CH_1—15 hy., 50 ma. filter choke
T_1—Power trans., 300-0-300 @ 50 ma., 5 v. @ 2 amp., 6.3 v. @ 1 amp.
T_2—Audio trans., 3:1 ratio
F_1—1 amp., 115 v. fuse
1—6AK6 tube
1—6C4 tube
1—5W4 tube
1—VR150 tube
L—400-800 kc., 2.5 mh. r.f. choke;
.8-1.8 mc., 125 to 350 mh. iron core coil;
1.5-4.2 mc., 50 to 125 μh., iron core coil;
4-8.5 mc., 26 turns, iron core coil;
8-12 mc., 17 turns, iron core coil;
11.5-17.5 mc., 14 turns, iron core coil;
17-25 mc., self-supporting #16 wire, 12 turns

Since the 400-800 kc. and the 17-25 mc. coils do not have iron cores, small variable ceramic trimmers are used. A 25 $\mu\mu$fd. size is used across the 400-800 kc. coil while a 5 $\mu\mu$fd. size is used for the 17-25 mc. coil. All coils are tapped approximately ⅓ up from ground end for cathode tap.





Under chassis view of completed all-wave signal generator.



Side view shows details of the coil and switch assembly.

Suppressor grid a.f. modulation is used. The audio is applied to the suppressor through a 10:1 step-down voltage divider and through a low pass, r.f. filter being made up of a 2.5 millihenry choke and a .006 μfd. mica capacitor. The suppressor grid is also brought out to a coaxial receptacle on the front panel. This serves two purposes: the first; to provide a means of externally modulating the r.f. oscillator, the second; to provide a handy source of fixed frequency a.f. for audio test work.

The a.c. power line is filtered through a "pi" network consisting of two 100 microhenry chokes and two .006 μfd. mica capacitors. Be certain that the r.f. chokes will carry the 450 ma. line current.

The signal generator, complete with power supply, is self contained in an outer metal box, (*Par-Metal* CA102), that measures 7¼" high, 10" wide and 8" deep. In laying out the front panel, a symmetrical layout is achieved without the sacrifice of efficiency. In the center is the main dial with paper scale cemented on the metal panel. A Velvet Vernier movement was stolen from an old *National* Type A dial that was kicking around the junk box. This movement, with home made plastic pointer attached, is fastened to the front panel. If care is taken to draw the various lines neatly with India ink and, as a finishing touch, color alternate frequency bands for clarity, a professional looking job results.

The 7" x 9" x 2" zinc plated chassis made for the previously mentioned cabinet is punched and drilled as shown on page 124. Make a full size template layout on heavy paper stock, indicating all hole centers. Fasten the template on the chassis with scotch tape and center punch all holes directly through the template. Following this procedure will guarantee a neat, accurate job. As a precaution, check the tube socket mounting hole centers before center punching as a slight variation exists with different sockets.

Making the aluminum shield box for the r.f. oscillator will be the most difficult mechanical task. Lay out the two "U" shaped sections by first cutting each to size, then center punching as directed for the chassis. After all the drilling is accomplished, bend each section carefully. Set two pieces of angle iron in a vise and carefully bend the aluminum by pounding with a wooden mallet. A word of caution, be sure a grade of soft aluminum is used since tempered aluminum or dural, plentiful as war surplus, will crack when sharply bent.

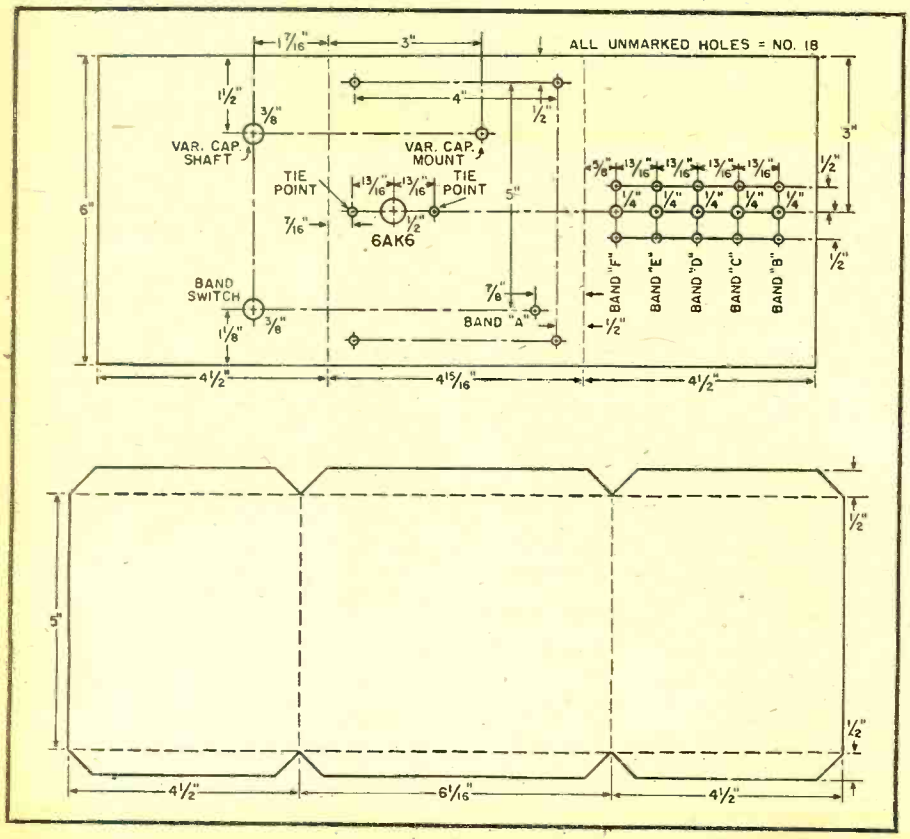
Although not shown in the photos, the attenuator has since been enclosed in a small shield box made of aluminum, to reduce leakage.

Install plastic grommets in the four chassis holes that will support the r.f. shield. The shield is mounted on top of the grommets by means of bolts and nuts. Before mounting the shield, however, install and wire all the oscillator circuits. It is easier to do this while the "U" shaped shield is free and unmounted.

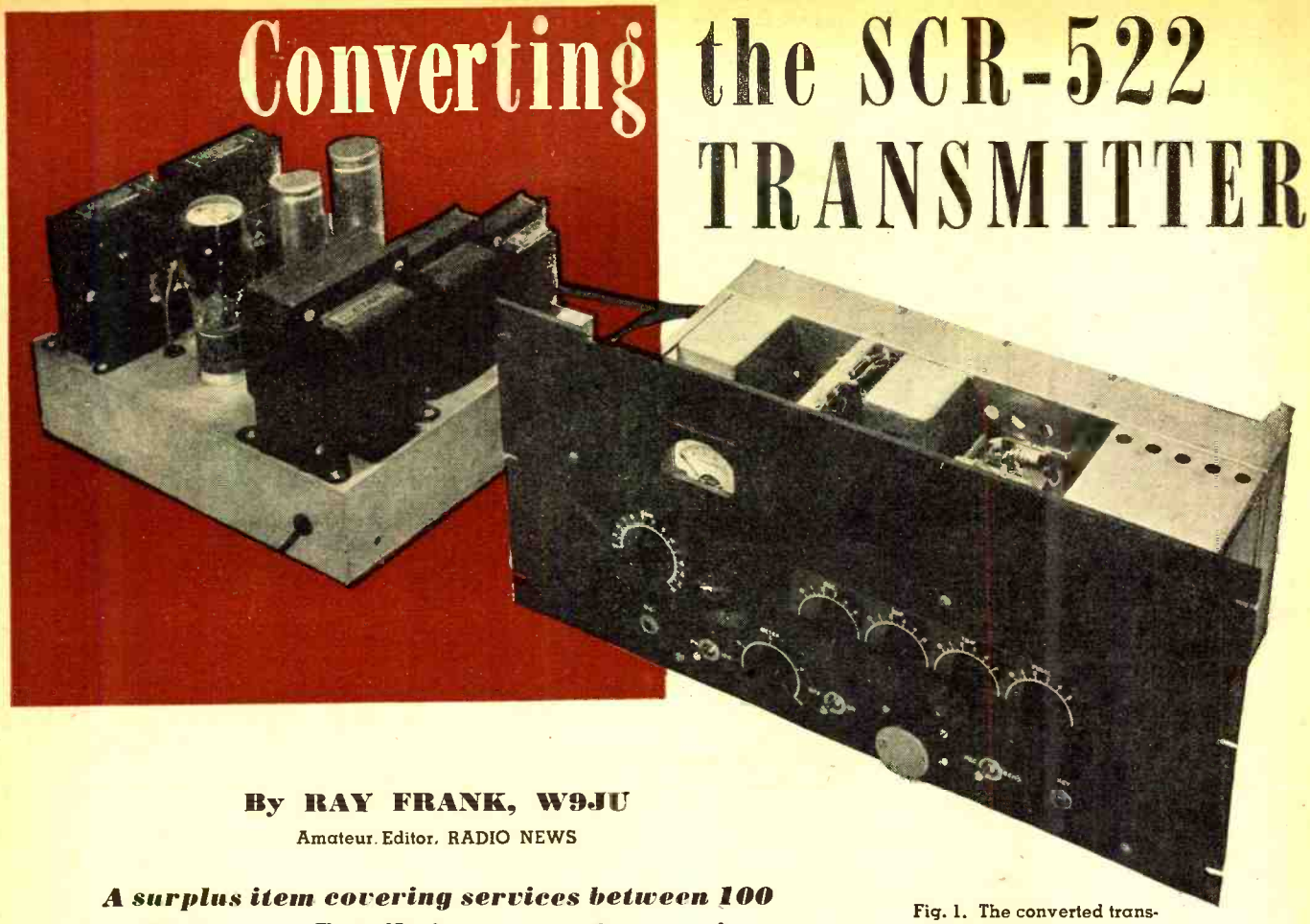
Mount the front panel to the main chassis by means of long bolts and 1" spacers. This is necessary in order to allow enough room for the dial mechanism, coax receptacle and toggle switches.

(*Continued on page* 124)

Mechanical layout for oscillator shield construction. All unmarked holes should be #18. 16 gauge soft aluminum was used for the shield construction.



Converting the SCR-522 TRANSMITTER



By RAY FRANK, W9JU
Amateur Editor, RADIO NEWS

A surplus item covering services between 100 and 156 mc. Details for converting receiver portion were covered in last month's issue.

Fig. 1. The converted transmitter. Power supply is built on separate chassis.

THE conversion of the transmitter portion of the SCR-522 is simplicity itself, and consists almost entirely of mechanical alterations for convenience, and the addition of a suitable power supply.

Basically, the transmitter consists of a 6G6G harmonic crystal oscillator, 12A6 harmonic amplifier, 832 tripler, and 832 final. The output of the transmitter is on the 18th harmonic of the crystal used. Modulation of the transmitter is accomplished by a low impedance dynamic microphone, which feeds a 6SS7 speech amplifier, in turn driving push-pull 12A6's as modulators. A form of cascade modulation is used with the screen of the 832 tripler modulated simultaneously with the plate and screen of the final. This form of modulation has the effect of increasing the drive to the final on modulation peaks where it is likely to be needed.

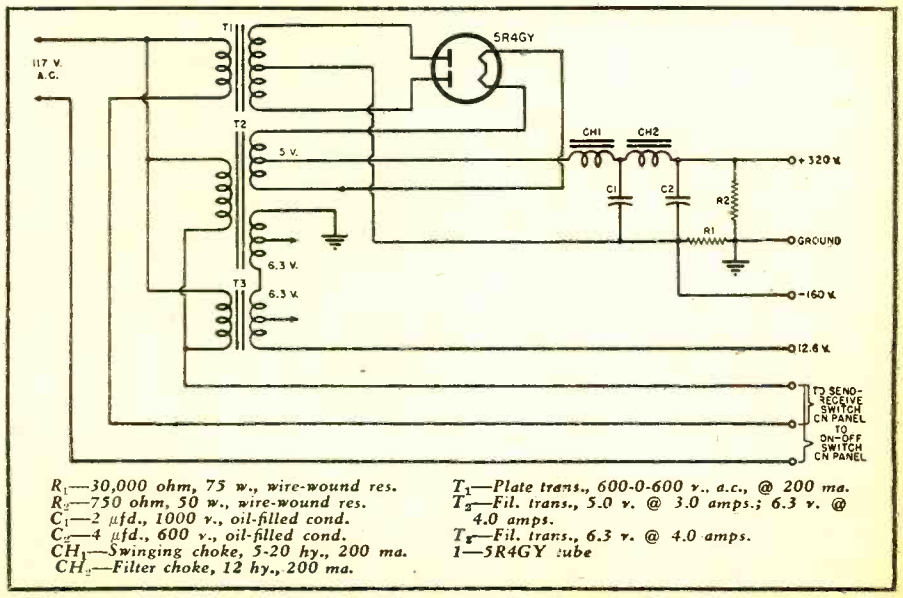
For indication of r.f. output, a 6SS7 is connected as a diode, and coupled to the tank circuit of the final. The rectified current through this diode serves as an indication of the relative output, and in addition may be used as a carrier shift indicator, enabling the modulation to be monitored to prevent overmodulation.

A feedback circuit is also provided in which the plate and grid circuits of the 6SS7 speech tube may be coupled together to allow this tube to oscillate at an audio rate of approximately 1000 cycles. This provides an easy means of tone modulating the transmitter for code operation.

The first step in the conversion is the removal of the transmitter from the case and rack. The red painted screws holding the transmitter in place should be removed, and a *Bristol* wrench to fit the 8-32 set screws on the flexible couplings procured. When these set screws are loosened, it is possible to remove the frequency shifter slides, taking care that all the

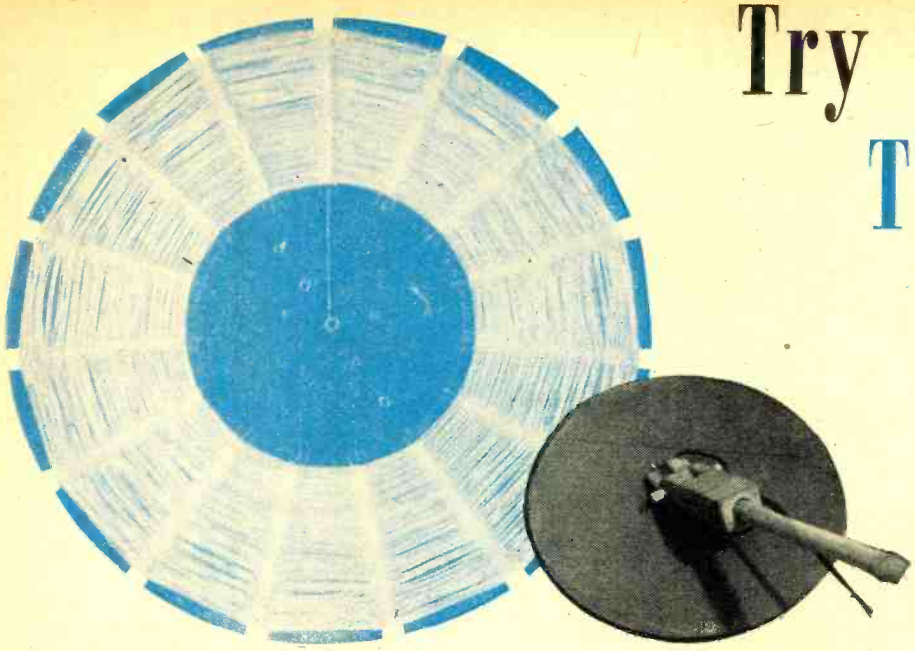
(*Continued on page 74*)

Fig. 2. Schematic diagram of power supply for 117 volt operation.



R_1—30,000 ohm, 75 w., wire-wound res.
R_2—750 ohm, 50 w., wire-wound res.
C_1—2 μfd., 1000 v., oil-filled cond.
C_2—4 μfd., 600 v., oil-filled cond.
CH_1—Swinging choke, 5-20 hy., 200 ma.
CH_2—Filter choke, 12 hy., 200 ma.
T_1—Plate trans., 600-0-600 v., a.c., @ 200 ma.
T_2—Fil. trans., 5.0 v. @ 3.0 amps.; 6.3 v. @ 4.0 amps.
T_3—Fil. trans., 6.3 v. @ 4.0 amps.
1—5R4GY tube

Try this 1946 TREASURE FINDER



Spiderweb type loop used in search arm.

By
W. E. OSBORNE
Gilfillan Bros., Inc.

This highly sensitive metal locator can spot a copper penny at a distance of three feet.

IN THE design of any portable type of "treasure-finding" equipment, whether for gold or for oil, the potential prospector must always watch, in addition to sensitivity, two other most important points—weight and stability. The question of weight can be most deceiving, and while many experimenters will feel that 25 or 30 pounds is a very modest figure when first setting out, a few hours of toil in really wild country—which is nowadays the only type of country offering a fair chance of success—will usually disillusion the keenest enthusiast.

Batteries are, of course, responsible for most of the weight in the majority of locators, and it will be found preferable—even though more expensive—to use very light-duty batteries, and replace these frequently from spares kept in the camp.

Regarding stability, many factors are involved. These include frequency used, type of meter (if any) and degree of sensitivity required. A locator may be aligned in the workshop and perform very well around the front garden, but when climbing over rocky territory or uneven ground a very different situation arises. From the physical angle, a delicate meter will flicker uncertainly; high frequencies will provide false readings from nearby moisture or green foliage, while a highly sensitive locator, such as the beat-frequency type, needs a lot of practice, very careful handling, and constant resetting to zero beat, as every bit of conductive ore is recorded as a "find."

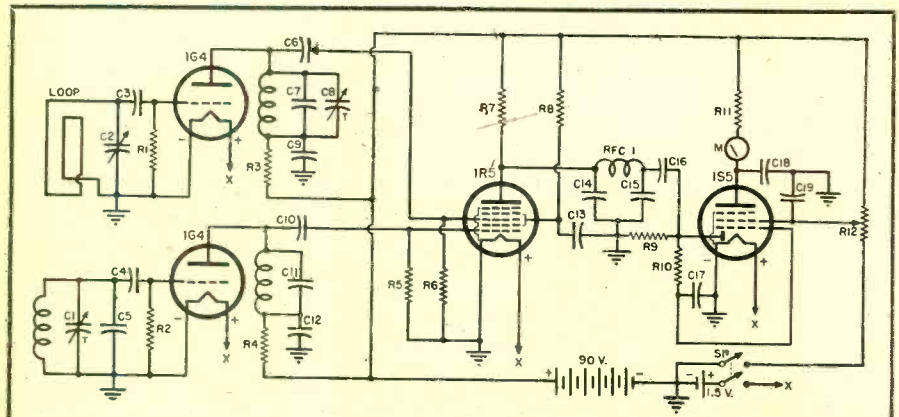
Since the war's end the conversion of military types of mine detectors to civilian use has proceeded rapidly. This is especially so in the case of the light and portable b.f.o. type (described below) and the more powerful radar or pulsed locators, which being heavier, are usually vehicle-mounted.

The total weight of the little unit to be described is only about 12 pounds, including antenna, and using very light-duty "A" and "B" batteries. The range, using a copper penny as a standard, is in the vicinity of three feet, while with larger pieces of metal up to ten feet has been recorded. The "pancake" type of loop antenna is employed and this is mounted on an 8-foot bamboo pole.

A beat-frequency circuit is used, consisting of two 1G4 oscillators, one fixed and one variable. The output of these is fed into the two control-grids of a pentagrid mixer which is a 1R5 miniature type. From here the difference frequency is filtered out and applied to the diode plate of a 1S5, also a miniature. After rectification and more filtering the signal is fed to the control grid of the pentode portion of this tube which normally is held at a little above cut-off point by a potentiometer. This pot, incidentally, constitutes one of the two main controls on the unit.

With the locator in a "search" condition, that is, with no other conductive material in the vicinity, the vari-

Fig. 1. Diagram of metal locator. Beat frequency oscillator principle is used.



R_1, R_2—500,000 ohm, ½ w. res.
R_3, R_4—5000 ohm, ½ w. res.
R_5, R_6—2 megohm, ½ w. res.
R_7, R_8—50,000 ohm, ½ w. res.
R_9, R_{10}—1 megohm, ½ w. res.
R_{11}—100,000 ohm, ½ w. res.
R_{12}—1 megohm pot.
C_1, C_8—75 μμfd. trimmer cond.
C_2—100 μμfd. var. cond.
C_3, C_4—200 μμfd., mica cond.
C_6, C_7—100 μμfd., mica cond.
C_6, C_{10}, C_{14}, C_{15}—.001 μfd., 200 v. cond.
C_9, C_{12}, C_{18}—.01 μfd., 200 v. cond.
C_{11}—150 μμfd., mica cond.
C_{16}, C_{17}, C_{18}, C_{19}—.1 μfd., 200 v. cond.
RFC_1—15 mh. r.f. choke
M—0-100 microampere meter
S_1—D.p.s.t. sw.
Coils and Loop—See text
2—1G4 tubes
1—1R5 tube
1—1S5 tube

able oscillator (with the loop antenna as its grid inductance) is set at zero beat, i.e., to the exact frequency of the fixed oscillator. In this condition there will naturally be no output from the mixer tube. However, as soon as the loop approaches a metallic object, the frequency of this oscillator changes, and a difference frequency (as well as a "sum" frequency, which we disregard and filter out) appears at the mixer output. After negotiating a low-pass filter, this difference frequency is rectified negatively by the diode, and the resulting potential, being now pure d.c., brings the grid of the output tube right down to cut-off, providing meter indication at the same time.

With careful layout and wiring the difference frequency can actually be registered down to four or five cycles or less, thus providing visual pulsing of the meter needle. This condition is, of course, one of extreme sensitivity as far as the loop antenna is concerned.

Now to the actual building of the unit. A chassis of 18 or 20 gauge aluminum is required, the size being 7" x 5¼" x 2¼" high, but a larger size may, of course, be used if desired.

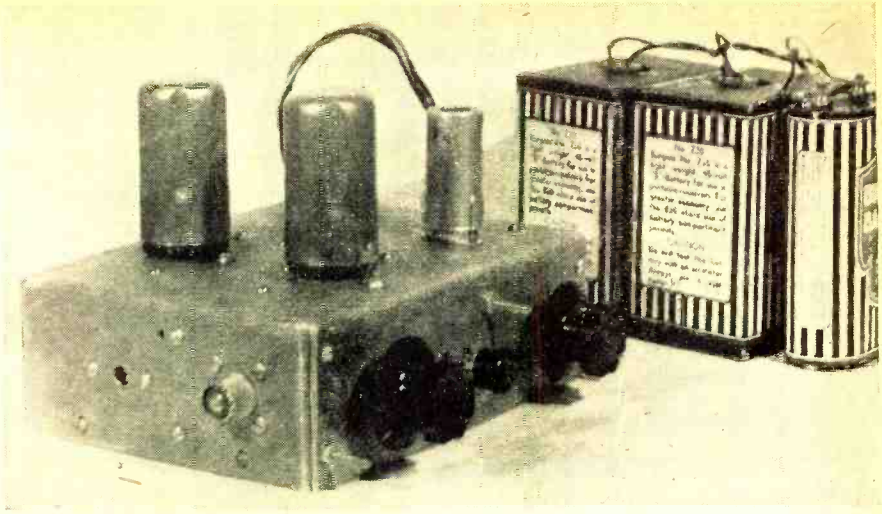
Complete shielding and isolation of the two oscillators is highly essential, and is quite simply accomplished by two aluminum shields, dividing the chassis into three parts as seen in the accompanying photographs. Careful wiring is, of course, necessary especially in the case of the signal leads between oscillator plates and mixer grids. These wires are shielded in flexible braid.

The signal frequency is of the order of 80 kc. and tuned-grid, tuned-plate oscillators are employed. It may be well to mention here that in comparison with the Hartley type of oscillator two extra coils were used. However, the Hartley requires three leads out to the loop antenna against the present two, and as these leads must be shielded in both cases, a lot of self-capacity trouble was avoided.

Three inductances are therefore required, of approximately 25 millihenries each. This value corresponds very nearly to that of certain standard r.f. chokes, but in case the reader possesses coil-winding facilities, 750 turns of 5/43 Litz wire, honeycomb wound on a ½" diameter former, will fill the bill. The coil width is ½", and the finished job is soaked in hot wax.

A suggested layout, as used in the original model, is shown in Fig. 2. Only one variable condenser is necessary (midget type, 75 or 100 μμfd. max.) plus two mica adjustable trimmers. In the original model one of these trimmers (plate circuit, variable oscillator) possessed a shaft instead of the usual screw-driver adjustment, so it was given a knob and mounted on the panel, but this is not absolutely necessary. The fixed oscillator trimmer (grid circuit) must never be varied after setting up for maximum oscillation.

After wiring, first test for oscillation with a midget neon bulb of the 991 type. There is usually enough r.f. to light the bulb simply by holding it near the r.f. coils. If not, solder a two-inch piece of wire onto one of the two bulb connections, and touch this wire on the output connections of the two oscillators in turn (or on the mixer grid terminals), at the same time adjusting the trimmers. A meter in the grid circuit of the oscillators will also serve the same purpose. As the mixer tube tends to load down the oscillators, a small fixed condenser of 5 or 10 μμfd., connected between plate and grid of each 1G4, is often necessary to force oscillation.



Front-side view of completed instrument. Panel has been removed to show detail.

The output meter, which is the sole indicator when searching for precious metals, should obviously be as sensitive as possible. However, a word of caution is necessary, as when walking over rough ground, the physical jolting will cause a 50 μa. needle to flicker a good deal, while on the other hand, a 1 milliampere movement, while better from the physical angle, is hardly as sensitive as could be desired.

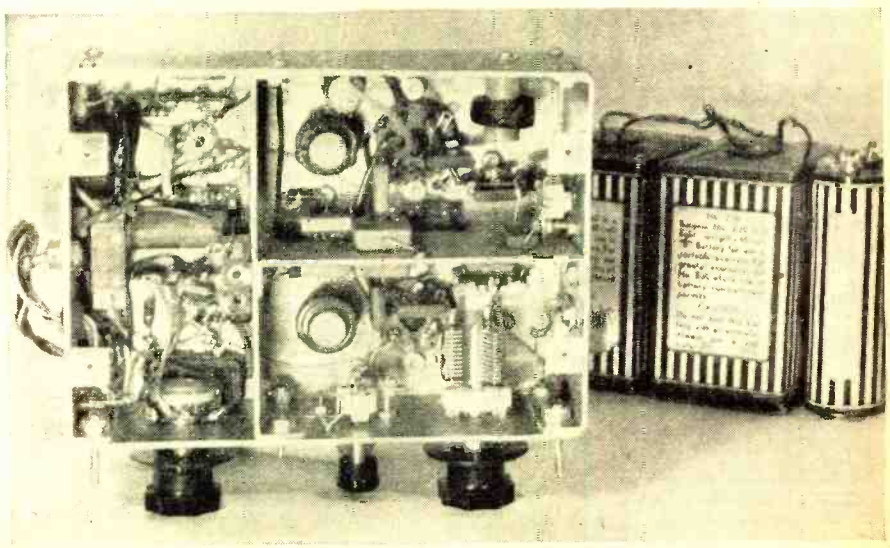
A compromise is therefore necessary, and the writer recommends a 100 or 200 μa. meter, although if the reader has a ½ or 1 milliampere unit on hand, by all means use it.

After oscillation has been established, set the meter to nearly full scale by adjustment of the output potentiometer. This controls screen and plate current almost to cut-off point. Now rotate the variable condenser very slowly and watch for meter indication back towards zero reading. If the two oscillator frequencies are approximately correct, an indication can easily be obtained either side of zero beat. However, the sensitivity here is very poor. The operator must watch for a small "kick" of the meter needle in the center of these two readings, and then "nurse" this by careful tuning to a full scale movement, or nearly so. This is zero beat, and the unit is now in a highly sensitive condition — so much so in fact, that a movement of the hand several feet from the loop will cause a deflection.

A metal cover for the bottom of the

(*Continued on page* 143)

Under-chassis view of metal locator shows placement of various component parts.



By CARL COLEMAN

JAMES McKINLEY was recently assigned to a "Cape" out of the East Coast and expects to be calling back shortly. Joseph Lewinski in town recently with his Matson Line Liberty. James E. Quinn just in after a four months trip aboard his Liberty. Fred Pratt relieved aboard a "Knot" by Neal Cofer and signed aboard another "Coastal" type craft. Henry E. Young relieved of his berth aboard a Liberty in order to attend the Sheepshead Bay radar training school. . . . John D. Ayres assigned to a "Knot" at Philadelphia. . . . Fred Howe, General Secretary-Treasurer of The Radio Officers Union, sends along some information that may be of interest to many. We are still receiving inquiries from Armed Forces members seeking advice on jobs in civilian life. . . . If you are interested in a good paying job as a Flight Radio Officer, ground radio operator or radio mechanic, write or call on any of the following: Andrew R. McKelvie, Trans Ocean Airways, Oakland Airport, Oakland, Calif.; Harrison Young, American Overseas Airlines, LaGuardia Field, N. Y.; Lester Rodman of TWA at LaGuardia Field, N. Y.; American Airlines, 100 E. 42nd St., N.Y.C.; Pan American Airways, LaGuardia Field or Miami, Fla.; TWA National Airport, Washington, D. C.; Pan American Grace Airways, Chrysler Bldg., New York, N. Y.; Pan American Airways, San Francisco; Matson Lines, Oakland Airport, Oakland, Calif.; Northwest Airlines, Municipal Airport, Seattle, Wash; Pennsylvania Central Airlines, National Airport, Washington, D. C.; National Airlines, Municipal Airport, Miami, Fla.—the last named has ground jobs only. . . . Trans Ocean Airways needs, at this writing, about 150 radio operators, mostly for ground work in Alaska. They want these men now. Wages are $475 per month. Transportation paid and return transportation will be furnished after three months if you don't like the job. American Overseas Airlines wants flight radiomen; wages run from $275 to $500 per month. . . . TWA wants ground radio operators. When contacting the above airlines give your age, class of license, experience, education and various other qualifications.

And speaking of airlines—the Navy has recently offered the airways a portion of Floyd Bennett Field, New York for commercial aviation in order to relieve the congestion at LaGuardia—If such an offer is taken up by the airlines the proposed new Idlewild Airport would be reduced in importance.

HARRY WEISS has joined the marine service field in New York. Galfrid Summerson arrived in the Gulf recently. Ronald Bradley aboard a cargo craft again. Robert Williams has a new, fast cargo ship. L. Hvidsten has resigned his marine service position and reportedly is engaged in the home service field. C. E. Williams still around town working as hard as ever.

"I warned you to stop tuning in those strip-tease shows!"

UNDER the sponsorship of the Bureau of Ships (Navy) the Electronics Lab at San Diego has started work on a half million dollar project to study the effects of weather changes on radio transmissions in the various high-frequency bands. . . . It is expected that out of the study will come a method of extending the present day range of ultra short wave radio and radar transmissions. . . . It is believed that the range of television, for example, will be jumped up from the present one hundred fifty miles to nearly two thousand. . . . So far the fact has been disclosed that the project has advanced to a stage where atmospheric changes are detected much quicker than with meteorological instruments although no positive weather forecasting is as yet possible. . . . Stations set up at bases about twenty-five miles apart have been fitted with weather instruments for studying the effect on high-frequency transmissions.

JOHN HANSON arrived recently at the big town aboard a Liberty and expects to be around town for some time. . . . Charlie Sparks in and about recently as his craft (cargo) is on the redelivery list to WSA. Ernest S. Bailey ashore from his "Knot" after it also was redelivered back to Uncle. . . . M. Meade in at the West Coast recently after traveling the Pacific for some time. . . . V. A. Smith and T. Mallonee are with HM. H. J. Mariani also another West Coast arrival with F. P. Whiting and F. E. Jones also along as second and third aboard his "Marine." . . . Harold Koch, marine serviceman at Charleston enjoying a vacation back "home" in the Mid-West.

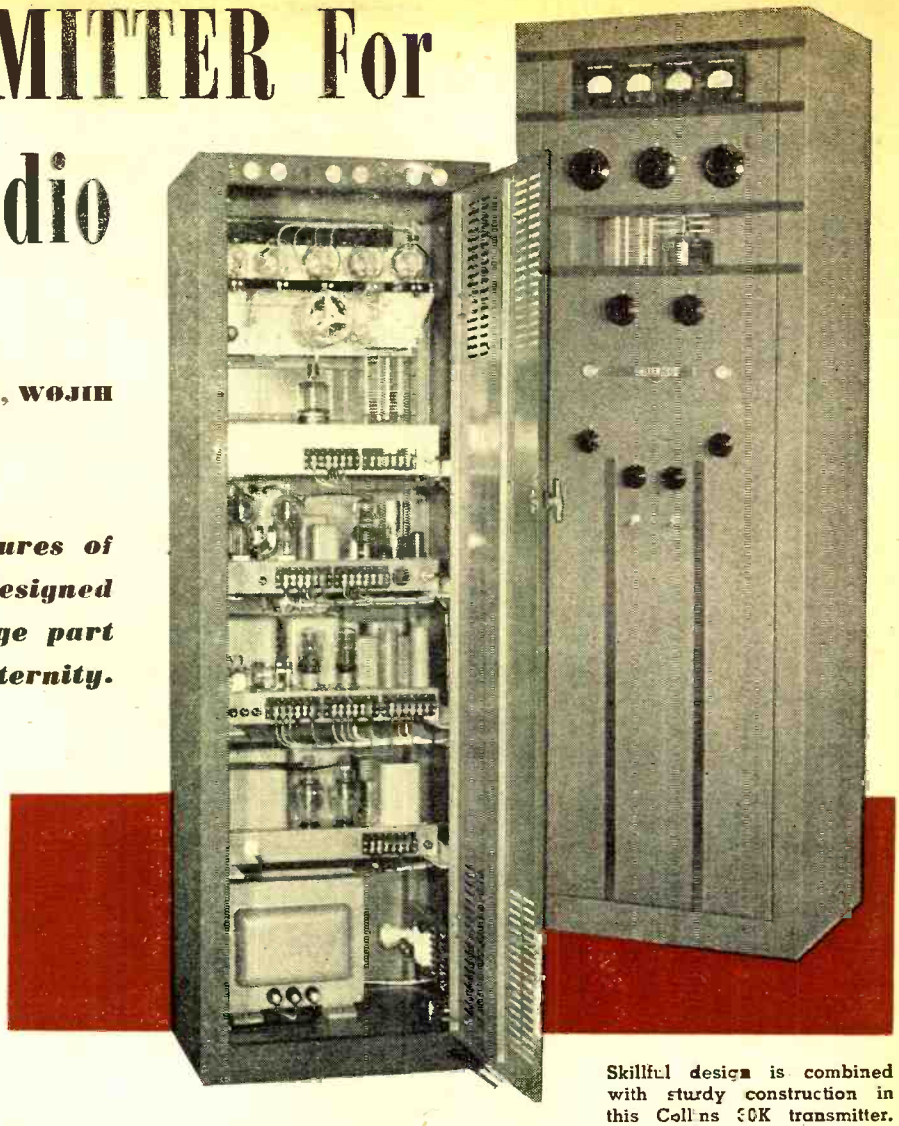
MANY operating companies, using government owned vessels which they have been running on a charter arrangement from the U. S. Maritime Commission, have been returning them since the new announcement effective the end of August which will allow the government a larger share of the profits and less to the steamship operator. . . . Formerly the arrangement was a 50-50 proposition whereby the government could claim 50 per-cent of the daily earnings of the vessels chartered out . . . under the new set-up the charter hire payable will be 50 per-cent of the average net voyage profit up to the first one hundred dollars per day which is in excess of 10 percent of the charter's capital necessarily employed in the business . . . 75 per-cent of the next $200 per day and 90 per-cent of all net voyage profits in excess of $300 per day. . . . This means that on a voyage that nets a vessel $800 per day the U.S. gets $650 and the operator $150—the steamship operator taking

(*Continued on page* 86)

New TRANSMITTER For Amateur Radio

By
W. BRUENE, WØTTK, and N. HALE, WØJIH
Collins Radio Company

Introducing the salient features of a new transmitter which is designed to fulfill the needs of a large part of the medium-power ham fraternity.



Skillful design is combined with sturdy construction in this Collins 30K transmitter.

THE new *Collins* 30K has many features that are considered highly desirable in amateur radio. A large number of the more than seventy-five hams in the *Collins* organization had a voice in its specifications. After thorough consideration of all their suggestions, the design engineer selected the following as the features that could be included consistent with versatility and economy: 1. 500 watts input on c.w., somewhat less on phone; 2. single ended output; 3. complete neutralization on all bands; 4. low driving power; 5. bandswitching; 6. v.f.o. control, highly accurate and stable; 7. fixed bias; 8. electronic keying; 9. minimum power supplies; 10. high efficiency; 11. high level class "B" modulation; 12. speech clipper; 13. low pass audio filter; 14. single control operation; 15. accessibility for operation and maintenance.

The result is a versatile, thoroughly engineered transmitter with high performance and easy operation. A more detailed description of the circuit and components follows.

1. *Power input.* A power input of 500 watts on c.w. and 375 watts on phone was chosen because it is obtainable with low exciter power requirements, moderate tube costs, and economical power supply design. The 115 volt, 60 cycle a.c. power consumed by a transmitter of this size does not require special wiring.

2. *Single ended r.f. stage.* An *Eimac* 4-125A is used in the final r.f. stage. This tube is admirably suited to features 1 and 2. Using one tube in a single ended output greatly simplifies bandswitching, since only one end of each coil is switched. The 4-125A, a notable advance in beam power tetrode development, easily handles the desired power. Its high efficiency (75% to 80%) assures maximum power output. The grid driving power required is well below 10 watts and can be supplied from a low powered exciter setting on the operating desk.

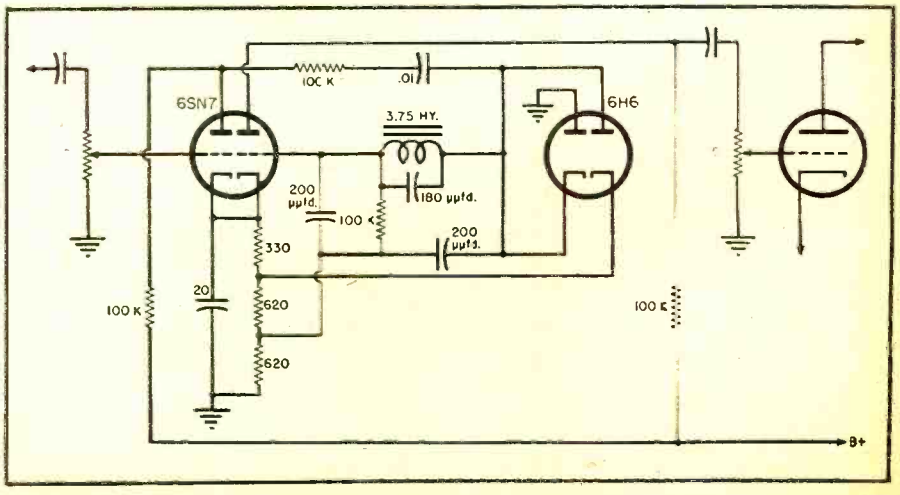
3. *Neutralization.* The 4-125A is again suited to the purpose. It requires no neutralization, even on 10 meters. Thus the circuit is simplified and a clean signal is transmitted on all bands.

4. *Low driving power.* Discussed under the second feature.

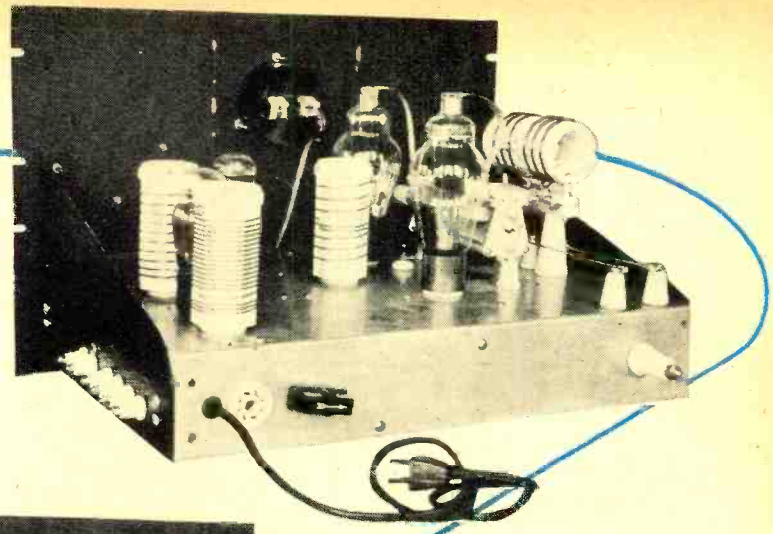
5. *Bandswitching.* The 30K has bandswitching throughout, so that the operator can change bands quickly.

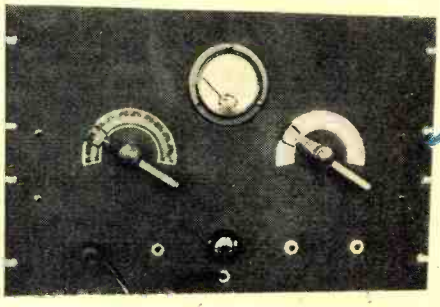
(*Continued on page* 110)

Clipper circuit employed in transmitter.



200 watt All-band TRANSMITTER





Rear view (above) and front view (left) of the r.f. portion of the transmitter.

By
HARRY D. HOOTON,
W8KPX

An easily constructed unit incorporating either crystal or v.f.o. control for 10, 20, 40, and 80 meter bands.

THIS 200-watt transmitter operates with full input on the four amateur bands from 80 to 10 meters. Designed especially as a flexible exciter unit for use with experimental high-power radio frequency amplifiers, it is, nevertheless, an excellent medium power rig in itself. The unit is constructed completely from standard manufactured components and uses inexpensive easy-to-get tubes. It is ideal for the fellow who wants a good, simple, foolproof transmitter that is free from "bugs" yet capable of producing a husky signal on either phone or code operation.

As the photographs and Fig. 3 show, the circuit has been reduced to bare essentials. There are no frills to run up the cost of construction or trick circuits to cause trouble. The tube lineup consists of a 6L6GA which may be used as either a first doubler or as a crystal controlled oscillator, a 6L6GA second doubler and a pair of 809 triodes as push-pull final r.f. amplifier. The author uses a *Meissner* "Signal Shifter" for variable-frequency operation; the 6L6GA input tube has a tuned circuit connected between its control grid and cathode, the output from the "Signal Shifter" being connected through a low-impedance line to the grid coil link. If crystal control is desired, the connections should be made as shown in Fig. 1B. The tuning adjustments for both crystal-controlled and v.f.o. operation will be discussed in detail later in this article.

Two power supplies will be required —one capable of supplying 400 volts d.c. at 150 milliamperes for the plates and screens of the 6L6GA tubes; the other must supply 1000 volts d.c. at 250 milliamperes for the plates of the push-pull 809 power amplifier.

Table 1. Approximate dial readings for the various bands.

Band	1st doubler plate	2nd doubler plate	Final amp. plate
80 m.	not used	50	67
40 m.	not used	50	52
20 m.	24	15	30
10 m.	20	3	31

Note: The dial readings given above are approximate only. If components other than those specified are used, the dial readings may vary considerably from the values given.

The construction of the unit is extremely simple. As the photographs show, it is built up on a standard 13 by 17 by 3 inch cadmium-plated, heavy-duty steel chassis and a standard 12¼ by 19 by ⅛ inch aluminum rack panel. The aluminum panel is much easier to work than the corresponding steel type. The 6L6GA and 809 tubes, the plug-in coils, the first doubler plate tank condenser and the 809 final tank condenser are mounted on top of the chassis; the 6L6GA input tuning condenser, the second doubler plate tank condenser, the neutralizing condensers, the 809 filament transformer and the various bypass condensers, r.f. chokes and resistors are underneath the chassis. As the bottom view shows, twisted pair leads extend from the small porcelain feed-through insulators, along the end of the chassis, to the link connections of the 6L6GA input, the first doubler output, and the second doubler output coils. By attaching the v.f.o. low impedance output line to the pair of feed-through insulators nearest the rear of the chassis, excitation will be applied to the grid of the 6L6GA input or first doubler tube; a connection to the center pair of insulators will supply excitation to the grid of the 6L6GA second doubler tube; a connection to the third pair of insulators feeds excitation directly to the grid circuit of the push-pull 809s. The 6L6GA tubes are supplied with filament and plate voltage from the 400-volt power supply through an 8-prong plug and cable arrangement; the octal socket for the power connection is mounted in the back of the chassis at the extreme left. The large cone insulator at the extreme right rear of the chassis is the connection for the 1000 volt 809 plate supply lead.

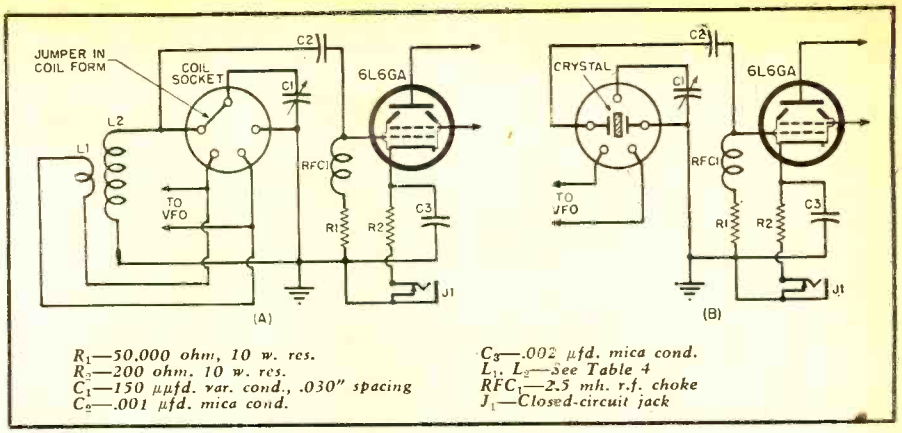
The wiring between the various

parts of the transmitter must be kept short and direct. Use #14 tinned copper round bus wire for the r.f. leads. Do not make sharp bends in the plate or grid leads; keep these leads well separated and away from the chassis. The low impedance leads, such as the filament wiring and the link lines between the feed-through insulators and the links of the various coils, may be made of insulated stranded wire and twisted and dressed close to the chassis to reduce their fields. Needless to say all connections are carefully soldered with rosin-core solder and a clean, hot and well-tinned iron.

On the front of the panel, the large pointer and scale control is that of the 809 final amplifier plate tank circuit; the control at the right is that of the first doubler plate tank circuit. In order to reduce losses to the minimum, the second doubler plate tank condenser is mounted underneath the chassis close to the plug-in coil socket and the 809 grid terminals. The small round knob at the bottom of the front panel is the control for this circuit. The control knob for the tuned input circuit of the first 6L6GA is at the left rear of the chassis, near the octal power socket. It is not necessary to bring this control out to the front panel as the "Signal Shifter" supplies sufficient excitation to the 6L6GA grid on any frequency in the 80 or 40 meter bands when the input circuit is adjusted to resonance at the center of the band. The output of the first 6L6GA falls off slightly at the extreme edges of the band but still supplies over five times the amount of excitation required by the second 6L6GA. In general, no readjustment of any control is necessary for frequency changes of one-fourth the bandwidth or less. A single 0-300 d.c. milliammeter, with a length of rubber-covered microphone cable and a phone plug which may be inserted into any one of the four jacks on the front panel, enables the operator to read the various cathode currents or the plate or grid currents of the 809 tubes at will.

The tune-up and operation of the transmitter is simplicity itself. An absorption-type wavemeter, calibrated for the 40, 20 and 10 meter amateur bands, and a small neon lamp will be a great help in getting the transmitter on the air for the first time. As mentioned above, either crystal control or v.f.o. control may be used. We shall first discuss the tune-up, neutralizing and loading procedure using a "Signal Shifter" or a v.f.o. unit such as that described in the March, 1946 issue of RADIO NEWS.

To operate the transmitter on any band from 80 to 10 meters, only two sets of v.f.o. coils will be required—one set for 80 meter output and the other set for 40 meter output. For operation on 10 meters, place the 40 meter output coils in the v.f.o. and adjust the unit to a frequency which, when quadrupled to the 10 meter band, will place the transmitter output on a frequency near the center of the band. Place a 40 meter coil in the first coil socket at the top rear of the chassis, place a 20 meter coil in the second coil socket and a 10 meter coil in the third coil socket between the second 6L6GA and the 809s. Place a 10 meter coil in the output tank jack bar. Insert an *open* phone plug in the 6L6GA second doubler cathode current jack. *Do not attach the high voltage lead to the 809 plate power connection.* With the 400 volt supply connected to the 6L6GA tubes and with 115 volts a.c. applied to the 809 filament transformer primary, hold a neon lamp near the input coil and adjust the bar knob at the rear of the chassis for maximum illumination. Now, insert the milliammeter plug in the cathode current jack of the first doubler and tune its plate circuit to resonance. The grid circuit of this tube is tuned to 40 meters and its plate circuit is tuned to 20 meters; the dip in plate current will be quite pronounced.



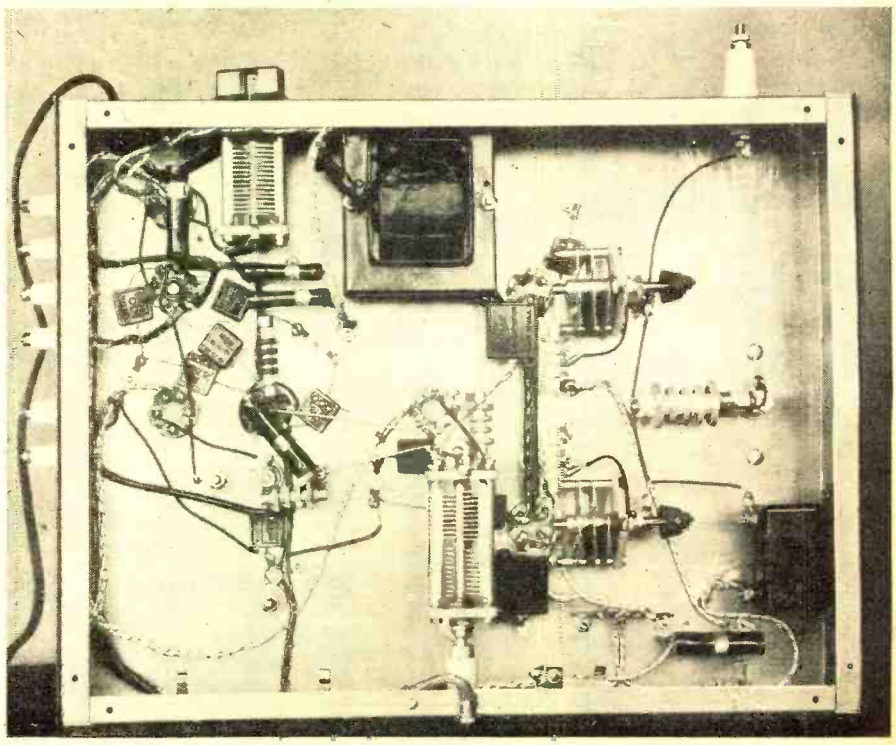
R_1—50,000 ohm, 10 w. res.
R_2—200 ohm, 10 w. res.
C_1—150 μμfd. var. cond., .030" spacing
C_2—.001 μfd. mica cond.
C_3—.002 μfd. mica cond.
L_1, L_2—See Table 4
RFC_1—2.5 mh. r.f. choke
J_1—Closed-circuit jack

Fig. 1. Connections for (A) v.f.o. and (B) crystal operation.

Band	Xtal	1st 6L6GA plate coil	2nd 6L6GA plate coil	Final amp. plate coil
80 m.	160 m.	160 m.	80 m.	80 m.
40 m.	80 m.	80 m.	40 m.	40 m.
20 m.	40 m.	40 m.	20 m.	20 m.
10 m.	20 m.	20 m.	10 m.	10 m.

Table 2. Coil combinations for crystal controlled operation.

Under-chassis view of the r.f. portion of the transmitter.



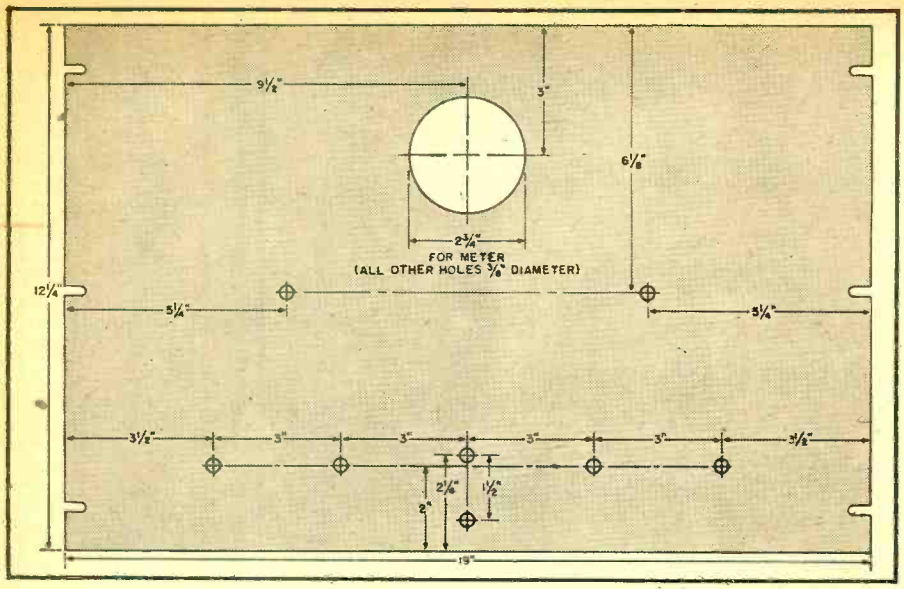


Fig. 2. Front panel layout shows proper placement of various operating controls.

Band	1st doubler grid coil	1st doubler plate coil	2nd doubler plate coil	Final amp. plate coil
80 m.	none used	none used	80 m.	80 m.
40 m.	none used	none used	40 m.	40 m.
20 m.	80 m.	40 m.	20 m.	20 m.
10 m.	40 m.	20 m.	10 m.	10 m.

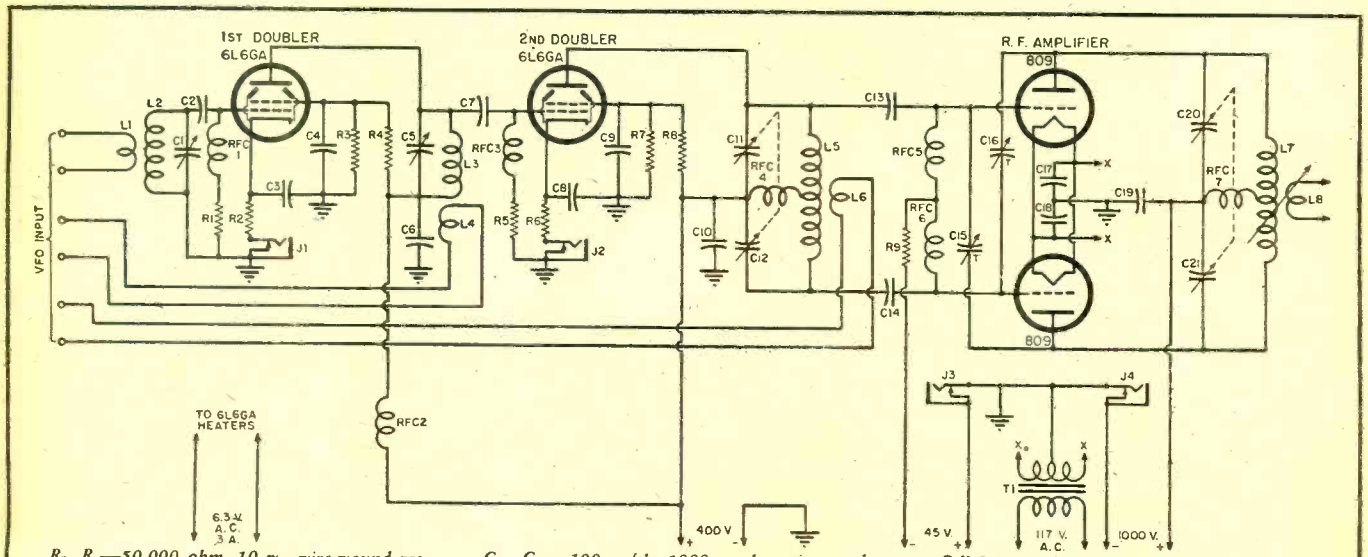
Table 3. Coil combinations to be followed for v.f.o. operation.

The plate current off resonance will be around 100 milliamperes; the plate current, when the circuit is properly tuned, will dip to approximately 40 to 45 milliamperes. *Before proceeding further, check to make certain that the first doubler plate circuit is actually tuned to the 20 meter band.* Hold the absorption wavemeter coil about four inches away from the plate tank coil, rotate the wavemeter tuning condenser through 180° and at the same time watch the cathode current milliammeter. As the wavemeter tuning condenser passes through the point where its *LC* circuit is resonant to the same frequency as that of the plate tank circuit, some r.f. energy will be absorbed from the 6L6GA plate circuit and the cathode current as indicated by the milliammeter will increase. Check the calibration of the wavemeter scale to determine the approximate frequency of the doubler output.

Remove the open phone plug from the second 6L6GA doubler cathode current jack and insert the milliammeter plug in its place. Rotate the tuning knob for the dip in plate current. The dip indication, as read on the cathode-current meter, will not be so pronounced as it was in the preceding stage. This is due to the fact that the grid circuit of the 809s is taking most of the available power from the 6L6GA plate circuit. However, the plate current should dip from around 100 milliamperes to 75 or 80 milliamperes when the circuit is properly tuned. Insert the milliammeter plug in the 809 grid current jack. The grid current should read from 40 to 50 milliamperes. It is sometimes more convenient to adjust the second doubler plate tank condenser for *maximum grid current* in the 809s, when operating on the 10 meter band, than to adjust it for minimum cathode current in the 6L6GA as the two conditions are not necessarily the same.

Up to this point we have *not* applied plate voltage to the 809s. Before

Fig. 3. Circuit diagram of the r.f. portion of the transmitter. For crystal control, Fig. 1B is to be incorporated.



R_1, R_6—50,000 ohm, 10 w., wire-wound res.
R_2, R_8—200 ohm, 10 w., wire-wound res.
R_3, R_7—50,000 ohm, 2 w., res.
R_4, R_8—10,000 ohm, 10 w., wire-wound res.
R_9—2000 ohm, 10 w., wire-wound res.
C_1, C_5—150 μμfd. (max.) var. cond., spacing .030" (Johnson 150H15)
C_2—.001 μfd., mica cond.
C_3, C_6, C_8, C_{10}, C_{17}, C_{18}—.002 μfd., mica cond.
C_4, C_9—.006 μfd., mica cond.
C_7—250 μμfd. mica cond.
C_{11}, C_{12}—Dual-section var. cond. Max. capacity per section, 100 μμfd., spacing .030" (Johnson 100HD15)
C_{13}, C_{14}—100 μμfd., 1000 v., d.c. mica cond.
C_{15}, C_{16}—Neutralizing cond., 4.3-13 μμfd., spacing .125" (Johnson 13G45)
C_{19}—.001 μfd., 5000 v., d.c. mica cond.
C_{20}, C_{21}—Dual-section var. cond. Max. capacity per section, 105 μμfd., spacing .045" (Johnson 100FD20)
L_1, L_2—See Table 3 (Johnson "Hi-Q" plug-in coil, Type 652 or 653)
L_3, L_4—See Table 3 (Johnson "Hi-Q" plug-in coil, Type 651 or 652)
L_5, L_6—See Table 3 (Johnson "Hi-Q" plug-in coil, Type 640, 641, 642, or 643)
L_7, L_8—Rotary-link, plug-in coil (Johnson "Hi-Q," Type 660, 661, 662 or 663)
RFC_1—2.5 mh. r.f. choke
RFC_2, RFC_3, RFC_4, RFC_5, RFC_6—150 ma., 1.7-30 mc. r.f. chokes (Johnson 750)
RFC_7—500 ma., 1.7-30 mc. r.f. chokes (Johnson 752)
J_1, J_2, J_3, J_4—Closed circuit jacks
T_1—Fil. trans. 105-120 v., a.c.; 6.3 v. @ 6 amps., c.t.

Although a specific part number and manufacturer is indicated for many of the above components, any parts having equivalent characteristics may be substituted.

plate voltage can be applied to the 809s the final amplifier stage must be neutralized. This is a very easy operation and need be performed only once if the instructions are carefully followed. First, rotate the two neutralizing condensers to the minimum capacity position. With the 6L6GA second doubler plate circuit tuned for maximum grid current in the 809s, swing the final amplifier plate tank condenser through the point of resonance, at the same time watch the grid current milliammeter. As the tank condenser passes through the point of resonance, the needle of the grid milliammeter will give a sharp flicker downward. Increase the capacity of the neutralizing condensers slowly until a point is reached where there is no change in the grid current as the plate tank condenser is rotated to any position on its 180° scale. It will be found that increasing the capacity of the neutralizing condensers past this critical point will again cause a change in grid current as the plate tank condenser is rotated through resonance. Once the setting of the neutralizing condensers is found where the plate tank condenser has no effect upon the grid current, tighten the locking nuts of the condensers and leave them alone. Apply the high voltage to the plate circuit of the 809s and tune the plate tank condenser for minimum plate current. The plate current of the 809s will run from 250 to 300 milliamperes or higher when the plate tank circuit is tuned to resonance. Without an antenna, the minimum plate current will be around 5 to 10 milliamperes or less when the amplifier is properly tuned.

Before attaching an antenna to the transmitter, check, in the same manner as described above, to insure that the output circuit is tuned to the 10 meter amateur band. It is relatively easy to mistake the 15 meter dip for the 10 meter dip in 6L6GA plate current and this is the principal reason why the use of an absorption wavemeter is recommended during the preliminary tune-up process. At the time of this writing no 15 meter band has been authorized for amateur use.

After it is ascertained that the transmitter is operating on the proper frequency band, attach the antenna coupling unit or the transmission line to the final plate tank link terminals. The *Johnson* 660 and 661 plate tank coils contain sufficient turns on their rotary links so that a 600 ohm line or resonant feeders *of the proper length,* may be connected directly to the output terminals without an output coupling device of any kind. For the preliminary loading adjustment, rotate the link coil for minimum coupling and tune the final amplifier for minimum plate current. Now, rotate the link coil to increase the coupling between the final tank circuit and the antenna; keep the final tank circuit tuned for minimum plate current. Continue to load the amplifier by increasing the antenna coupling and retuning the tank circuit for the dip until the minimum plate current to the 809s is 200 milliamperes. With 1000 volts applied to the plate this will give an input of 200 watts to the final amplifier and should give an r.f. output of approximately 150 watts or better.

For 20 meter operation, the v.f.o. may have either 40 or 80 meter output. If 80 meter output is used the 20 meter tune-up procedure is exactly that described above except that 80, 40 and 20 meter coils are used instead of the 40, 20 and 10 meter coils specified. *Check the doubler stages with the wavemeter to make sure that the transmitter is operating on an authorized amateur band.* A little care may save suspension of your amateur station and operator license. If 40 meter v.f.o. output is used, connect the v.f.o. output to the center pair of feed-through insulators and place an open phone plug in the cathode current jack of the first 6L6GA tube.

(*Continued on page* 133)

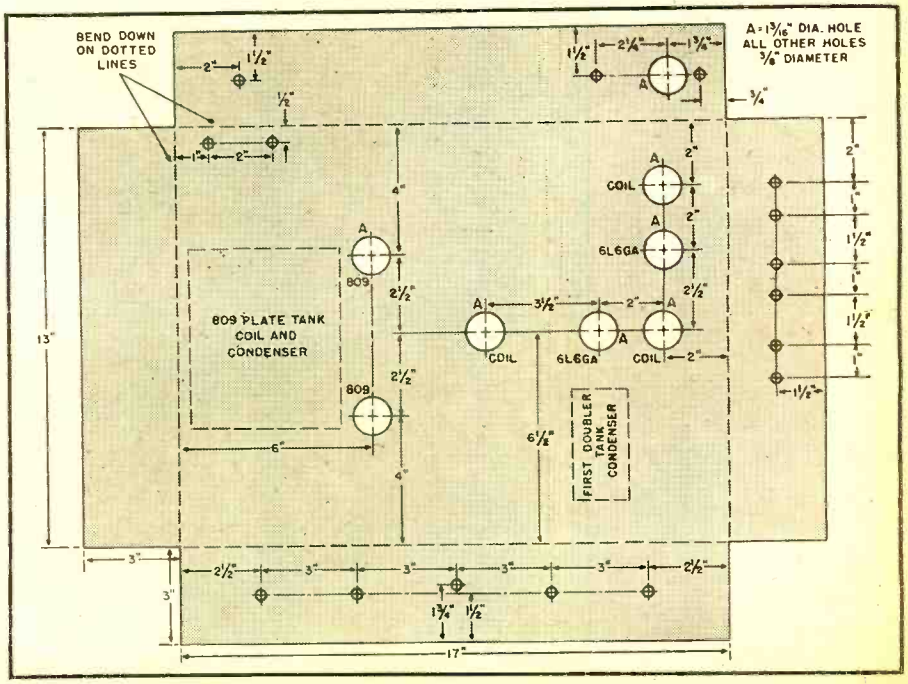
COIL SPECIFICATIONS

Type	Form	Winding Length	No. Turns	Wire Size
651	5-prong 1¾" dia.	2 inches	8 pl. 2 link	#20 enam.
652	5-prong 1¾" dia.	2 inches	16 pl. 3 link	#20 enam.
653	5-prong 1¾" dia.	2 inches	32 pl. 4 link	#20 enam.
640	5-prong 1¾" dia.	2¼ inches	6 pl. 4 link	#20 enam.
641	5-prong 1¾" dia.	2¼ inches	12 pl. 3 link	#20 enam.
642	5-prong 1¾" dia.	2¼ inches	24 pl. 3 link	#20 enam.
643	5-prong 1¾" dia.	2¼ inches	36 pl. 4 link	#22 enam.
660	4 1/16" x 2"	3 inches	6 pl. 9 link	#12 enam.
661	4 1/16" x 2½"	3 inches	10 pl. 9 link	#12 enam.
662	4 1/16" x 2½"	3 inches	18 pl. 13 link	#12 enam.
663	4 1/16" x 2½"	3 inches	28 pl. 14 link	#14 enam.

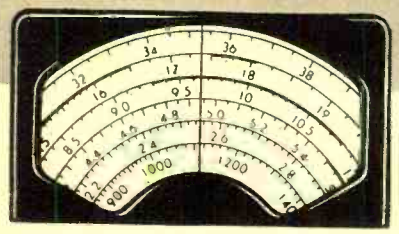
Coils listed above are manufactured by the *E. F. Johnson* Co. Coils of other manufacture having similar electrical characteristics may be substituted, if desired. Types 651, 652 and 653 are wound with link at bottom end of plate coil; types 640, 641, 642 and 643 are wound with a center tap and with link at center of plate coil. The types 660, 661, 662 and 663 are wound with center tap and have variable rotary-type links.

Table 4. Coil specification chart. See parts list, Fig. 3, for further details.

Fig. 4. Chassis template shows correct location of major components.



International SHORT-WAVE



***Compiled by* KENNETH R. BOORD**

IT IS with much pleasure that this month's International Short-Wave Department is dedicated to "Radio in Sweden." Almost every short-wave broadcaster speaks of the many listeners in this northwestern European country. *Are Swedish short-wave listeners the most active in the world?*

When we posed this question to Arne Skoog, short-wave authority in Sweden, in answer he cited these facts:

The Canadian Broadcasting Corporation writes in a printed booklet: "Reports from Sweden, England, and France rate its 50 - kilowatt beam the loudest and clearest signal from this continent. . . ." (The name of Sweden was placed first, Mr. Skoog noted.)

From *Radio Australia* comes this comment: ". . . Significantly, *Radio Australia* has many fans in Northern Europe, particularly in Sweden — a neutral country where short-wave listening was entirely free. They tell you why they listen—because *Radio Australia* has an accurate news survey, because they're curious about the country and its peoples. To many of them it is a prospective home."

An official of KU5Q, Guam, wrote in a verification-letter: "Although KU5Q has been heard on every continent except Antarctica, more reports are received from Sweden than from the rest of the world combined."

The same testimonial comes from the Middle East Forces' Broadcasting Service, Cairo, concerning reports to JCKW, Jerusalem, Palestine, where 256 reports were received from Sweden during the period, September 14, 1944-March 13, 1946.

Madame Angele Touchard of the Swedish section, *Radiodiffusion Francaise,* has received more letters from listeners than any other chef de section at the Paris Radio.

HCJB, "The Pioneer Missionary Broadcaster" in Quito, Ecuador, has received more than 600 letters and reports from Sweden.

When in May, 1944, *Radio Tokyo* dedicated a program in Swedish to the Radio Club of Sweden, over JLT3, 15.225, the Club received 518 reports on this single broadcast.

A low-powered short-wave station in Spain, *Radio Mediterraneo Valencia,* intends to broadcast a special program in Swedish—but it is much more remarkable that the 9.3 kw. station, *"Radio Coro,"* in Venezuela, has received so many fine reports from Sweden that they are now searching for a Swedish-speaking person in Coro to voice a program in Swedish.

You can figure it out for yourselves —but your short-wave editor would like to add that of all the countries from which we receive regular reports, Sweden leads the list with 29 monitors; this, of course, excludes the United States. Reports from Sweden are detailed and accurate, and they clearly indicate that short-wave listeners there do take their short-wave DXing quite seriously.

The population of Sweden is around 6,600,000. Of that number, the BBC concludes that almost 5,000,000 persons have heard a broadcast in Swedish on short-wave from London at one time.

It is further estimated that *"The Voice of America"* has been received in Sweden by about 100,000 listeners. There are more than 1,800,000 radio sets in the country, probably 1,000,000 of which are equipped with short-wave bands.

Mr. Skoog points out to us that the radio industry in his country was not so actively engaged in war-supply production as was the case in other countries. New receivers were sold as usual in almost every radio shop in Sweden throughout the war.

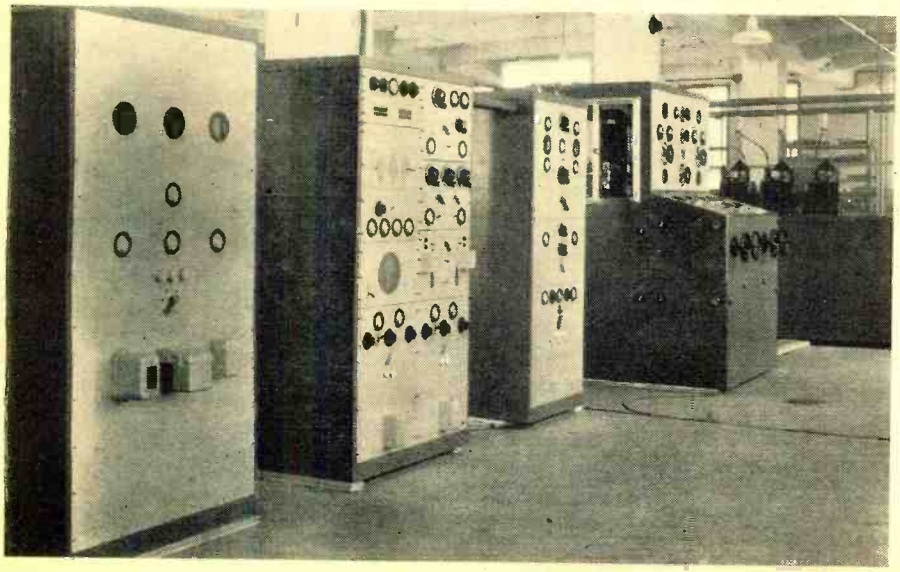
"The Swedish radio sets appear to be better for short-wave tuning than the American (broadcast) sets in general, thanks to their longer dials and wider-spread short-wave bands," Mr. Skoog explains. "They are, however, only marked by wavelengths in meters and not in frequencies (megacycles or kilocycles), which is a matter of difficulty to some listeners in tuning stations that announce only frequency.

(*Continued on page* 145)

SWEDISH RADIO TO BROADCAST SPECIAL PROGRAM ON NOVEMBER 24 FOR READERS OF RADIO NEWS

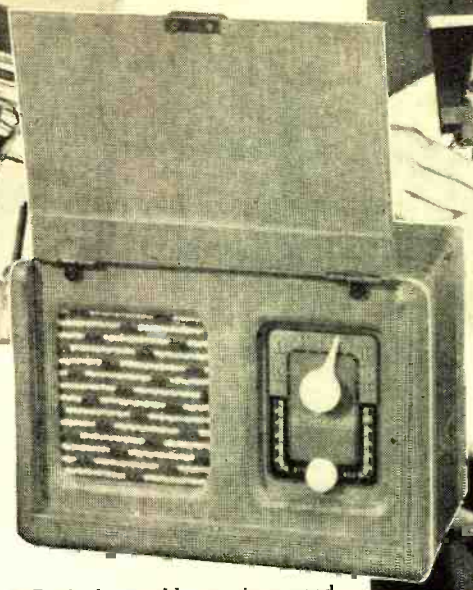
On November 24, 1946, between 1600-1630 GMT (11-11:30 a.m. EST), *Radiotjanst* (The Swedish Radio) will broadcast a special DX program dedicated to readers of RADIO NEWS. Arne Skoog, short-wave authority in Sweden, who arranged the broadcast, will be at the microphone. The program will be radiated over SBT, 15.155, and SDB2, 10.780, and will immediately follow the regular North American beam, which is heard 1500-1555 GMT (10-10:55 a.m. EST). *English* will be the principal language used for the period. Verifications will be sent and return postage (IRC) is *not* required. Address, Radiotjanst (The Swedish Broadcasting Corporation), Stockholm 7, Sweden (Sverige). *(Your short-wave editor would also appreciate a report from all those who tune in this broadcast, and can be addressed at 948 Stewartstown Road, Morgantown, West Virginia, U. S. A.)*

One of the two short-wave transmitters (12 kw.) at Motala. This equipment will be used to transmit the program dedicated to Radio News and ISW on November 24th.



Unless otherwise indicated, all time herein is in *Eastern Standard Time,* 5 hours *behind* GMT.

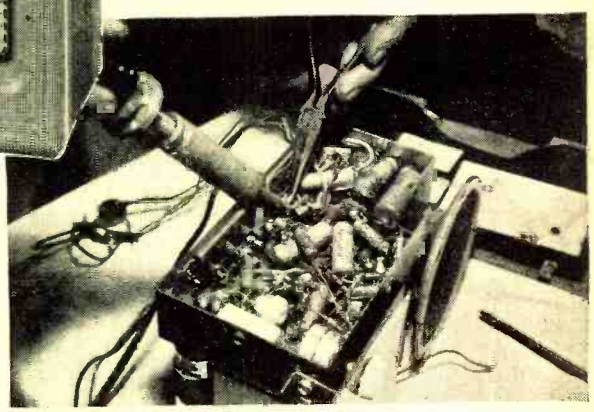
2 Chassis is withdrawn from cabinet and rectifier tube removed. Only four tools are needed for complete conversion.



1 Typical portable receiver used to illustrate step-by-step installation of selenium rectifier.

3 Two extension leads are soldered or the selenium rectifier lugs. Positive side is shown by red wire, negative by yellow or black.

New Selenium Rectifiers for Home Receivers



4 Here the leads are soldered on to the appropriate pins. The red wire goes to pin 4 while yellow or black wire, whichever is used, is soldered to pin 5.

By GEORGE EANNARINO
Field Eng., Federal Telephone & Radio Corporation.

Selenium rectifiers have been designed to replace all conventional types of rectifier tubes used in home receivers.

MARKEDLY improving the performance of home receivers and completely trouble-free, the new miniature selenium rectifier stack, developed by *Federal Telephone and Radio Corporation,* Newark, N. J. means more "customer satisfaction" plus increased profits to the up-to-the-minute serviceman. One of the first advancements made in home radios since the end of the war, this stack replaces all conventional rectifier tubes, is simple to install, and is guaranteed to outlive the receiver, thereby ensuring a minimum of power supply failures.

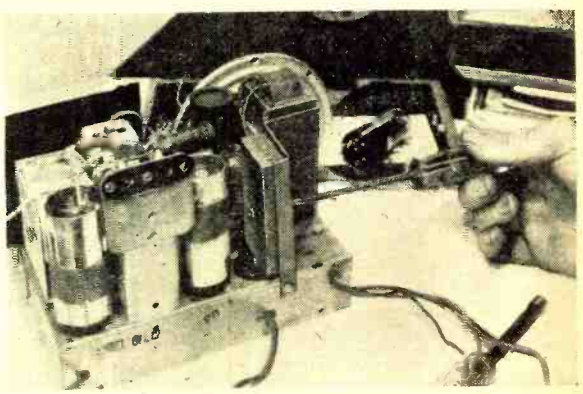
With competition in the service field mounting, this latest development should provide a "shot in the arm" for many alert radio repairmen for it has such excellent selling points, such as instantaneous starting for both a.c. and d.c., less heat, longer battery life (in portables), improved tonal quality, trouble-free power supply operation, pilot light failures reduced to a minimum, and more audio output (in 35Z5 circuits). In every case this new type of rectifier means customer satisfaction.

Selenium rectifiers have been used in electronic circuits for many years but due to their relatively high cost and large space factor they were not used in home receiver rectifier circuits. However, by virtue of a new process developed by *Federal,* this cost and space factor has been reduced to the point where use of the miniature selenium rectifier is entirely practical.

The rectifier stack has two distinct poles, positive and negative, corresponding to the plate and cathode of the vacuum tube and can be inserted into the circuit as such. The positive

(*Continued on page* 131)

5 Rectifier operation should now be checked by turning the receiver on. The set should operate immediately without the customary warm-up period.



6 Final operation consists of tightening rectifier to the chassis and placing shield over it. Chassis is then returned to the cabinet with conversion completed.

HIGH FIDELITY RECEIVER

By
J. C. HOADLEY

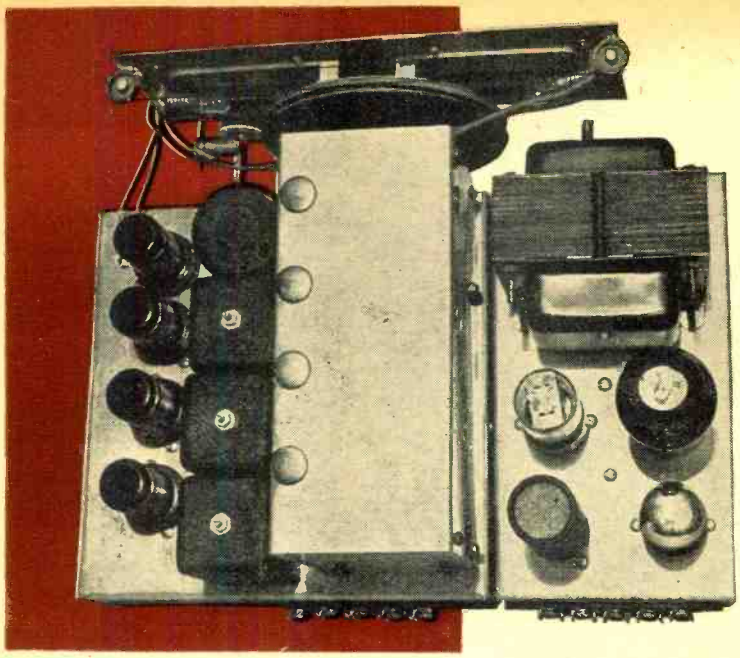


Fig. 1. Top view of the completed receiver. Note that the power supply and audio amplifier are built as separate units.

Details for constructing TRF receiver which features an infinite impedance detector and high fidelity amplifier.

FOR real high fidelity reception, one should put a little thought into the construction of a receiver. It is undoubtedly true that a broadband superheterodyne receiver offers a lot of advantages, such as flat bandpass over any desired range, constant sensitivity over the broadcast band, high sensitivity, and extreme selectivity on each side of the pass band, but there are also disadvantages.

The circuit of a high fidelity superheterodyne is necessarily complex, which multiplies the possibilities of oscillation, hum and noise. Because of the complexity, the cost is high. Also, at this writing, there are not any broadband i.f. transformers available. We can, however, at a reasonable cost, build a tuned radio frequency receiver which will produce fidelity comparable to the best superheterodyne and be selective enough to separate any local stations more than twenty kilocycles apart. Its effective range is about fifty miles, with a short indoor antenna. If a large outdoor antenna is used, it would, in rural areas, prove to be quite a distance getter.

Due to such troubles as QRM, QRN, fading, selective fading, etc., it is extremely difficult to realize high fidelity reception from a distant station; so, we want a receiver which has sufficient sensitivity to receive only the local stations. It is unpleasant to have to listen to several stations located on the same frequency, one in your city and one five hundred miles away.

To provide sufficient sensitivity without regeneration, we will need at least two and perhaps three r.f. amplifier stages. Each of these stages should be tuned with a ganged variable condenser. We must have a distortionless detector circuit, preferably tuned with the condenser gang, also. If you can obtain a four-gang condenser, by all means include the third r.f. stage. The receiver can be built with a three-gang, however, with good results. In either case, care must be taken to prevent oscillation, a perverse tendency of r.f. stages.

There are several choices of tubes for the r.f. amplifier lineup. Normally, the choice would be 6SK7 tubes, but if we wish to operate our tuner on a low voltage, 6AB7 tubes can be used. The author found that maximum sensitivity could be obtained with the 6AB7s with only an 80 volt plate supply drawing about 14 milliamperes. If one were considering battery operation of the tuner in a rural location, 6AB7 tubes would be a good choice.

The detector is another item that should be carefully considered. All the usual detectors generate distortion under certain conditions. A diode is the usual choice. However, a diode has disadvantages such as distortion at low levels of modulation. One must take care not to load the detector circuit with the a.v.c. circuit, as this can generate serious distortion.

For this application, then, a cathode follower was chosen as a detector. This type of circuit is usually referred to as an infinite impedance detector. This name was chosen because a cathode follower degenerates its input capacity to a very low value, and unlike a diode, it does not constitute heavy loading during one-half of the detected cycle. This is a great advantage as it allows the detector circuit to realize a much higher selectivity.

To provide a.v.c. without using an extra tube, a new item to the radio market, a *Germanium Crystal Diode*, manufactured by *Sylvania Electric Products Inc.*, was used. It is no larger than a one watt resistor and is provided with pigtail leads. It is soldered directly into the circuit, and according to the manufacturer, has an extremely long life. In the event that the builder wants to cut the tubes to a minimum, he may use one of these crystals as a detector.

After the radio wave is demodulated, a high quality amplifier to drive a loudspeaker must be provided. Although this amplifier is not elaborate, it has very good fidelity due to the great amount of degeneration used. The 6L6 output tube will deliver at least five watts of power to a speaker at reasonably low distortion.

So that this receiver may be of interest to a maximum of readers, it has been so designed and built as to give the reader several alternatives in its construction. The builder can construct the receiver as such. For the reader who already has an amplifier, the tuner may be constructed without the amplifier and the power supply may be made a part of the tuner or not, depending on whether the user desires to supply the tuner's power with his existing amplifier.

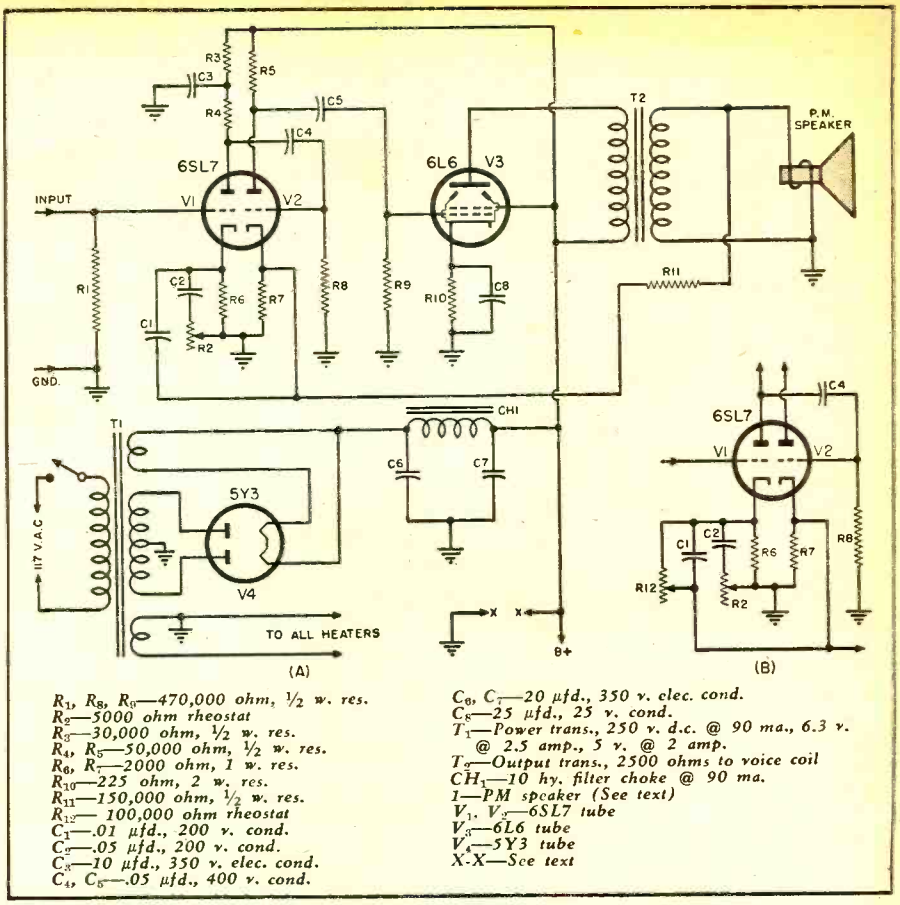
The circuit diagram of the tuner is shown in Fig. 6. Notice particularly the extensive bypassing and filtering. Considering the high gain of the circuit, this was found to be necessary. The r.f. coils are *Meissner* iron core slug tuned shielded models. The detector coil is an air core antenna coil. The condenser is a four-gang unit which matches the *Meissner* dial.

The chassis, for the tuner alone, measures 8 x 8 x 2 inches and was made from 1/16 inch aluminum. This aluminum was obtained from a 15 x 18 inch cookie sheet, which can be bought at most hardware stores for less than a dollar. The holes were punched with a one-inch *Greenlee* socket punch. The shield for the condenser was bent from the remnant of the cookie sheet. The shield's exact size will be determined by the three-or-four-gang condenser you select. Notice that the dual .1 μfd. bypass condensers (Fig. 3) are mounted in such a manner as to shield the leads from the variable condenser to the coils. If these dual units are not readily available, one can bend up small shield strips and mount one between each pair of leads. Shielded wire is out, because it will increase the minimum capacity of the tuning condenser and will not allow the receiver to tune up to 1500 kc. Normally, this receiver would tune sharply, so we have broadened it out by putting resistors across the primary and secondary of all the coils except the first r.f. stage. In this stage, which is normally quite broad, we wish to realize all the possible selectivity that we can, to reduce cross modulation and reject any and all spurious signals which might ride through the amplifier.

The trimmers are mounted directly on the tuning condenser and holes are provided in the condenser shield so that the high frequency end of the tuning range can be aligned with the shield in place. Care should be exercised in keeping all the leads short and away from each other, to reduce the possibility of oscillation. The bypass condensers should be mounted as close to the tube sockets as possible. Mount the bias resistors directly on the tube sockets so that their leads may be short. Be sure to ground the "outside foil" end of each bypass condenser. It is well to keep the filament wiring away from the other wires and close to the chassis.

The amplifier filament and plate supply connections for the tuner are made to a terminal strip located in the back of the chassis, as is the audio signal output. The amplifier and power supply (Fig. 4) are located on a separate chassis measuring 4½ x 8 x 2 inches, which can be bolted to the receiver chassis, located at some remote point, or used as a separate amplifier by itself.

The power transformer is a little oversize but this allows it to run cooler, which is a desirable design feature. The amplifier and receiver do not draw over 90 milliamperes, and the transformer is rated at 120 ma. It supplies filament power for the amplifier tubes and the tuner, a total of about 2.5 amperes at 6.3 volts. The extra plate power may be made use of in case a field model speaker is used instead of the PM model, or if an



R_1, R_8, R_9—470,000 ohm, ½ w. res.
R_2—5000 ohm rheostat
R_3—30,000 ohm, ½ w. res.
R_4, R_5—50,000 ohm, ½ w. res.
R_6, R_7—2000 ohm, 1 w. res.
R_{10}—225 ohm, 2 w. res.
R_{11}—150,000 ohm, ½ w. res.
R_{12}— 100,000 ohm rheostat
C_1—.01 μfd., 200 v. cond.
C_2—.05 μfd., 200 v. cond.
C_3—10 μfd., 350 v. elec. cond.
C_4, C_5—.05 μfd., 400 v. cond.
C_6, C_7—20 μfd., 350 v. elec. cond.
C_8—25 μfd., 25 v. cond.
T_1—Power trans., 250 v. d.c. @ 90 ma., 6.3 v. @ 2.5 amp., 5 v. @ 2 amp.
T_2—Output trans., 2500 ohms to voice coil
CH_1—10 hy. filter choke @ 90 ma.
1—PM speaker (See text)
V_1, V_2—6SL7 tube
V_3—6L6 tube
V_4—5Y3 tube
X-X—See text

Fig. 2. Circuit diagram of the power supply and audio amplifier. A high frequency boost tone control (C_2,R_2) is incorporated in the feedback circuit. If a low frequency boost is desired it may be added as shown in insert B, components C_1, R_{12}. Note that if audio amplifier oscillates reverse voice coil leads. Should this not eliminate the oscillation, the value of resistor R_{11} must be changed. The value of this resistor will vary with the different output transformers. To eliminate oscillation, the value of R_{11} should be increased until oscillation ceases. It is possible for the amplifier to oscillate at an inaudible frequency. This may be checked by temporarily connecting a dial light across the speaker voice coil. If the lamp lights the amplifier is oscillating.

Fig. 3. Under chassis view of both the amplifier and tuner.

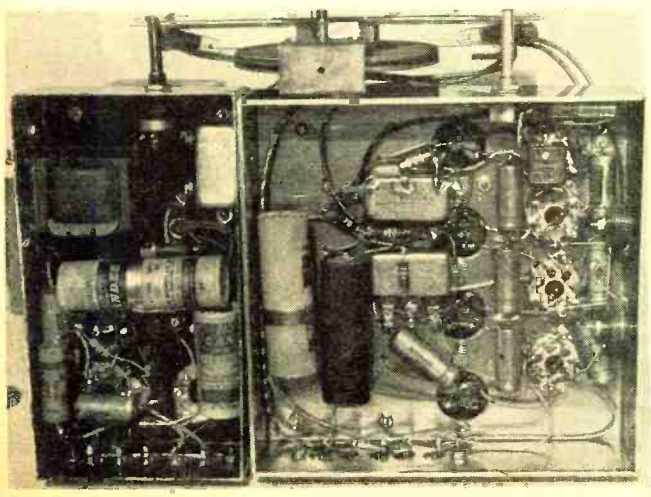
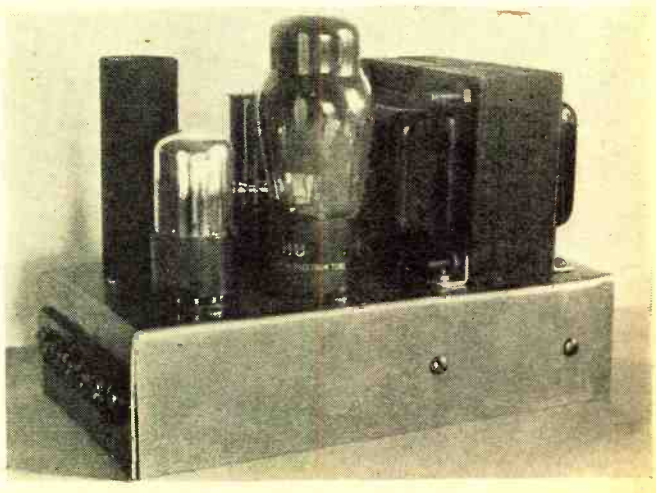


Fig. 4. Side view of power supply and audio amplifier unit.



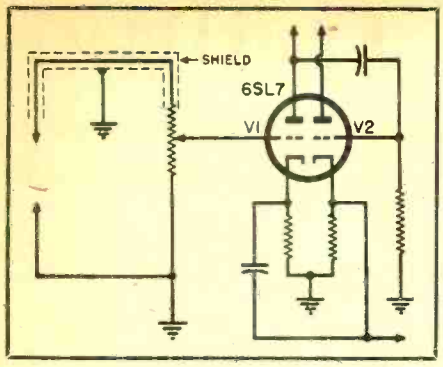


Fig. 5. Schematic diagram shows method of connecting a volume control to the input stage of the audio amplifier. This is particularly needed should the constructor want to use amplifier separate from tuner.

extra speaker is used. A 5000 ohm field or higher should be chosen and connected at the points marked *X* in the circuit diagram. It would be desirable to use the PM as the remote speaker, as then only two wires would have to be run to it. The voice coils may be placed in parallel. The negative feedback will compensate for the impedance mismatch.

The negative feedback network was chosen to impart a response characteristic which would compensate for the deficiencies in the speaker, output transformer, baffle, room acoustics and the human ear, at normal room volume.

This latter is quite a problem, as the response curve of the human ear is flat only when the reproduced music is as loud as the original. The more rapidly the volume is reduced, the more rapidly the ear's response to low and high frequencies is reduced.

The high frequency boost may be varied from the panel by a control, which allows 6000 c.p.s. to be varied from flat to plus 15 db. The amplifier circuit (Fig. 2) allows the individual adjustment of the high and low frequencies, and, if it is desired to have bass response also controllable from the front panel, Fig. 2B shows how it is done. The high frequency control has the power switch ganged to it, but if the bass control is added, then, in the interest of symmetry, the power switch could be a separate control. Figs. 1, 3, and 4 show, photographically, the layout and manner of construction.

When the wiring is done, connect the two units, being sure that shielded wire is used to introduce the detector's output to the amplifier. Connect a ten foot piece of wire as an antenna. Turn on the power, and, turning the volume control up, tune in a station. If no station is received, turn the volume control to maximum and vary the trimmers and iron slugs in the coils until the noise level is at a maximum. This will tune up the receiver, roughly. Now, you should be able to tune in a station.

Pick a weak station at the low frequency end of the dial and adjust the iron cores until you obtain maximum volume. It is important that you pick a weak station so that the a.v.c. will be inoperative. If no weak station is available, reduce the antenna size.

When this is done, tune in a weak station at the high frequency end of the dial and adjust the trimmers for maximum volume. Of course, an output meter can be used for this adjustment, in conjunction with a service oscillator, or a vacuum tube voltmeter may be connected to the a.v.c. bus as a maximum indicator.

If you are not able to procure adjustable iron core coils, you can align the receiver by first tuning up at the high frequency end of the band with the trimmers, and then bringing the low frequency end in line by bending the condenser plates on each gang section until maximum sensitivity is obtained. When this is accomplished, sit back and listen to your favorite musical program.

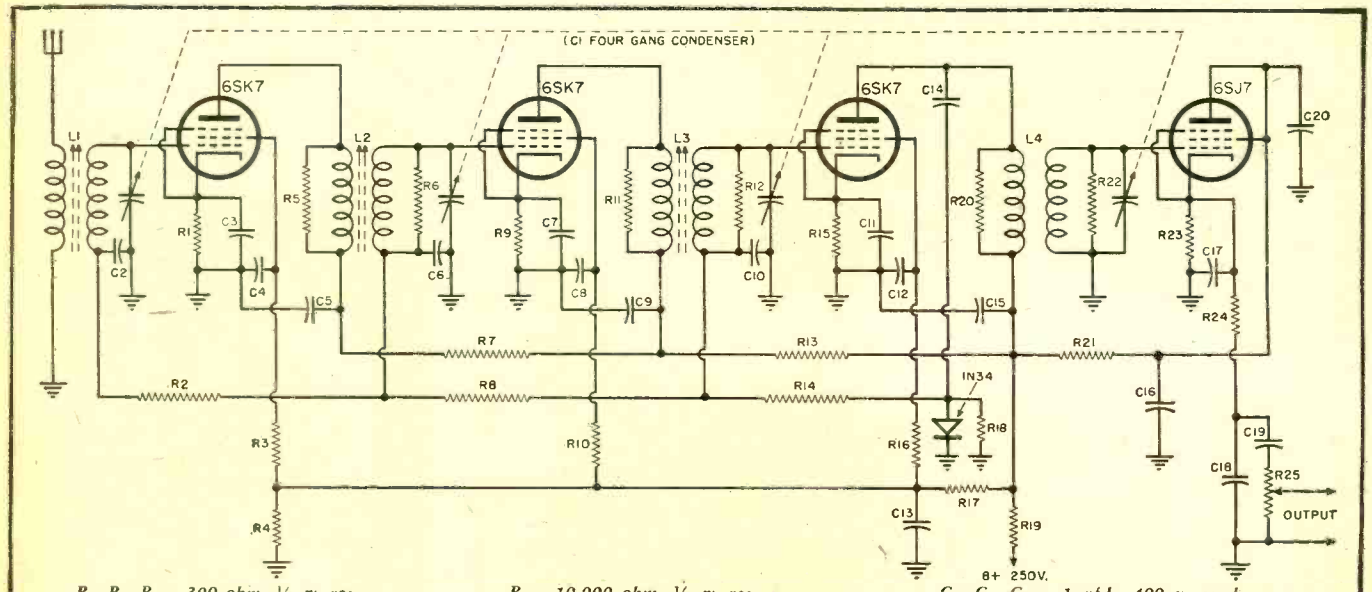
The speaker, of course, can be any size from a 5 inch on up to an 18 inch; the larger, the better. It should be properly baffled, to realize the maximum fidelity from it.

If it is desired to use the amplifier by itself, it will be necessary to mount a .5 or 1 megohm volume control on it, as shown in Fig. 5. If the amplifier is built by itself without the tuner, the volume and both tone controls may be mounted in one long side, constituting a compact 5 watt amplifier.

The combination can be mounted in a cabinet or in the wall, but it would be desirable to keep the speaker and the receiver separated, as the excellent low frequency response might cause a large speaker to vibrate the tuner excessively.

This unit, if connected to a twelve or fifteen inch speaker, will provide real high fidelity from your favorite AM station, and provide an excellent source of program material for recording. It need not cost over twenty-five dollars, including a light duty twelve-inch speaker. All of the parts are readily available. —30—

Fig. 6. Diagram of TRF tuner. A 3-gang variable condenser may be substituted for the 4-gang unit by eliminating one r.f. stage.



R_1, R_9, R_{15}—300 ohm, ½ w. res.
R_2—240,000 ohm, ½ w. res.
R_3, R_{10}, R_{16}—39,000 ohm, ½ w. res.
R_4, R_{17}—10,000 ohm, 5 w. wire-wound res.
R_5, R_{11}—43,000 ohm, ½ w. res.
R_6, R_{12}, R_{23}—56,000 ohm, ½ w. res.
R_7, R_{13}—18,000 ohm, ½ w. res.
R_8—220,000 ohm, ½ w. res.
R_{14}—470,000 ohm, ½ w. res.
R_{15}—1 megohm, ½ w. res.
R_{19}—10,000 ohm, ½ w. res.
R_{20}, R_{22}—22,000 ohm, ½ w. res.
R_{21}—30,000 ohm, ½ w. res.
R_{24}—62,000 ohm, ½ w. res.
R_{25}—½ megohm pot.
C_1—4-gang var. cond. (See text)
C_2, C_8, C_{10}, C_{19}—.1 µfd., 200 v. cond.
C_3, C_7, C_{11}—.05 µfd., 200 v. cond.
C_4, C_8, C_{12}—.05 µfd., 400 v. cond.
C_5, C_9, C_{15}—.1 µfd., 400 v. cond.
C_{13}—10 µfd., 350 v. elec. cond.
C_{14}—50 µµfd., mica cond.
C_{16}—50 µfd., 350 v. elec. cond.
C_{17}, C_{18}, C_{20}—100 µµfd., mica cond.
L_1, L_2, L_3, L_4—See text
1—1N34 crystal diode
3—6SK7 tubes
1—6SJ7 tube

Possibilities of Home Facsimile

The manufacture of home facsimile equipment will open new sales opportunities for the radio dealer.

By
SIDNEY FELDMAN
Radio Inventions, Inc.

Radio News cover serves as subject copy which is held in place on the scanning drum by a thin celluloid sheet. The copy is progressively scanned by submitting it to a fine beam of light from a photocell exciter lamp. This beam is reflected from the copy to the photoelectric cell, causing the current to vary as the reflected light. Before scanning is begun the operator tests the range of copy shading by means of an electric eye, and then adjusts photocell amplifier accordingly.

FACSIMILE development has opened new avenues of promotion and interest for retailers, servicemen and amateurs.

As a result of technological advances the possibilities of facsimile as a new field for retail merchandising and service seem to be growing into a reality. Recently demonstrated to the technical press, the *Hogan Faximile System* shows promise of becoming a regular service for printing by radio through FM broadcasting.

Inventor of this system is John V. L. Hogan, pioneer in radio and wire communications, who is well known as founder of high fidelity station WQXR in New York. Copy is reproduced by the *Hogan System* at the rate of 28 square inches per minute, which is somewhat better than five times prewar speeds.

In the time required for the usual 15 minute broadcast, four pages of illustrated reference copy can be transmitted by FM radio and reproduced in the home. At the same time, for example, this will permit a 15 minute newscaster on an AM station to accompany his spoken word on an associated FM station with 4000 words of printed text or four pages of maps, diagrams, photographs in any combination of four 9½ x 12" sheets. A format can be selected to permit four-column layouts of standard newspaper size.

Through this system of instant, direct printing, copy is visible immediately as transmitted. It requires no photographic or other finishing process and occupies no more space in a radio console than that now devoted to the conventional phonograph and record-changer unit. In its present form the home recorder can be manufactured as an attachment to any FM home receiver or combined in a single unit with AM, FM and radio-phonograph.

Produced in quantity, the home unit should cost the equivalent of record changer and turntable, which makes it quite possible that the set buyer ultimately will have his choice of facsimile or phonograph, in a combination, at about the same price.

With the increase of facsimile broadcasting there would be another gadget to be sold by the radio dealer as a repeat item, facsimile paper. The *Hogan* recorder holds a 400-foot roll of paper. It is estimated this will be enough paper to last a conservative user of sustained facsimile broadcasting for a full month, and an average user, at least two weeks. At present, a roll manufactured by hand processes in the laboratory costs about $4.00.

By quantity production methods, this may be reduced to be about $1.00 per roll. The more ingenious the fac-

(*Continued on page* 112)

Facsimile signals, to be reconverted from sound to printing impulses, are received by an FM receiver for staticless reception.

Comparison of the original copy (top photo) with the facsimile print. Reproduction of received copy is exceptionally good.

Low Cost AUDIO OSCILLATOR

By ROBERT W. EHRLICH

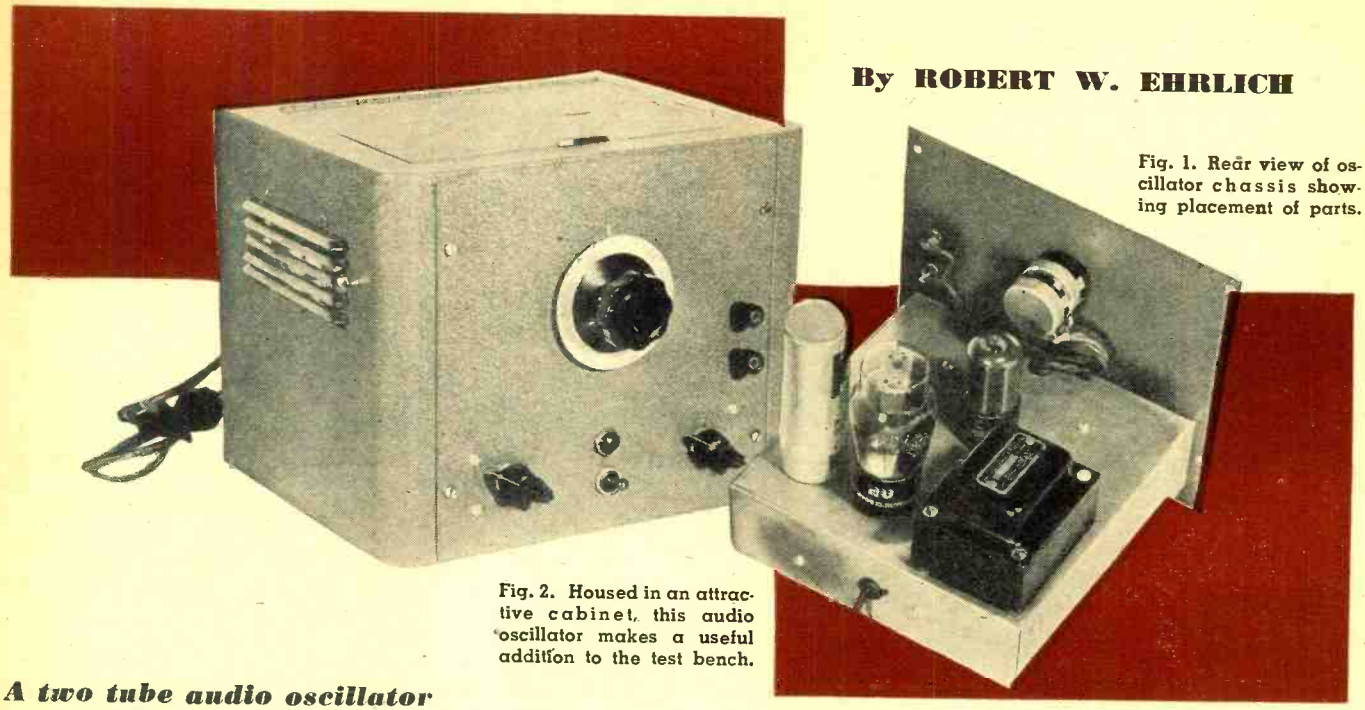


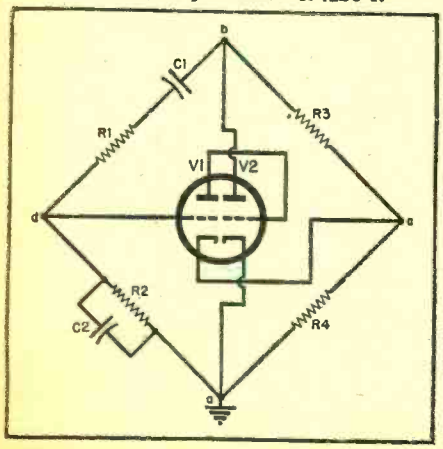
Fig. 1. Rear view of oscillator chassis showing placement of parts.

Fig. 2. Housed in an attractive cabinet, this audio oscillator makes a useful addition to the test bench.

A two tube audio oscillator utilizing resistance tuning which may be built for $10 at present day parts costs.

THE audio oscillator described in this article was designed with the idea of providing the experimenter with a low-cost, easily-built, foolproof test instrument that could provide a good quality audio test signal at any frequency for use in testing receivers, audio amplifiers, modulators, etc. The device fulfills these conditions admirably, at only a small sacrifice of the features that appear on more expensive commercial models.

Fig. 3. Basic Wien Bridge audio oscillator circuit. Feedback takes place from the plate circuit of tube 2 to the grid circuit of tube 1.



As the unit appears in Fig. 2, all parts can be purchased at amateur rates for about $10. It is to be expected, however, that most of the necessary parts will be found in the junk box, thereby lessening the actual cost of construction. In fact, the oscillator lends itself quite well to junk-box production, because none of the parts, with the exception of the tuning potentiometer, are at all critical.

As for performance, the oscillator will deliver an excellent sine-wave signal at frequencies between 100 cycles and 25,000 cycles, with no band changing. The maximum r.m.s. output ranges between ten and twenty volts, with an output impedance of approximately 10,000 ohms. This impedance is low enough so that hum pickup in the output leads is minimized and conventional test prods can be used.

A standard Wien Bridge circuit is used which is basically similar to that used in many commercial audio signal generators, but it contains two important modifications that make for simplicity. One is the use of a two-gang variable potentiometer as the tuning element rather than a large variable capacitor. This not only reduces the expense considerably, but also makes possible a tremendous range of frequencies in one band (over 100 to 1). The sacrifice here is, of course, some loss of accuracy in frequency calibration; however, the majority of applications do not require extremely accurate frequency information.

The other modification is that control of the feedback necessary to sustain oscillations is brought out to the front panel. This makes it unnecessary to undertake any involved alignment procedure when the oscillator is first put into operation. Furthermore additional flexibility is introduced in that it is possible to set the feedback control to produce either a sine wave or a highly distorted pulse wave that might be required for special applications.

The basic Wien Bridge circuit used in this oscillator is shown in Fig. 3. R_1, C_1; R_2, C_2; R_3; and R_4 constitute the bridge circuit through which feedback takes place from the plate of V_2 to the grid circuit of V_1. This bridge is balanced when:

$$f = \frac{1}{2\pi\sqrt{R_1 C_1 R_2 C_2}}, \text{ and}$$

$$\frac{C_2}{C_1} = \frac{R_3}{R_4} - \frac{R_1}{R_2}$$

Note that the frequency of balance depends only on values of R_1, R_2, C_1 and C_2, and that a suitable adjustment of the ratio of R_3 to R_4 will bring about a balance at that frequency.

Determination of the conditions necessary for oscillation in the circuit of Fig. 3 is most easily carried out by assuming a voltage between the plate and ground of V_2, and then using vector analysis to determine whether or not the voltage between the cathode and grid of V_1 will be of such a nature as to sustain the assumed voltage. Fig. 7A shows vector relationships in the bridge circuit when it is perfectly balanced. Points *a*, *b*, *c*, and *d* in the vector diagram correspond to similarly

lettered points in Fig. 3. Note that under these conditions, the cathode-grid voltage (c-d) on V_1 is zero, and it cannot act to sustain the voltage (a-b) between the plate and ground of V_2. Therefore there will be no oscillation.

Fig. 7B shows the vector relationships when circuit values remain the same as those in Fig. 7A, but different frequencies are assumed for the applied voltage a-b. As the frequency changes, the junction point (d) between the vectors a-d and d-b moves along the dotted circle, and the cathode-grid voltage takes on the different values shown. Note that at no time is c-d at all in phase with the applied voltage, a-b. Remembering that two reversals in phase take place between the grid of V_1 and the plate of V_2, it will be realized that c-d must have a component in phase with a-b to sustain oscillations. Since the feedback is out of phase, and therefore degenerative, oscillations will not take place at any frequency.

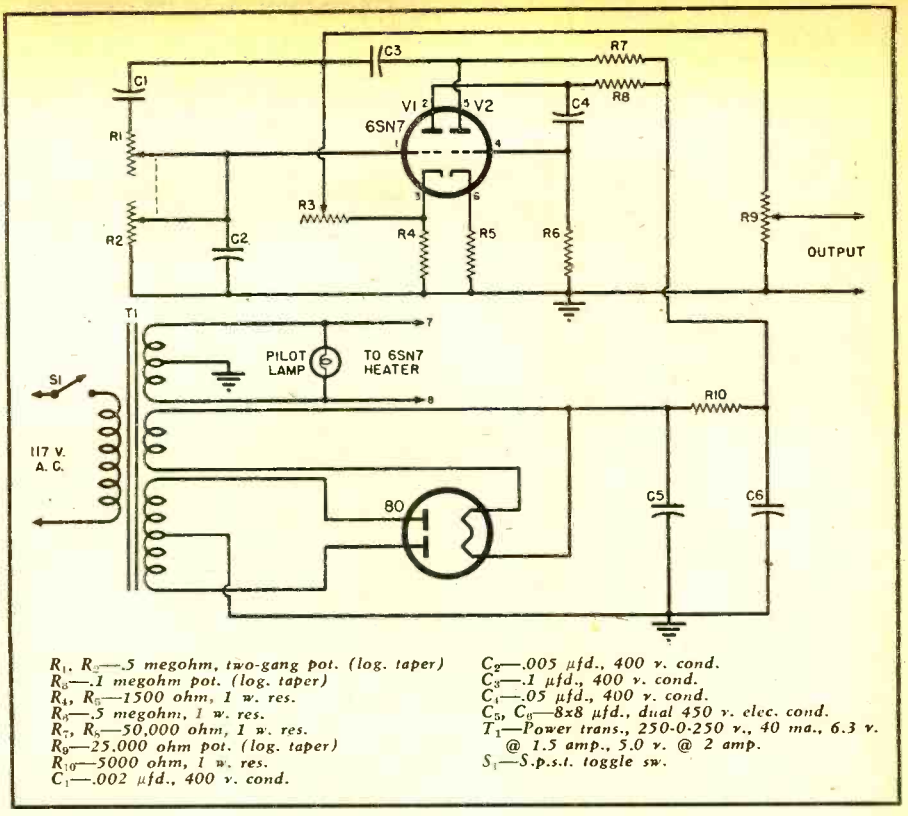
In Fig. 7C, resistor R_3 is slightly smaller than the value required for balance. While there is now some feedback at the balance frequency as well as at other frequencies, it is still degenerative and no oscillations will take place.

In Fig. 7D, resistor R_3 is slightly *larger* than the value required for balance. At frequencies close to the balance frequency (the top of the circle), the vector c-d swings around so that it is in phase with a-b. When resistor R_3 is adjusted so that the voltage c-d, as amplified by the two tubes, is just large enough to equal voltage a-b, then oscillations will take place.

The preceding analysis shows two significant features of the Wien Bridge circuit. One is that for any values of R_1, R_2, C_1 and C_2, it is possible to find a setting of R_3 that will just cause the circuit to break into oscillation. The other is that oscillation is limited to frequencies very close to the balance frequency determined by R_1, R_2, C_1 and C_2, and no harmonics thereof; from which result the inherent frequency stability and pure waveform characteristics of this circuit.

The actual circuit of the audio oscillator is shown in Fig. 4. This is the same as the circuit of Fig. 3 with the addition of a power supply and the necessary blocking capacitors for the insertion of the d.c. voltages to the tube sections. In designing the circuit, every effort was made to keep cost down. While a transformerless power supply might be used to shave expenses a little further, it was felt that an isolating transformer was necessary in order to make it possible to connect the oscillator to other apparatus that may or may not be grounded to the a.c. line.

The chassis layout and placement of parts are adequately described in the accompanying pictures and diagrams, and very little need be said. Most of the impedances were purposely kept low to avoid any problems of hum pickup that might be encountered relative to parts placement.



R_1, R_5—.5 megohm, two-gang pot. (log. taper)
R_2—.1 megohm pot. (log. taper)
R_4, R_6—1500 ohm, 1 w. res.
R_3—.5 megohm, 1 w. res.
R_7, R_8—50,000 ohm, 1 w. res.
R_9—25,000 ohm pot. (log. taper)
R_{10}—5000 ohm, 1 w. res.
C_1—.002 μfd., 400 v. cond.
C_2—.005 μfd., 400 v. cond.
C_3—.1 μfd., 400 v. cond.
C_4—.05 μfd., 400 v. cond.
C_5, C_6—8x8 μfd., dual 450 v. elec. cond.
T_1—Power trans., 250-0-250 v., 40 ma., 6.3 v. @ 1.5 amp., 5.0 v. @ 2 amp.
S_1—S.p.s.t. toggle sw.

Fig. 4. Over-all circuit diagram and parts list for the audio oscillator.

Selection of parts to be used is also not very critical. It might be pointed out, however, that it is wise to use resistors and capacitors that are rated considerably higher than the wattages and voltages they will have to stand in order that stability of the unit will not be affected by overheating and breakdown of components.

In selection of potentiometers, it is important to note that they are all of the logarithmic-taper type. This taper is used in conventional volume control units, so it should not be difficult to find the correct parts. It is also important to observe the connections shown in Fig. 5 for the potentiometers. If they were connected incorrectly, calibrations on the main tuning potentiometer would be very crowded near one end, and the setting of the feedback control would be extremely critical. With correct connections, the frequency calibrations space out about equally for every octave (See Fig. 8), and adjustment of feedback can be accomplished smoothly and easily.

It is not so important to use a logarithmic taper for the output control, but it is more convenient. The total

(*Continued on page* 106)

Fig. 5. Proper connections for potentiometers used in the test oscillator. All potentiometers are of the logarithmic-taper type.

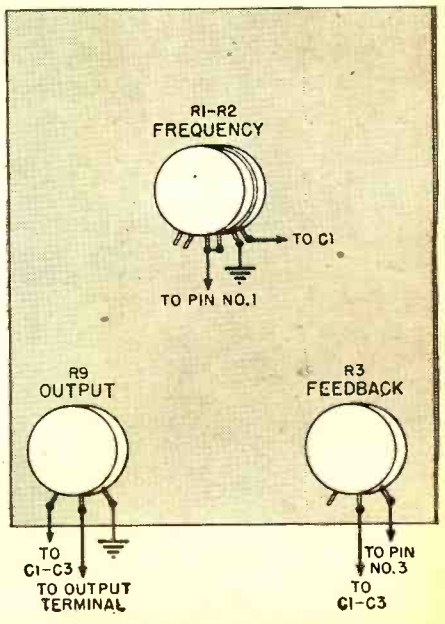
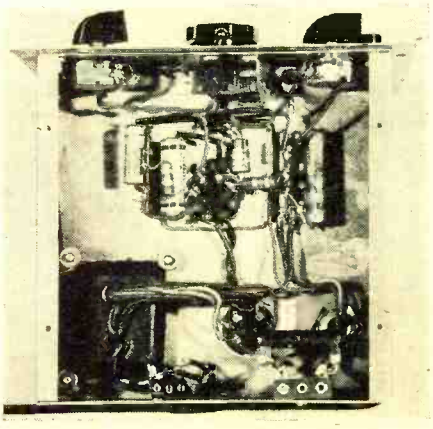


Fig. 6. Bottom view of chassis.



Trouble Shooting the TELEVISION RECEIVER

By EDWARD M. NOLL
Television Tech Enterprises

Part 16. In this, the concluding article of the series, the author covers some of the servicing problems encountered in television receivers.

TELEVISION receiver trouble-shooting and repair is no more difficult than trouble-shooting a multiband home radio. The radio serviceman must be convinced on two points if he desires to save time and do an efficient and capable service job. One, he must devote more time to studying theory and recommended procedures. Trouble-shooting, in the case of the television receiver, is really servicing by visual observation. Every receiver trouble, except sound channel failure, manifests itself in one form of malfunction of the pattern on the picture tube screen. The ability to interpret these malfunctions quickly and accurately can only come with experience and thorough knowledge of receiver theory. The second factor he must be convinced of is that hit-or-miss or revamping tactics must not be employed. Follow manufacturers' procedures and recommendations closely. When replacing defective parts, use recommended replacements, and in critical circuits, arrange wiring and parts positioning as it was originally.

Troubles can be grouped into three classifications: (1) Signal strength troubles, (2) Spurious signals, and (3) Defective parts.

Signal strength and spurious signal troubles can be corrected or reduced by the serviceman when the receiver is installed. The wise serviceman will adjust and tune each receiver in his own shop before he installs it in the customer's home. In this way, he can be reasonably certain any trouble which appears at the customer's home is an installation defect and not the fault of the receiver.

Some of the troubles he is likely to encounter are:

1. *Weak Signal.* A weak signal will usually occur at the outer extremities of the transmitter range, in congested areas hemmed in by tall buildings, and in valleys or locations isolated by mountainous terrain. The remedy, of course, is to get the antenna higher into the air, use low-loss transmission line, and a more directional antenna. Proper orientation of the antenna is extremely important in such localities. A weak signal produces a faded, noisy presentation on the picture-tube screen. Contrast control has to be advanced almost full on before any picture can be seen.

2. *Strong Signal.* Too strong a signal often occurs in the immediate vicinity of the transmitter. A strong signal gives the picture an over-exposed appearance. Some difficulties with synchronism are also experienced. It would seem logical, therefore, that all we need do is unhook the antenna. However, removing the antenna not only leaves a mismatch in the input circuits, upsetting the receiver input bandpass characteristic, but also leaves the input circuit vulnerable to stray pick-up of noises. The solution to the strong signal problem is the insertion of a resistance pad (carbon resistors between transmission line and antenna input terminals of receiver). The pad still maintains a proper match but increases the signal attenuation.

3. *Noise Pick-up.* Noise pick-up is most troublesome at the outer extremities of the transmitter range or in congested hemmed-in areas. Noise pick-up at these points not only causes an interfering pattern to appear on the screen but, in addition, sharp bursts of noise, such as might come from auto ignition interference, cause momentary loss of synchronism. Another source of noise is diathermy installations which cause a herringbone pattern to appear on the screen. High voltage sparking from trolley cars or electric trains also interfere with picture reception at weak signal points. Here again the solution is to get the antenna high and clear, use well-shielded low-loss transmission line, and properly orient the antenna. Many times the addition of a reflector to the dipole element, which minimizes noise pick-up from the rear, will reduce the interference. The more directive the antenna is (both horizontally and low-angle vertically) the more

Fig. 1. Television receiver divided into sections for convenient trouble-shooting.

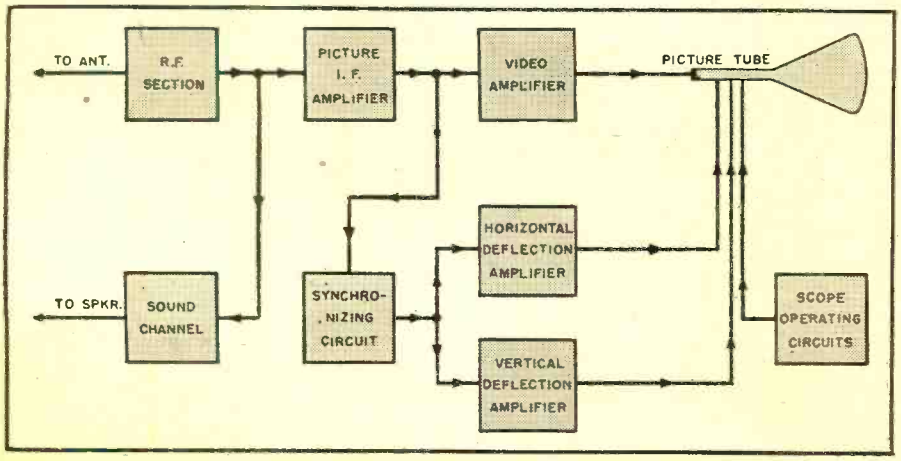


Table 1. Common television receiver faults and possible sources of their origination.

improved the signal-to-noise ratio becomes.

4. *Reflections.* Reflections or ghosts in the presentation (dual images) are caused by multi-path signals. For example, one signal may arrive at the antenna directly, while a second signal will be reflected from a large building some distance past your location. Since signal two arrives some interval after signal one but contains the same information, dual images will appear on the screen. In fact, if the transmission line is not well-shielded and is not properly matched, a signal induced into it will also cause ghosts in the presentation. Again, we have an antenna problem which can be eliminated or reduced by careful antenna planning.

a. Horizontal directivity (uni-directional)
b. Low-angle vertical directivity
c. High and clear as possible
d. Properly matched system
e. Low-loss well-shielded transmission line
f. Position antenna assembly where a minimum of reflections appear. Sometimes shifting the entire assembly only a few feet makes an appreciable difference.

Receiver Troubles

The angle of attack in locating receiver troubles is to first localize the trouble to a specific section of the receiver by visual observation of the scanning raster or, preferably, with the local transmitter on the air, with a test pattern. The better equipped repair shops will possibly have their own monoscope signal generator which will couple a signal into the receiver similar in character to a transmitted signal. Output of this elaborate signal generator contains synchronizing and blanking pulses as well as a picture signal. The monoscope signal generator can also be used to demonstrate television reception to customers when the local stations are not on the air.

Thus, the first step, Fig. 1, in trouble-shooting the receiver is to localize the failure to one of the following sections; r.f. section, sound channel, picture i.f. amplifier, video amplifier, synchronizing circuits, horizontal deflection, vertical deflection, or scope operating circuits. This can be done almost immediately as follows:

1. *Scope Circuits.* If scope circuits are defective the screen will not illuminate or will be very dim with the brightness control full advanced. A breakdown in the high-voltage filter circuits will cause severe hum on the picture (continuous contraction and expansion of raster along with alternate black and white thick bars.

2. *Horizontal Deflection.* A failure in the horizontal deflection circuit is indicated when only a thin vertical line appears on the fluorescent screen or when it is impossible to cover the

(*Continued on page* 132)

DEFECT	CHECK
PICTURE-TUBE CIRCUITS	
1. No illumination.	a. High-voltage rectifier. b. Resistance of secondary winding of high-voltage transformer. c. Filter capacitors and resistor.
2. Some illumination. Erratic operation of centering, focus, and brightness controls.	a. High-voltage and low-voltage rectifier tubes. In the G.E. HM-171, low voltage supply is also a part of the scope operating circuit. b. Inspect, and check values of high-voltage bleeder resistors which make up the high-voltage divider.
3. Improper operation of any one scope operating control.	a. Resistance and mechanical operation of control. b. Associated bypass capacitors.
4. Improper operation of brightness control.	a. Output of low-voltage power supply. b. Brightness potentiometer and associated bypass capacitor.
5. Weak or no illumination, all other checks normal.	a. Substitute another picture tube.
6. Hum (black and white thick bars) on scanning raster. Continuous contraction and expansion of scanning raster.	a. Filter capacitors of both power supplies. b. Check for low resistance path draining excessive current from supply.
HORIZONTAL DEFLECTION	
1. Thin vertical line on picture tube. No horizontal deflection or inability to sweep entire width of raster.	a. Horizontal saw-tooth generator and horizontal sweep amplifier tubes. Substitute another saw-tooth generator tube as some tubes will not oscillate at this frequency. b. Voltage check horizontal amplifier to locate a defective part.
2. Non-linear deflection in all positions of linearity control as shown on received test chart.	a. Horizontal amplifier tubes. b. Components of linearity network and damping circuit. c. Voltage check amplifier.
3. Inability to lock-in horizontal sync. Vertical lock-in normal.	a. Horizontal saw-tooth generator tube and horizontal sync-amplifier tube, if used. Substitute another tube in saw-tooth generator. b. Check components of frequency determining network. c. Voltage check horizontal sync circuits.
4. Hum (expansion and contraction of raster horizontally).	a. Voltage circuits, looking for open or partially shorted bypass capacitors.
VERTICAL DEFLECTION	
1. Thin horizontal line on picture tube. No vertical deflection or inability to sweep entire height of raster.	a. Vertical saw-tooth generator and vertical sweep amplifier tubes. b. Voltage check vertical amplifier to locate defective part.
2. Non-linear deflection in all positions of linearity control as shown on received test chart.	a. Vertical amplifier tubes. b. Components of linearity network. c. Voltage check vertical amplifier.
3. Inability to lock-in vertical. Horizontal lock-in normal.	a. Vertical saw-tooth generator tube and vertical sync amplifier tube. b. Components of vertical sync amplifier. c. Voltage check sync circuits.
4. Hum (expansion and contraction of raster vertically).	a. Voltage circuits, looking for open or partially shorted bypass capacitor.
SYNCHRONIZING CIRCUIT	
1. Inability to synchronize vertical or horizontal sweep oscillators. Signal strength normal as indicated by wide range of intensities in random pattern appearing on screen.	a. Sync separator and amplifier tubes. b. Voltage check sync circuit.
2. Frequent loss of horizontal and vertical sync. Continuous readjusting of hold control necessary.	a. Sweep oscillator and sync tubes. b. Check component parts, sync circuits, and frequency discharge circuits. Look for overheated or intermittent parts.
R.F. SECTION	
1. No received signal. Sound and picture channels dead. Power circuits normal.	a. R.F. section tubes. Substitute a new oscillator tube. b. Voltage check r.f. section. c. Check component parts. d. Do not touch any alignment adjustments until defect has been found. Alignment in most cases will be normal after trouble has been corrected. e. As a final check, use sweep oscillator and scope to observe bandwidth and alignment.
PICTURE I.F. CHANNEL	
1. No picture signal and sync. Sound channel normal.	a. I.F. amplifier tubes. Substitute a tube known to be good, successively in each stage. b. Locate dead stage by using amplitude modulated signal generator applied stage-by-stage from video detector to converter. c. Voltage check i.f. amplifier. Check transformer windings for continuity. Do not touch alignment adjustments until trouble has been corrected. d. As a final check, use sweep oscillator and oscilloscope to observe response characteristic.
2. Loss of picture definition. Sync normal.	a. Use sweep oscillator and oscilloscope to localize loss of response in r.f., i.f. or video amplifiers. b. Substitute tube. Voltage and resistance check. Do not touch alignment until trouble has been found.
3. Interfering sound (regular pattern on picture tube which varies with sound modulation).	a. Check sound wavetraps.
4. Hum (heavy black bars moving up and down on screen).	a. Voltage and resistance check, looking for open or partially shorted bypass capacitors.

(*Continued on page* 132)

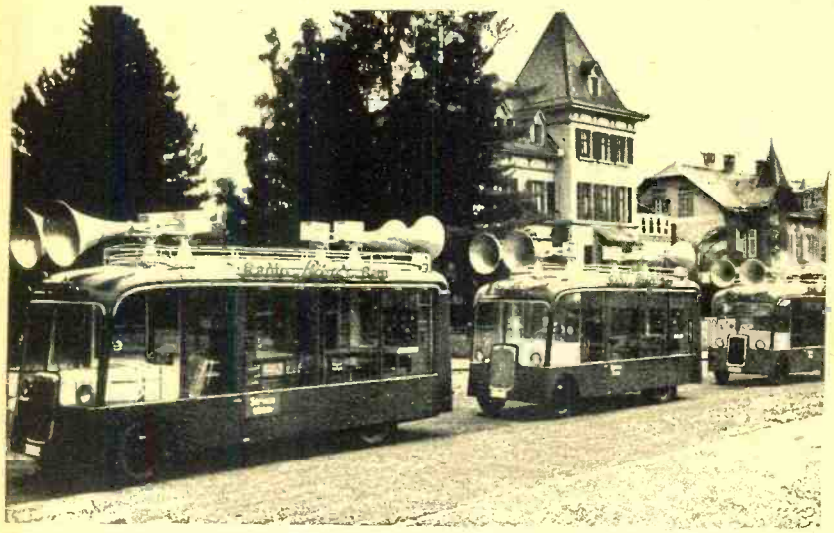
SUBSCRIPTION-LEASE PLAN

A Merchandising Success Story from Switzerland

A Review By

PAUL H. WENDEL

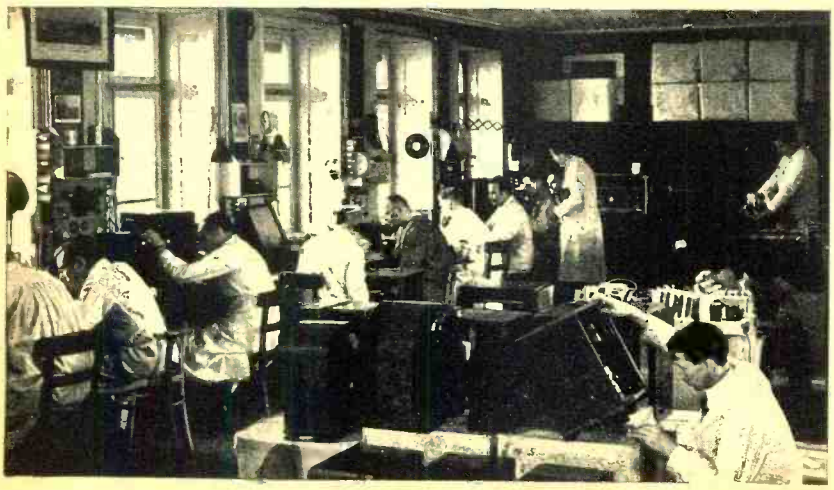
Eastern Editor, RADIO NEWS



Unique glass enclosed motorized repair shops command public attention.

Customer and prospect files assure efficiency of business operation.

Large staff of skilled technicians handle repair and rehabilitation.



ANY radio retailing and service organization in these United States which could boast of more than 400 employees would indeed be considered the miracle organization of the industry, but that is the claim of Radio Steiner located in Switzerland and serving a total population of only 4.2 millions of inhabitants. Here indeed, is a success story which warrants investigation. Back in 1927 no electrically operated sets existed in Europe and people had to be satisfied with local stations which could be tuned in with battery sets and detectors. Power packs suddenly came onto the market and at that point the Steiner concern conceived the "subscription-lease" idea.

Within a year about half the owners of vacuum tube operated receivers in Switzerland had become subscribers. The plan provided these set owners with a power-pack and a rectifier for a monthly fee corresponding to the average monthly expense of operating a five-tube battery set. Provision was made so the subscriber could purchase both pieces of apparatus with 9/10 of the rental already paid at the time of decision to purchase being deducted from the sales price.

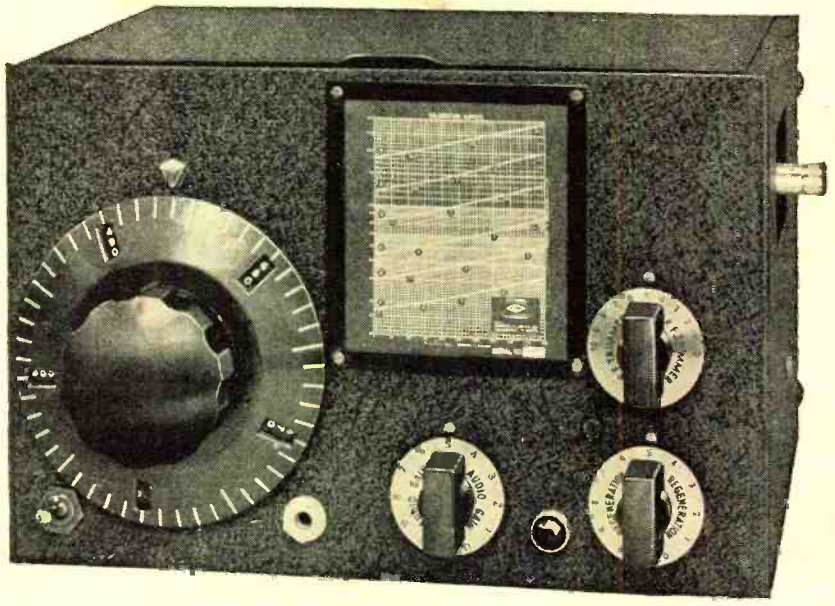
The principles of the subscription-lease program were developed during the course of years to apply to all types of receivers.

How Subscription-Lease Works

The subscriber selects the receiver model he wants and the company delivers and installs it. Maintenance is included as a part of the original subscription-lease. For these services, a subscriber is charged a monthly rental fee, amounting to 1/48th of the list price of the set. In addition, the subscriber pays a monthly fee to cover insurance, repairs and risk, varying from 3¼ to 6 francs depending on the model involved.

For each of the first three months, the subscriber pays three times the amount of the monthly rent. From the fourth month onward, the subscriber may break his contract by giving a one-month notice. Note that the minimum proceeds of any single transaction amount to a ten months' fee which is paid in a period of four months.

At any time during the term of the subscription-lease, the subscriber may acquire the set by paying list price less rental amounts already paid, with the exception of premiums paid for repair and risk insurance. At the end of 42 months, the subscriber may declare his set purchased without further payment.



THE 1-10A

The ONE-TEN-A is a complete redesign of the ONE-TEN, retaining all the proven design features of the older model but with improved performance and smoothness of control.

For many years the ONE-TEN has been the "standard" receiver for work in the range from one to ten meters. Although many advances in high frequency technique have been made since this little receiver was first introduced, it has easily held its place in the affections of experienced amateurs by its consistent dependability under actual operating conditions and its high usable sensitivity.

The new ONE-TEN-A inherits the fine qualities of its predecessor brought up to date by a complete restudy of circuit, mechanical arrangement and constructional details.

The ONE-TEN-A is a fine receiver.

NATIONAL COMPANY, INC., MALDEN, MASS.

If a set is repossessed due to dissolution of the contract, it is tested, checked, rehabilitated and made available to new subscribers at reduced rates. The repossesed sets are covered by the same guarantees as new sets.

The system provides for limitation of choice among the various sets, since no more than one model is made available for lease in each price class.

In case a subscriber desires a new or different model before the expiration of his subscription-lease contract, he may turn in his set at a rate of 10 to 15 per-cent of the price of the new model he selects. The exchange sets are subjected to thorough overhauling and some of them are placed at the disposal of the service organization for customers' service, to be used as spare sets for customers' use during repairs which cannot be handled in the customers' home.

The greatest number of these radios, however, are made available on a subscription-lease whereby the subscriber pays a fixed sum of 25 francs after delivery and installation and a monthly subscription fee of six francs. The cost of service is included in this subscription fee and the set remains the property of the company.

The subscriber may at any time break the contract at a month's notice and receive a credit note for rent paid less 50 francs, which credit may be used against the purchase of a new radio receiver. Note that in this way, the company puts out a new set and realizes 75 francs, with which sum the exchange expense can be covered.

Tube Repair Subscription Agreement

Under the terms of this agreement the company assumes the obligation of servicing the customer's set at a monthly rate of 6 francs. The agreement contract runs for a 20 month period but thereafter may be dissolved at any time. A total sum of 50 francs for all repairs required during the entire subscription period is charged but the balance paid in may be used by the subscriber against the purchase of a new receiver.

The fact that the Steiner organization contracted to maintain, service and repair the receivers necessitated the development of an extensive service organization. Mobile workshops, sensational in design and construction, serve to merchandise the Steiner proposition. The shops are driven from place to place and provide public evidence of the capabilities of the organization. Each car carries a crew of ten men including one chief, two technicians and seven salesmen. With only three cars, in a period of two years, the company concluded contracts amounting to well over 7 million francs. The advent of the war temporarily terminated this activity.

Merchandising and Advertising

The Steiner organization believes in extensive and colorful advertising. That they are master showmen is

(*Continued on page* 163)

From coast to coast

SERVICE PROFITS ARE GOING UP

(and operating costs are going down)

thanks to

SAMS PHOTOFACT* FOLDERS

Here's What Servicemen Themselves Say:

- "Your folders help give the quick service the public wants—good service, too." *Willis, Tex.*
- "They easily cut my repair work to half the original time." *Chicago, Ill.*
- "A great time saver—and cheap enough for the small shop owner" *New York City.*
- "You have what the serviceman has been waiting for all these years." *Richmond, Calif.*
- "Wouldn't swap my first set for $100." *Ashtabula, Ohio.*
- "They make a big cut in non-productive time—especially in servicing new receivers." *Pascagoula, Miss.*

Time is the most valuable commodity you have. Cut down waste operating time and your earnings go up automatically. You, as a good business man, know that.

But maybe you don't know that Sams Radio PhotoFact Folders reduce non-productive service time by as much as 50 percent. The experience of hundreds of servicemen definitely proves that they do! PhotoFact Folders accomplish this because they give *more complete information—faster*—than any other data that has ever been available.

By means of full-page pictures, comprehensive data, voltage and resistance values, etc., they tell you everything you want to know about radios, phonographs, intercommunication systems and power amplifiers manufactured since January 1, 1946. Released in sets of 30 to 50 folders at a time, they reach you when you need them most—just as the products described reach the market. Yet the cost, including membership in the Howard W. Sams Institute, is only $1.50 a set. ($1.90 a set in Canada).

Get Sams PhotoFact Folders working for you! Use the coupon below for Sets No. 5 and 6. To bring your files up to date, order the four preceding sets, too. That way your biggest expense will be behind you. Thereafter it will be an easy matter to pay as you go.

*Trade Mark Reg.

PUBLICATION DATES:
Set No. 5 . . . October 15th
Set No. 6 . . . October 26th

Cut This Out and Mail It to Your Distributor! If you do not know his name and address, send it directly to Howard W. Sams & Co., Inc., 2924 East Washington Street, Indianapolis 6, Indiana, and we will see that your nearest distributor gets it. (In Canada write to A. C. Simmonds & Sons, 301 King Street East, Toronto, Ontario)

CHECK ONE OR MORE SQUARES
PLEASE PRINT

☐ Send Sets No. 5 & 6

☐ Send Set No. 4 ☐ Send Set No. 3

☐ Send Set No. 2 ☐ Send Set No. 1

☐ Send me a specimen folder

My (check) (money order) (cash) for Sets Nos..... (at $1.50 a set, $1.90 in Canada) is enclosed. (If you send cash, be sure to use registered mail.)

*Name*_____

*Address*_____

*Zone*_____ *State*_____

*Company Name*_____

*My Distributor's Name*_____

*City*_____

In Each PHOTOFACT Folder You Get—

1. A cabinet-view photo of the receiver to help you establish identity and control functions. **2.** A top-view photo of chassis and speaker to identify component parts and alignment points. **3.** A bottom-view photo of chassis and/or accessories. **4.** A complete list giving keyed reference to all parts, alignment and schematic diagram. **5.** A complete full page schematic diagram of the receiver with loads of new information shown in a uniform manner. **6.** Stage gain measurements listed on the schematic diagram. **7.** A complete voltage and resistance analysis chart for rapid check of operational values. **8.** Complete alignment instructions on the receiver consistent with the keyed alignment points indicated in top- and bottom-view photos.

HOWARD W. SAMS & CO., INC. RADIO PHOTOFACT SERVICE

In Canada—write to A. C. SIMMONDS & SONS, 301 King Street East, Toronto, Ontario

Income Tax Saving Facts For Radio Dealers

By HAROLD J. ASHE
Tax Counselor

Prepare now for TAX returns. You can save money by keeping an accurate account of business transactions.

TODAY, every radio and appliance dealer in America has a silent, though exacting, partner in his business. That partner is the United States of America. Four times a year he demands his share of the profits and, on March 15, insists upon a full accounting with prompt payment of any balance due. Even if the business venture proves to be unprofitable, this silent partner insists on being shown before he relinquishes his claim on his active partner.

In spite of this novel arrangement in which the silent partner cannot lose, active partners continue to treat the casting up of accounts upon which the division of profits is based as a minor matter worthy only a few harrassed last hours crowded in before final tax deadline. It is little wonder that, in all too many instances, Uncle Sam gets more profits, called taxes, than, by his own partnership agreement, he is entitled to.

It is the writer's firm conviction that if the average small merchant would hang out a sign "closed to compute income tax" for a week, he would make more money than if he continued to serve his patrons during that period. Many taxpayers too poor to give $100 to war charities, nevertheless pony up $200 or $300 in overpayment of taxes because they "can't find time" to do a thorough job of making out a tax return which truly reflects their financial circumstances. Yet, such oversight on the taxpayer's part may represent as much income as he may make by hard work and careful management in four or five weeks' time.

With 1945 income taxes taking (even in the lowest tax bracket) $23 of every $100 in taxable income, it simply means that of every $100 of overlooked business expense—or personal deductions—to which the taxpayer is rightfully entitled by law, he is being penalized at least $23. Even a $23 saving should warrant more than haphazard application in making an income tax return.

Assuming that most businessmen are now sufficiently versed in the purely mechanical problems of making income tax returns, it is not the purpose of this article to review that aspect of the subject. Rather it is the author's intention to discuss certain of the finer shades of tax problems as they apply to small businessmen and to indicate certain tax-saving methods which, if employed, may materially reduce the income tax paid on a given income, just as such tax-saving methods have been employed for years by taxpayers in the higher tax brackets.

Partly because of labor and material shortages most businessmen throughout the war deferred making needed repairs and improvements to their business properties. In normal times such expenditures would have been made as a matter of course and the costs would have been reflected in income tax returns. Failure to make such needed improvements and repairs—as required—have cost taxpayers dearly in increased income taxes, odd as that may seem. A part of what such taxpayers thought they were saving by deferring such expenditures—because taxable income was increased by that amount—actually slipped through their fingers in the form of higher income taxes.

For example: John Jones, radio dealer, owns the property occupied by his store. Both inside and outside of the building is badly in need of painting. The building should have been painted in 1944; it is still unpainted in early 1946. His income subject to tax is $4,500 in 1945. His tax is $1,105. If, however, he had painted his property in 1945 at a cost of $500, his income subject to tax would have been reduced by that amount and his income tax then would have been only $960, or a tax saving of $145. Note that this $500 comes off of the third surtax bracket of 26 percent (plus 3 percent normal). Stated another way, the net cost of the paint job would have been only $355. In addition, no doubt, he has sustained additional losses by reason of accelerated depreciation of his property due to neglect, as well as loss of trade, because his place is becoming run-down and dingy.

Or other improvements, such as additions to buildings, of course unlike painting, may not be written off in the year made, but must be written off as depreciation over the normal life of such improvements. Here, too, how-

See This NEW Book for 7 Days FREE

VALUABLE HELPS FOR RADIO ENGINEERS

HELPFUL DATA ON RADIO CONTROL & MAINTENANCE

DIAGRAMS, TABLES, CHARTS TO AID RADIO REPAIRMEN

JUST OFF THE PRESS

RADIOMAN'S HANDBOOK

A New, Valuable Book for Men Working in Radio, Electronics, Electricity

No matter what work you do in radio, this handbook will prove mighty valuable since it contains exactly the information you wish, available in an instant. You can refer to it easily right on the job. I'm so sure that you wouldn't part with this book for many times its cost that I'm willing to send it to you for a 7-day FREE examination.

USE IT DAILY ON THE JOB

You can't expect to carry all the necessary information you need on a job, in your head. But you CAN have all the information at your side with this handy book. Once you look through the pages of the Radioman's Handbook and see how the tables, charts, diagrams and data can save time and help you get ahead, you will see why this book is as valuable as your other tools.

HERE'S WHAT THIS GREAT BOOK COVERS

MATERIALS
ABBREVIATIONS
CIRCUITS
POWER FORMULAS
RECEIVING TUBES
TRANSFORMERS
AMPLIFIERS
SOUND SYSTEMS & DEVICES
RADIO RESISTANCE & INSULATION (WIRE TABLES, etc.)
CAPACITORS & CAPACITANCE
COILS & COIL WINDING
RESONANCE & COUPLING
OSCILLATORS & ANTENNAS
RECEIVERS

THOUSANDS OF FACTS — NOT A TEXTBOOK

Every subject is indexed and condensed to fit in readable space without waste. Over 300 pages packed full of valuable information that will help you in your daily work. When you are "on a spot" just turn to the quick index, look up the subject you want and you'll find that subject thoroughly explained with helpful diagrams and tables. Every diagram has been fully tested in the great *Coyne Electrical Shops*. Every table is scientifically correct.

SEND NO MONEY. SEE IT FREE

I am not asking you to send any money—not a single penny. I am so sure this is the book you want and need that I will send it to you to examine for 7 days FREE. Then you look it over and you decide. If it isn't all I claim, then send it back and you owe nothing. If you are convinced that this book is worth many times its cost, then send $3.25 at the end of 7 days and the book is yours. Send the coupon now, while it is before you!

3 OTHER COYNE BOOKS . . . SEE THEM FREE

Electrical & Radio Dictionary and Data Book

Contains 3,300 electrical, radio, radar, electronic and atomic energy terms in every day shop and construction use. Know the meaning of the newest terms. Hand-picked data to help you on job. 300 pages, vest pocket size, 3x5". Flexible cover. Price $1.50—sent on 7 days' FREE trial. Mail coupon today.

Electronics for Radiomen & Electricians

Practical electronics for electricians, radiomen, anyone working in radio, television or other electronic fields. It includes trouble shooting and installation. Full details on basic electronic principles. Hundreds of diagrams. See it free for 7 days, then return and owe nothing or pay only $4.95. Mail coupon today.

Electrical & Radio Trouble Shooting Manual

All new methods of trouble shooting on electrical, radio, refrigeration, diesel and automotive equipment. 500 wiring diagrams. 612 pages, 1 year free Consultation Service and Technical Bulletins. Only $9.95 on terms—$3 in 7 days and $3 monthly. Cash price $9.00. See it FREE for 7 days before buying. Mail coupon now.

COYNE ELECTRICAL SCHOOL Technical Book Division
500 S. Paulina St., Dept. 86-T3 Chicago 12, Ill.

FREE TRIAL COUPON

B. W. Cooke, Director, COYNE ELECTRICAL SCHOOL, Dept. 86-T3
500 S. Paulina Street, Chicago 12, Illinois

☐ Send me the **COYNE RADIOMAN'S HANDBOOK** for 7 days' FREE examination. After 7 days I'll either return the book and owe nothing or I'll send you a check or money order for $3.25.

Here are other Coyne Books—I'll send any or all on same 7 day Free Examination Offer.

☐ **Coyne Electrical & Radio Trouble Shooting Manual**—1 Volume, $9.00 cash—$9.95 on time—$3.00 after 7 days and $3.00 monthly—1 year Technical Bulletins Free.
☐ **Coyne Electronics for Radiomen & Electricians**—1 Volume, $4.95 after 7 days' examination—1 year Free Technical Bulletins.
☐ **Electrical & Radio Dictionary**—vest pocket size, $1.50 after 7 days.

*Name*_____ *Age*____

*Address*_____

*Town*_____ *Zone*____ *State*____

*Where Employed?*_____

☐ Check here if you prefer to pay postman cash price indicated above when books arrive. Same 7 day examination and money-back guarantee of satisfaction.

ever, tax savings on a more modest scale may be made, provided such improvements are needed and are going to be made eventually in any case.

Assuming that 1946 taxable income will be the same as 1945, taxpayers who have failed to make such improvements and repairs where needed, but who will do so in 1946 are losers by about $3 on the $100, due to the fact that 1946 tax rates are lower by 3 percent in various brackets. It should be observed that if tax rates are again reduced in subsequent years, the longer such improvements and repairs are deferred, the less they will be worth to the taxpayer as tax-savers. The only exception to this rule is where the taxpayer in later years has taxable income in higher brackets than in the past.

Reverting to painting to illustrate. This job, which effects a tax saving in 1945 of $145, if deferred until 1946 would save only $130 on a $4,500 taxable income.

New equipment and fixtures with a shorter useful life than buildings would effect relatively higher savings in taxes. This is aside from greater profits accruing to owners by reason of such installations and improvements.

As depreciation represents a very substantial part of the cost of doing business—and as many taxpayers fail to take any depreciation or forget depreciation on certain items—taxpayers should deliberately take time to prepare an inventory of every last item that is subject to depreciation, regardless of its relative value. Numerous small items will aggregate in value as much as a major item. Such inventory should show date acquired, value at time of acquisition, rate of depreciation, amount of annual depreciation. In addition to providing that all rightful depreciation will be reported in the tax return, such an inventory will prove invaluable in event of a fire involving an insurance adjustment. A duplicate copy of the inventory should be kept off the business premises.

While tax returns provide for a separation of business expenses and personal deductions, the latter may have as profound an effect on the tax computed as the former. Both business expenses and personal deductions determine the owner's take-home compensation from his business.

Thus, the question of whether to use the short form (where the taxpayer's income permits) or to use the long form and report the personal deductions, should not be dismissed without careful thought. The wrong decision costs many taxpayers dearly every year. The same holds true on the long form option of showing deductions or taking the standard deduction of $500, where income is $5,000 or more. If in doubt, the taxpayer should figure his return both ways and compare, using the one giving the greatest tax saving.

Even if there appears to be no dif-

National Union Announces an

EXCLUSIVE RADIO MERCHANDISING PLAN for Service Engineers

PRESENTATION MODEL No. G619. *6 Tubes. AC-DC. Tuned R.F. Stage. Superheterodyne Circuit. Loop Aerial. Automatic Volume Control. Illuminated Slide-Rule Dial. Standard American Broadcasts. Mahogany Veneer All-Wood Table Cabinet, 13" x 8¾" x 6½".*

COMPANION MODEL No. 571. *5 Tubes. AC-DC. Superheterodyne Circuit. Built-in Antenna. Automatic Volume Control. 2-Gang Air Condenser Tuning. Illuminated Slide-Rule Dial. Standard American Broadcasts. Walnut Veneer All-Wood Table Cabinet, 13⅜" x 7⅝" x 8⅛".*

HERE IT IS AT LAST! The radio line thousands of service engineers have been waiting for—yes, the radio that has *everything* the service trade needs to cash-in on today's big pent-up new set demand.

And who else but National Union could provide a merchandising plan for radio sets—so perfectly fitted to the service engineer's special needs?

For over 15 years National Union products, plans and policies have been shaped for the exclusive benefit of service dealers.

And now N.U. RADIO SETS are here—for the same service men who have so long known and used other N.U. products—and have found the N.U. way of doing business a better, more profitable one for their special type of operations.

THE LINE—5 models, of which one 5-tube and one 6-tube model are now ready; three others available in 90 days.
THE PRODUCT—Top quality throughout; precision-built chassis; beautiful cabinets in modern designs.
PERFORMANCE—Thoroughly up-to-the-minute; N.U. sets compare with the best in their class.
PRICES—Competitive with established brands.
VOLUME REQUIREMENTS—None! N.U. sets are not sold on a franchise basis. Order whatever quantity you need.
DISTRIBUTION—Sold only through N.U. Distributors and Service Dealers.

OTHER MODELS NOW BEING PLANNED

- A 3-Way (AC-DC-Battery) Portable Model.
- A Combination Table Model Radio-Phonograph with Automatic Record Changer.
- A 6-Tube Battery-Powered Farm Radio Table Model.

Here, for the first time, is a practical post-war radio line for the service engineer to handle—a group of fine modern radio sets—but *above all* a proven merchandising plan which *fits*. Ask your N.U. Distributor for the complete facts today!

NATIONAL UNION RADIO CORPORATION, NEWARK 2, N. J.

NATIONAL UNION RADIOS, TUBES AND PARTS

Transmitting, Cathode Ray, Receiving, Special Purpose Tubes • Condensers • Volume Controls • Phototubes
Panel Lamps • Flashlight Bulbs • Radio Sets • Auto Vibrators • Ballasts • Batteries

ference in income tax by use of either method, the taxpayer may still effect savings by showing his deductions, if he anticipates the situation before year-end. This situation arises where the taxpayer, as is frequently the case, owes personal bills which, if paid in the tax period reported, may be taken as personal deductions. This, of course, involves taking a snap account prior to year-end, and it is suggested that taxpayers make a memorandum on this point and keep with their tax papers where, before year-end 1946, they may be reminded of this particular tax-saver.

Let us assume that a taxpayer owes a medical bill of $500 which he let go unpaid until 1946. However, if he had paid this bill by year-end 1945 in time to report in his current 1945 tax return (assuming that otherwise short or long form show about the same tax) he may make a tax saving ranging from $115 upward, depending upon what tax bracket the upper layer of his taxable income is in. The same rule applies to other personal items of a deductible character, which he may elect to pay by year-end, instead of deferring, if by paying his total of personal deductions are boosted above the ten percent allowed by the short form, or by the standard deduction.

Conversely, where payment of such items may not aid him taxwise, he may elect to take the short form or standard allowance for personal deductions, and make such payments on deductible items in the ensuing year when he expects they will bulk large enough to give him a tax saving by use of the long form.

Other deductions of a personal character frequently overlooked include loss from accident, storm, hurricane, fire, flood, etc., to personal property, usually forgotten by the time the income tax is prepared. Such deductions, of course, may be taken only to the extent not covered by insurance. Losses sustained by theft, either cash or property, are also deductible, if not recovered by insurance.

Above all else, no hard and fast rules may be made that apply to all taxpayers in all circumstances. Presented with certain alternatives and choices, what a given taxpayer should do is as individual as is each taxpayer's income tax return. It has been the purpose of this article—showing by illustration—to point out that taxpayers, by becoming tax-conscious as a year-around state of mind, may be able to meet certain situations and make certain decisions with tax-saving considerations in mind and who may, without violating the tax code, effect material tax savings for themselves in the burdensome tax years ahead of us.

They should develop an inquiring mind taxwise. They should not only ask themselves: "Can I afford this?" and "Is this sound business?" but also add to these queries a new question: *"How will this affect my income tax?"*

—30—

MONTH AFTER MONTH
ARTICLE AFTER ARTICLE
FACT AFTER FACT

...pointing your way to leadership in the radio servicing business

RADIO MAINTENANCE Magazine, with its complete, up-to-date coverage of all the problems of a radio shop, can be the secret of your success. For, in each information-packed issue, you get full details about new developments in the industry . . . solutions to both everyday and unusual problems likely to confront you in the shop or on outside jobs . . . descriptions and analyses of new products and equipment . . . comprehensive discussion of various aspects of the industry by qualified authorities. So, with each issue, you move closer to the top in your work. That's why it pays to read RADIO MAINTENANCE from cover to cover when you get it and to keep your copies as a handy library of reference. You'll find that, over a period of time, your file covers everything you need and want to know on every conceivable phase of radio servicing. Yes, you'll always find RADIO MAINTENANCE a real help . . . all ways.

regular monthly features of special help and interest

Radio Service Bench—Service Kit—Electronically Speaking—Review of Trade Literature—Industry Presents (new products)—Radio Men's Opinions

ONE ISSUE FREE

IF PAYMENT IS ENCLOSED

RADIO MAINTENANCE MAGAZINE R. N. 11
460 BLOOMFIELD AVE. MONTCLAIR, N. J.

Please enter my subscription as follows:

For 12 Issues at $2.50 ☐ **For 24 Issues at $4.00** ☐

NAME _____

***OCCUPATION** _____

ADDRESS _____

CITY _____ **ZONE** _____

STATE _____

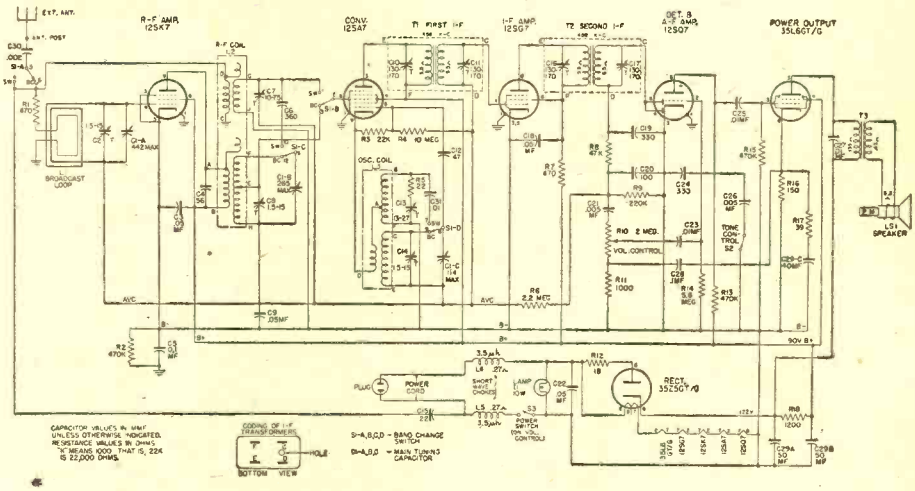
*State whether Radio Serviceman, Jobber or Dealer.

BY SUBSCRIPTION ONLY

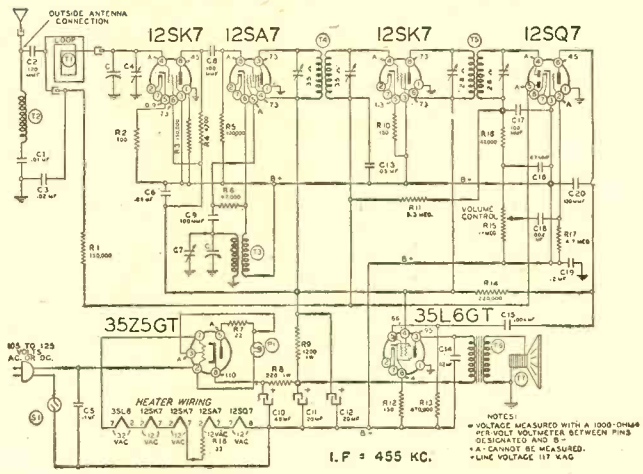
the RN CIRCUIT PAGE

(FOR PARTS LISTS SEE PAGE 70)

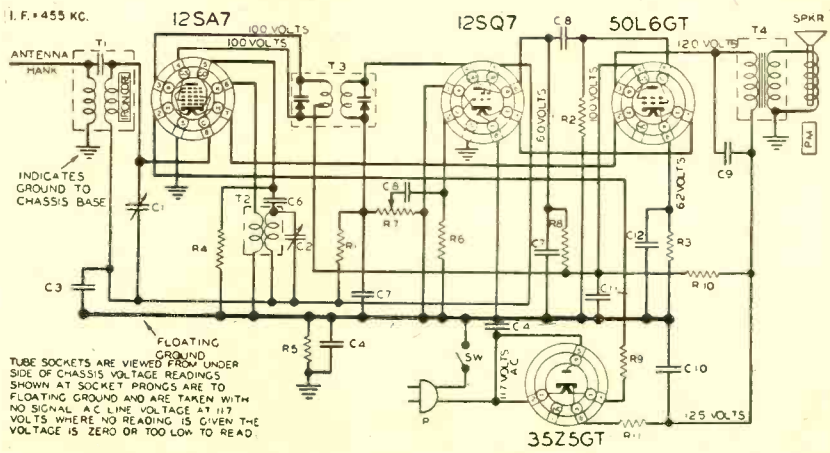
RADIO NEWS, NOVEMBER, 1946 GENERAL ELECTRIC MODELS 219, 220, 221



RADIO NEWS, NOVEMBER, 1946 GRANTLINE MODELS 605, 606

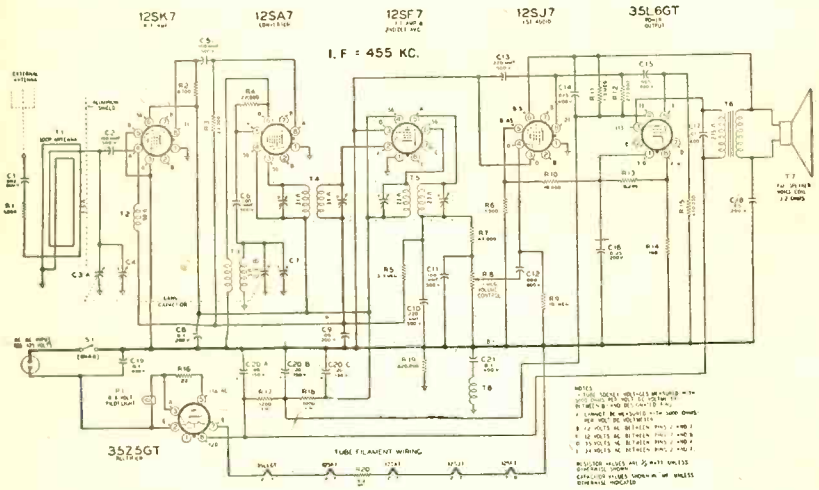


RADIO NEWS, NOVEMBER, 1946 ARVIN MODELS 444, 444A

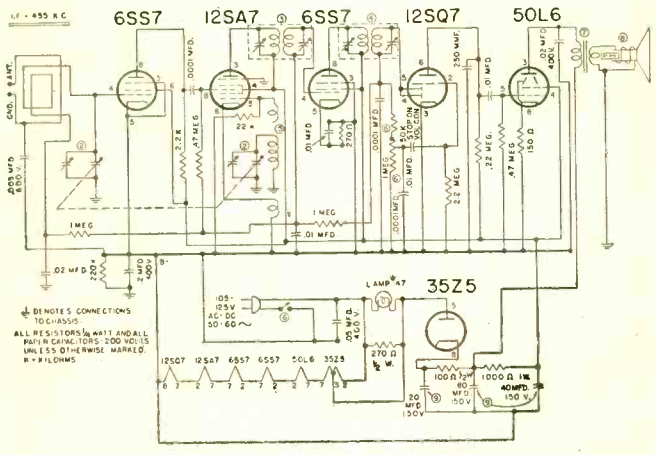


Here, and on following pages, are circuit diagrams and parts lists of many new postwar radio receivers. Radio News will bring to you other circuits as quickly as possible after we receive them from manufacturers.

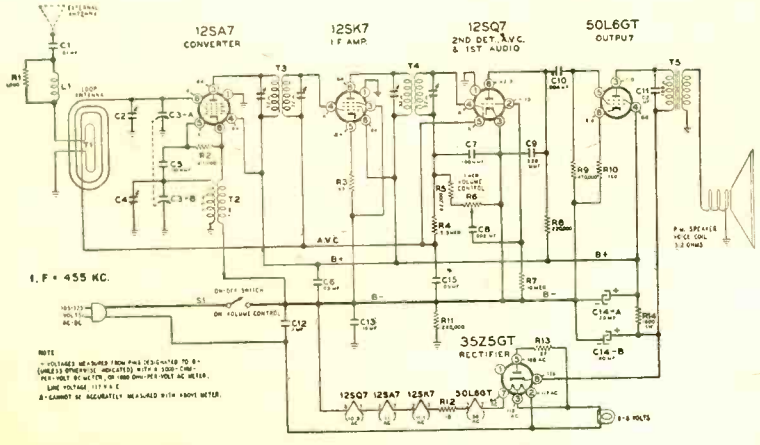
RADIO NEWS, NOVEMBER, 1946 **TRUETONE MODEL D2616**



RADIO NEWS, NOVEMBER, 1946 **GAROD MODEL 6AU-1**



RADIO NEWS, NOVEMBER, 1946 **BELMONT MODEL 5D128**



What's New in Radio

PORTABLE COMBINATION

One of the new combination radio-phonographs to come off the production line at *Viewtone Television & Radio Corporation* is a portable model

which can be carried like luggage or be used as a table model in the home.

An easy-to-operate automatic record-changer handles ten 12″ or twelve 10″ records and features a crystal pickup. The player turns off automatically after the last record in the stack has been played. A self-locking arm protects the unit when the machine is being carried.

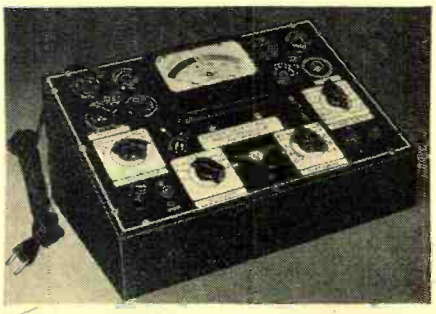
The radio is a five-tube superheterodyne with a.v.c. and a built-in aero loop. The receiver comes in a sturdy, two-tone simulated leather case with lock and key.

Additional information on this combination radio phonograph is available from Charles W. Robbins, national distributor, *Viewtone Television & Radio Corporation,* 81 Willoughby Street, Brooklyn 1, New York.

TUBE TESTER

Radio City Products of New York is currently offering a new tube tester, the Model 322.

A special Dynoptimum circuit permits rapid operation of the instrument with only four controls. This simplicity of operation saves time and reduces obsolescence, according to the manufacturer. Special adaptors are



incorporated in the tester for checking individual sections of multipurpose tubes. A convenient jack is provided for headphone test of noisy, swinging, or high resistance connections.

The tester is available in two types, the Model 322 is open-faced and is housed in a crackle-finish steel cabinet. The Model 322-P is supplied in a black crackle-finish welded metal portable carrying case.

Descriptive material and prices will be furnished by *Radio City Products Company, Inc.,* 127 West 26th Street, New York 1, New York.

POCKET SIZED TESTER

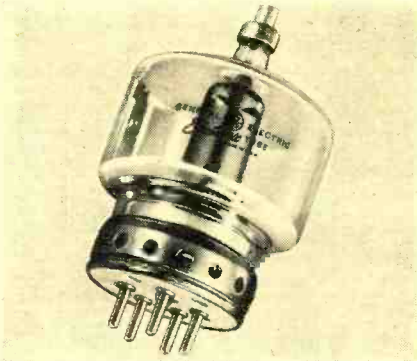
Naken Engineering & Manufacturing Co. of Chicago have recently introduced a pocket-sized continuity tester which houses in one unit all the necessary parts to perform such continuity tests.

The tester consists of a battery, bulb and buzzer with jacks provided for connections and the selection of either bulb or buzzer. The tester may be used in such a way that the self-contained battery is out of the circuit. With this mode of operation the presence of a potential can be detected.

Prices and complete data about this unit will be supplied by *Naken Engineering & Manufacturing Co.,* 25 North Franklin Street, Chicago, Ill.

NEW POWER TETRODE

The Tube Division of *General Electric Company* has announced the production of a new four-electrode transmitting tube, Type GL-5D24 for use



as an amplifier, oscillator or class B modulator.

This tube was designed to provide a basic power tube for FM transmitters. Because of the frequency range that includes the six-meter band, the tube is also applicable in class "C" telegraphy.

Maximum ratings of the GL-5D24 apply up to 85 megacycles. Tests made on the tube show a maximum d.c. plate voltage rating of 3500 volts, a maximum plate input rating of 600 watts and a maximum plate dissipation rating of 200 watts for continuous commercial service. Under intermittent commercial or amateur service conditions the ratings of the d.c. plate voltage, the plate input and the plate dissipation may be increased to 4000 volts, 1000 watts and 250 watts, respectively.

MAKING TUBES IS EASY...

If YOU KNOW HOW!

Hytron commercial engineer makes precision measurements of 50L6GT performance in many typical radio receivers. He then compiles weighted averages of tube characteristics selected to be correlated for functional testing.

Out of the commercial engineer's investigations grows this functional production tester. Combined functional and standardized tests are quicker. Operator can be even more accurate, and you are assured of more uniform performance.

FUNCTIONAL TESTING..

Another HYTRON EXTRA!

You may have discovered that a tube rigidly inspected by standardized testing procedures (JAN, RMA, IRE) still may not perform satisfactorily in your equipment. Ordinary control of basic characteristics may not be enough. Functional dynamic tests—selected and correlated to simulate performance in typical equipment applications—may have to be added.

Simple analogy explains why. Testing of fundamental tube characteristics is like inspection of individual components of multi-ganged tuned circuits. When the tuner is assembled or the tube connected into a circuit, coils and condensers or tube characteristics may not combine properly. Individual variations within tolerances may be in opposition. Operational tests are the only positive checks.

Hytron commercial engineers, therefore, developed functional testers like the illustrated 50L6GT production test kit —essentially a customary equipment circuit. Whether or not a part of the standardized tests, 50L6GT characteristics related to power sensitivity and output are simultaneously checked for smooth dynamic interaction. This comprehensive functional test automatically includes additional minor tests —pertinent but usually omitted from production testing. Hum itself is also measured, because no basic characteristic test controls it adequately.

Functional testing is another Hytron extra. Based on painstakingly acquired know-how, it is often the best and easiest way to assure you of uniform, reliable tube performance in your equipment.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

Further information on the GL-5D24 is available on request to the Tube Division, Electronics Department, *General Electric Company,* Schenectady, New York.

NEW RECORD CHANGER

The Model 70 automatic record changer has recently been added to the *Webster-Chicago Corporation's* line of production and replacement units.

This unit will play a 1⅛" stack of 10 and 12 inch records intermixed. An

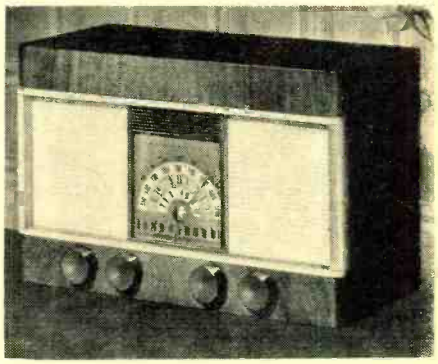
automatic "disengage" device relieves pressure on the rubber drive wheel when the machine is not in use. The Model 70 also includes velocity trip, automatic shut-off, improved rim drive and 4-pole shaded pole motor. The stainless steel spindle is spring cushioned to prevent center hole wear of records.

This model will be available soon through regular distribution channels. Additional data on the Model 70 will be furnished by *Webster-Chicago Corporation,* 5610 Bloomingdale Avenue, Chicago 39, Illinois.

HOME RECEIVER

Hallicrafters Company of Chicago have introduced their first home receiver, the Echophone Model EC-113, a five tube (plus rectifier) a.c.-d.c. table model unit.

An innovation in the form of electric bandspread tuning has been intro-



duced in this receiver. It provides, by means of a separate linear bandspread scale, wide separation of stations at all frequencies in the short-wave ranges.

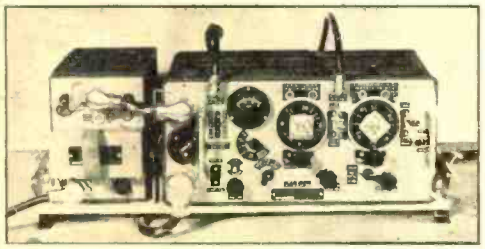
The inside of the cabinet is tropicalized with special aluminum base seal coating.

Terminals have been provided for external antenna and ground for re-

(*Continued on page* 114)

MINE DETECTORS

TUBES! TRANSFORMERS! CONDENSERS!



NEW COMPLETE TRANSMITTING AND RECEIVING SETS **$68.50**

No. 19—Mark I-II-III Tank, made by Zenith & Emerson, lend-lease Russia.

Trans. 6 tubes 807 final, grid mod. tel. 2 to 8 meg. cont. var. Includes 80 & 40 m. bands. Receiver 6 tube Super-Het. Also included intercom. Sys. 3 control boxes, 3 Comb. head phones & mikes; power supply, dynamotor, 12 volts. Ideal for mobile or marine. Also includes ant., variometer. Shipping weight in crates 300 lbs. (& spare set of tubes).

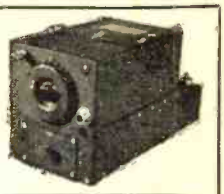
AMERTRAN PLATE TRANSFORMER! 115v-60 cycle primary. 6200 volt-ct-700 mil secondary, also tapped at 2850v. Size 11" x 14" x 10". This buy goes for **$39.95**

HI-VOLT TRANSFORMER ½ WAVE RECTIFICATION 115v-60c/3200v @ 150 mils. MADE BY KENYON .. **$9.95**

NEW USN NAVY MODEL RAK-7 SHIP RECEIVER

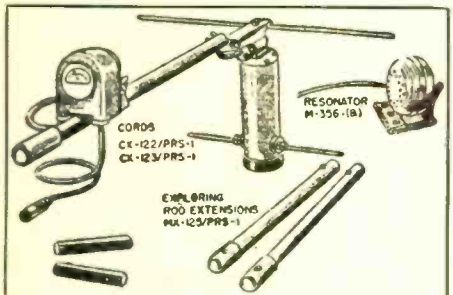
15 kc to 600 kc. 6-tube receiver with: AVC-Band pass filter—Audio filter Noise limiter—Precision tuning with a Vernier dial — Voltage regulated power supply, with three tubes, for 60 cycle, 115 volts. Can be battery operated. Complete with spare parts box weighing 73 lbs., spare tubes and inst. book **$73.50**

NAVAL AIRCRAFT RADIO



NEW ARC-5 SUPERHET RECEIVERS. Tubes (included) 3—12SK7; 1—12K8; 1—12SR7; 1—12AG7. Range (specify freq. desired): 190-550 Kc; 1.5-3 mc; 3-6 mc; 6-9.1 mc. Power: 24-28 VDC. Unit and Dynamotor..... **$37.50**

NEW ARC-5 TRANSMITTERS: 25 watts CW; 15 watts phone. Tubes (included): 2—1625; 1—1629; 1—1626; 1—6200 Kc crystal RANGE: (specify freq. desired): .5-.8 mc; 8-1.3 mc; 1.3-2.1 mc; 3-4 mc; 4-5.3 mc; 5.3-7 mc; 7-9.1 mc. POWER: 24-28 VDC. MODULATOR with: 1-1625; 1VR-150; 1-12J5 28V Dynamotor **$59.50**
Extra $16.00



NEW/AN/PRS-1/MINE DETECTORS

—For detecting metallic and non-metallic materials by indicating either aural or visual means or both.
Set consists of:
Detector head, antenna and reflector, meter and housing (illust.)
Amplifier assembly AM-32/PRS-1, complete
Headset HS-30-B.
Operates from two 45v; one 6v; one 3 volt. batteries. (Batteries not included.) Worth approximately $175.
Complete unit with tubes..... **$27.50**

NEW CATHODE RAY TUBES!!!

Made by North American Philips. These tubes are listed at five to six times our price!

Tube	Approx. List Price	Cost
3BP1	$15.00	$3.95
3BP1	15.00	3.95
3FP7	27.00	5.95
5BP1	20.00	4.95
5BP4	27.00	5.95
5CP1	28.00	4.95
5CP7	45.00	6.00
5FP4	32.00	4.95
5FP7	37.00	6.25
5JP1	50.00	13.50
5JP2	48.00	13.50
5LP1	41.00	8.00

Sockets for the 5CP1 and similar types $0.95
We have many of these tubes in quantity for manufacturers. INQUIRE

TRANSMITTING CONDENSERS

A. Cardwell type TC-300-US. 300 mmf. max. .2" spacing between plates. Ruggedly constructed. List value of $40.50. Our new low price..... **$9.85**
B. Johnson type 500D35. Maximum cap. 500 mmf, min 35 mmf. .08" spacing, 3500v. Listed at $11.75. Lowered to..... **$4.75**

PULSE AMPLIFIER

Signal Corps type BC409. Designed for 115 volts, AC 60 cycles. Component parts worth several times the price of this unit. Slightly used. Following are a few of the items that make up the unit.
1—304TL (Eimac).
3—2 mfd. 4,000 W.V. GE Pyranol condensers.
1—3200 volt. 150 MA power transformer.
1—Varine 5 amps. General Radio type CU 200.
1—5 volt. 20 Amp. fil. transformer (for 304 TL).
1—2.5 volt. 10 Amp. fil. transformer (5000 volt. insulation).
1—1 mfd. 1,000 volt. GE Pyranol. With
1—2 mfd. 1,000 volt. GE Pyranol. Tubes **$59.50**

U.H.F. Receiver, from SCR-268

Tunes from 201-210 mcs. Has 15 tube superhet circuit. Uses 6 acorn tubes in RF; 4 6SK7's in I-F stage designed for 20 mc, with 2 mc bandwidth. Designed for use on 115v/60c.
New low price with 15 tubes.... **$21.95**
With Tuning Motor.....$24.95

1-F Crystal filter for BC-312, BC-342. Resonant at 470 kc. Crystal incl. **$6.95**

TS-13 handset with 50-ohm mike 200-ohm phone. 1 each PL-55 & PL-68. Selling brand new .. **$5.95**

SPECIAL Price
HURRY!!

RG—8/U.. .05 per foot
RG—9/U. .05 per foot
RG—58/U. .05 per foot
Minimum order $1.50
Limited Stock at This

TRANSFORMERS

Modulation XFMR: 807 to pair of 807's	$ 1.65
Modulation XFMR: For 211's cl. A, 50 Watts	1.10
Modulation XFMR: 811's to 813	5.00
Driver: 6V6 to pair 811's	3.00
CHI Trans. P.P. Mod. & Driver, 6L6's—per pair	3.30
PWR: 115 v. 60c/330-0-330, 85 ma/6.3 v., 7.5a/5v-2a/6.3v-3a	3.95
PWR: 115 v. 60c/750v-110 ma/c.t./6.3v-5a/5v-3a	5.95
H.V. Plate: 115v60c/2750v-750 ma oil, Navy Specs	35.00
Swinging Choke: 2.5 hy @ 375 ma.; 10 hy @ 75 ma.	3.95

TRANSMITTER PARTS

GE Pyranol 23F47 2 mfd 4000 VDC (List $30)	5.95
SANGAMO G-4 Mica .004 mfd. 20,000 V (List $110)	25.50
Mica, Sangamo F3L .0005-8000 VDC (list $29)	5.25

Oscilloscope Transformer, Ideal for 7 inch tubes, 9000 volts @ 10 ma. This unit, list for $25.50 is..... $11.95

Condenser Special. 4000 mfd @ 30
Listed at $13.50 released for..... $ 2.40

BX-4 Battery box used with the BC-178 Receiver - transmitter. Will hold 2-# 6 1½ volt dry cells; 4-22½v. "B" batteries; 1-4½v. "C" batteries. Ideal for a portable test unit or a set **$1.95**

SEND FOR OUR CATALOG
All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City.
Send Money Order or Check. Shipping charges sent C.O.D. Send for Flyers.

COMMUNICATIONS EQUIPMENT CO.

131-A LIBERTY ST., NEW YORK 7, N. Y. TELEPHONE WH 4-7658

ALSO
LARGE INVENTORY OF 400 CYCLE TRANSFORMERS. SEND FOR LIST.

Parts Lists

(FOR CIRCUIT DIAGRAMS APPEARING ON PAGES 64 AND 65)

TRUETONE—MODEL D2616

Part No.	Code and Description
C-9B1-62	R_1—1000 ohm, ½ w. res.
C-9B1-70	R_2—4700 ohm, ½ w. res.
C-9B1-80	R_3—33,000 ohm, ½ w. res.
C-9B1-78	R_4—22,000 ohm, ½ w. res.
C-9B1-34	R_5—3.3 megohm, ½ w. res.
C-9B1-64	R_6—1500 ohm, ½ w. res.
C-9B1-82	R_7—47,000 ohm, ½ w. res.
A-10A-10642	R_8, S_1—Vol. control and sw.
C-9B1-37	R_9—10 megohm, ½ w. res.
C-9B1-77	R_{10}—18,000 ohm, ½ w. res.
C-9B1-32	R_{11}—1.5 megohm, ½ w. res.
C-9B1-91	R_{12}—270,000 ohm, ½ w. res.
C-9B1-73	R_{13}—8200 ohm, ½ w. res.
C-9B1-53	R_{14}—180 ohm, ½ w. res.
C-9B1-94	R_{15}—470,000 ohm, ½ w. res.
C-9B1-3	R_{16}—22 ohm, ½ w. res.
C-9B2-63	R_{17}—1200 ohm, 1 w. res.
C-9B2-62	R_{18}—1000 ohm, 1 w. res.
C-9B1-90	R_{19}—220,000 ohm, ½ w. res.
C-9B2-44	R_{20}—33 ohm, 1 w. res.
C-8D-10778	C_1—.002 μfd., 600 v. cond.
C-8F3-8	C_2, C_5, C_6, C_{11}—100 μμfd., 500 v. mica cond.
B-8A-10827	C_{3a}, C_{3b}, C_4, C_7—Two-gang cond. assembly including antenna and osc. trimmers. Range of gang: 15-452 μμfd. (ant.) 10-162 μμfd. (osc.)
C-8D-10771	C_8—.1 μfd., 200 v. cond.
C-8D-10770	C_9, C_{18}—.05 μfd., 200 v. cond.
C-8F3-10	C_{10}, C_{13}—220 μμfd., 500 v. mica cond.
C-8D-10788	C_{12}—.004 μfd., 600 v. cond.
C-8D-10997	C_{14}—.025 μfd., 400 v. cond.
C-8D-10935	C_{15}—.005 μfd., 600 v. cond.
C-8D-10775	C_{16}—.25 μfd., 200 v. cond.
C-8D-10761	C_{17}—.01 μfd., 400 v. cond.
C-8D-10760	C_{19}, C_{21}—.1 μfd., 400 v. cond.
A-8C-10077	$C_{20-a, b, c}$—60/40/40 μfd., 150 v. elec. cond. (25 cycles)
A-8C-10946	$C_{20-a, b, c}$—40/20/20 μfd., 150 v. elec. cond. (60 cycles)
C-201-10908	T_1—Loop antenna assembly
A-16A-12161	T_2—R.f. choke coil
A-13D-10661	T_3—Osc. coil
B-13B-10091-1	T_4—Input i.f. trans.
B-13B-10794	T_5—Output i.f. trans.
B-12C-10623	T_6—Output trans. for speaker
B-18A-10647	T_7—6"x4" oval PM speaker
A-16A-10792	T_8—I.f. choke coil

GRANTLINE—MODELS 605, 606

Part No.	Code and Description
C-9B1-26	R_1 R_3—150,000 ohm, ½ w. res.
C-9B1-50	R_2—100 ohm, ½ w. res.
C-9B1-70	R_4—4700 ohm, ½ w. res.
C-9B1-25	R_5—100,000 ohm, ½ w. res.
C-9B1-82	R_6—47,000 ohm, ½ w. res.
C-9B1-42	R_7—22 ohm, ½ w. res.
C-9B2-54	R_8—220 ohm, 1 w. res.
C-9B2-63	R_9—1200 ohm, 1 w. res.
C-9B1-52	R_{10}, R_{12}—150 ohm, ½ w. res.
C-9B1-34	R_{11}—3.3 megohm, ½ w. res.
C-9B1-29	R_{13}—470,000 ohm, ½ w. res.
C-9B1-27	R_{14}—220,000 ohm, ½ w. res.
101193	R_{15}, S_1—Vol. control and sw.
C-9B1-23	R_{16}—47,000 ohm, ½ w. res.
C-9B1-35	R_{17}—4.7 megohm, ½ w. res.
C-9B2-44	R_{18}—33 ohm, 1 w. res.
B-8A-10211	C, C_4, C_7—Two-gang cond. including antenna & osc. trimmers
C-8D-10761	C_1—.01 μfd., 400 v. cond.
C-8F3-114	C_2—120 μμfd., 500 v. mica cond.
C-8D-10774	C_3, C_{14}—.02 μfd., 400 v. cond.
C-8D-10760	C_5—.1 μfd., 400 v. cond.
C-8D-10775	C_6—.25 μfd., 200 v. cond.
C-8F3-8	C_8, C_9, C_{17}, C_{20}—100 μμfd., 500 v. mica cond.
11994	C_{10}, C_{11}, C_{15}—40/20/20 μfd., 150 v. elec. cond. (60 cycles)
11995	C_{10}, C_{11}, C_{15}—60/40/40 μfd., 150 v. elec. cond. (25 cycles)
C-8D-10770	C_{13}—.05 μfd., 200 v. cond.
C-8D-10788	C_{15}—.004 μfd., 600 v. cond.
C-8F3-6	C_{16}—47 μμfd., 500 v. mica cond.
C-8D-10778	C_{18}—.002 μfd., 600 v. cond.
C-8D-10942	C_{19}—.2 μfd., 400 v. cond.
B-212-11062	T_1, T_2—Loop antenna assembly
A-13D-10215	T_3—Osc. coil
108140G	T_4—Input i.f. coil
108145C	T_5—Output i.f. coil
10595B	T_6—Output trans.
114191B	T_7—5" PM speaker

GENERAL ELECTRIC—MODELS 219, 220, 221

Part No.	Code and Description
URD-041	R_1, R_7—470 ohm, ½ w. res.
URD-113	R_2, R_{13}, R_{15}—470,000 ohm, ½ w. res.
URD-081	R_3—22,000 ohm, ½ w. res.
URD-145	R_4—10 megohm, ½ w. res.
URD-009	R_5—22 ohm, ½ w. res.
URD-129	R_6—2.2 megohm, ½ w. res.
URD-089	R_8—47,000 ohm, ½ w. res.
URD-105	R_9—220,000 ohm, ½ w. res.
RRC-004	R_{10}—2 megohm vol. control
URD-049	R_{11}—1000 ohm, ½ w. res.
URE-007	R_{12}—18 ohm, 1 w. res.
URD-139	R_{14}—5.6 megohm, ½ w. res.
URD-029	R_{16}—150 ohm, ½ w. res.
URD-015	R_{17}—39 ohm, ½ w. res.
URF-051	R_{18}—1200 ohm, 2 w. res.
RCT-004	C_1, C_7, C_8, C_{14}—Main tuning capacitor assembly
RCY-002	C_2—1.5-15 μμfd., trimmer cond.
UCC-045	C_3, C_9, C_{18}, C_{22}—.05 μfd., 600 v. cond.
RCU-053	C_4—56 μμfd., mica cond.
RCC-046	C_5, C_{28}—.1 μfd., 600 v. cond.
RCU-164	C_6—360 μμfd., mica cond.
RCU-110	C_{12}—47 μμfd., mica cond.
RCY-003	C_{13}—13-27 μμfd., trimmer cond.
RCU-108	C_{15}—22 μμfd., mica cond.
RCU-115	C_{19}, C_{26}—330 μμfd., mica cond.
RCU-112	C_{20}—100 μμfd., mica cond.
UCC-039	C_{21}—.005 μfd., 600 v. cond.
RCC-045	C_{25}—.05 μfd., 600 v. cond.
RCC-040	C_{23}, C_{25}, C_{27}, C_{31}—.01 μfd., 600 v. cond.
RCC-004	C_{26}—.005 μfd., 600 v. cond.
RCE-001	C_{29a}, C_{29b}, C_{29c}—50/50/40 μfd., 150/150/25 v. elec. cond.
UCC-036	C_{30}—.002 μfd., 600 v. cond.
RLL-003	L_1—Loop assembly
RLB-001	L_2—R.f. coil
RLC-003	L_3—Osc. coil
RLI-001	L_4, L_5—Power cord choke coil
RTL-001	T_1—First i.f. trans. assembly
RTL-002	T_2—Second i.f. trans. assembly
RTO-003	T_3—Output trans.

GAROD—MODEL 6AU-1

Part No.	Code and Description
1.411	1—Loop assembly
2.163	2—Two-gang var. cond.
1.259	3—First i.f. trans.
1.409	4—Second i.f. trans.
1.402-1	5—Osc. coil
8.200	6—Vol. control & sw.
9.200	7—Output trans.
30.300	8—5" PM speaker
5.400-7	9—80/40/20 μfd., elec. cond.

BELMONT—MODEL 5D128

Part No.	Code and Description
C-9B1-13	R_1—1000 ohm, ½ w. res.
C-9B1-82	R_2—47,000 ohm, ½ w. res.
C-9B1-46	R_3—47 ohm, ½ w. res.
C-9B1-34	R_4—3.3 megohm, ½ w. res.
C-9B1-85	R_5—82,000 ohm, ½ w. res.
101198	R_6, S_1—1 megohm vol. control & sw.
C-9B1-37	R_7—10 megohm, ½ w. res.
C-9B1-27	R_8, R_{11}—220,000 ohm, ½ w. res.
C-9B1-29	R_9—470,000 ohm, ½ w. res.
C-9B1-53	R_{10}—180 ohm, ½ w. res.
C-9B1-41	R_{12}—18 ohm, ½ w. res.
C-9B1-43	R_{13}—27 ohm, ½ w. res.
C-9B1-64	R_{14}—1500 ohm, 1 w. res.
C-8D-10761	C_1—.01 μfd., 400 v. cond.
B-8A-10754	C_{3a}, C_{3b}, C_2 C_4—Two-gang, including antenna and osc. trimmers. Range of gang: 11-388 μμfd. (ant.) and 8.5-162 μμfd. (osc.)
C-8F3-8	C_5, C_7—100 μμfd., mica cond.
C-8D-10770	C_6, C_{15}—.05 μfd., 200 v. cond.
C-8D-10789	C_8—.002 μfd., 600 v. cond.
C-8F3-10	C_9—220 μμfd., mica cond.
C-8D-10788	C_{10}—.004 μfd., 600 v. cond.
C-8D-10774	C_{11}—.02 μfd., 400 v. cond.
C-8D-10760	C_{12}—.1 μfd., 400 v. cond.
C-8D-10953	C_{13}—.15 μfd., 400 v. cond.
11992	C_{14a}, C_{14b}—40/20 μfd., 150 v. elec. cond. (60 cycles)
11993	C_{14a}, C_{14b}—60/40 μfd., 150 v. elec. cond. (25 cycles)
12311	L_1—Load coil
C-212-10895	T_1—Loop ant. assembly
A-13D-10748	T_2—Osc. coil
B-13B-10091	T_3—Input i.f. transformer
B-13B-10812	T_4—Output i.f. transformer
B-12C-10735	T_5—Output transformer

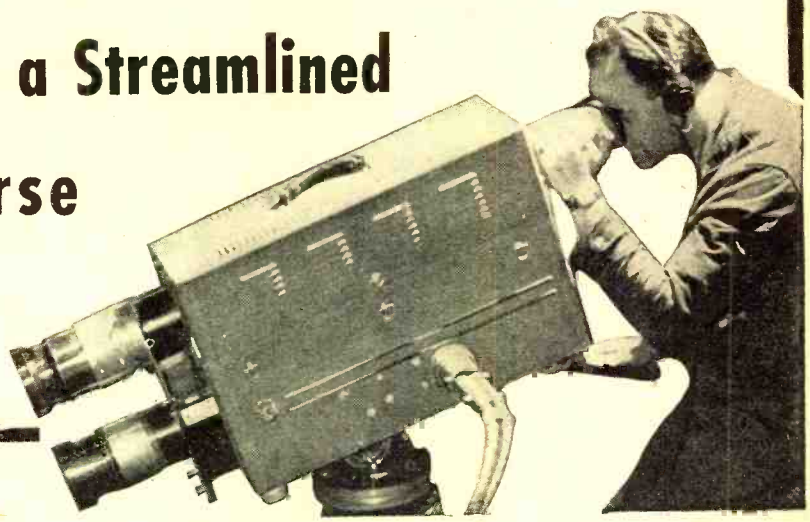
ARVIN RADIO—MODELS 444, 444A

Part No.	Code and Description
	R_1—4.7 megohm, ¼ w. res.
	R_2—1 megohm, ¼ w. res.
	R_3—150 ohm, ¼ w. res.
	R_4—22,000 ohm, ¼ w. res.
	R_5—330,000 ohm, ¼ w. res.
	R_6—15 megohm, ¼ w. res.

ONE OF OUR MOST IMPORTANT ANNOUNCEMENTS IN 19 YEARS OF PROVEN LEADERSHIP IN TRAINING PROFESSIONAL RADIO MEN!

Here it is! Your first practical step toward a good-paying career in TELEVISION....

CREI Introduces a Streamlined Home Study Course in Practical



Television ENGINEERING

AVAILABLE NOW - FOR THE FIRST TIME!

Here's Your Chance to "Get in on the Ground Floor" of Television Opportunities

Don't say, "I never had a chance!" Prepare NOW for the good paying jobs awaiting trained television engineers and technicians. Be in a position to command a "key" job in the growing TELEVISION Industry by preparing now with the type of thorough, practical TELEVISION Engineering training that the industry requires. The new CREI TELEVISION Engineering course is (1) A complete well-coordinated course of study that covers the entire field of practical TELEVISION Engineering (2) Presented in CREI's professional and proven home study form (3) Prepared by CREI's experienced staff, based on actual experience in our own TELEVISION Studios and Laboratories, plus years of close contact with leaders in television development. Here's your opportunity to be prepared for television well ahead of competition, if you start NOW!

CAPITOL RADIO ENGINEERING INSTITUTE

DEPT. RN-11, 16th and PARK ROAD, N. W., WASHINGTON 10, D. C.

***Just off the press!* Mail Coupon for complete Free Details and Outline of the Course**

If you have had professional or amateur radio experience and want to prepare for opportunities in TELEVISION, let us prove to you we have the training you need to qualify. To help us intelligently answer your inquiry—Please STATE BRIEFLY YOUR BACKGROUND OF EXPERIENCE, EDUCATION AND PRESENT POSITION.

CAPITOL RADIO ENGINEERING INSTITUTE RN-11
16th and Park Road, N.W., Washington, D. C.

Gentlemen: Please send me complete details describing the new CREI home study course in Practical Television Engineering. I am attaching a brief résumé of my experience, education and present position.

NAME .....

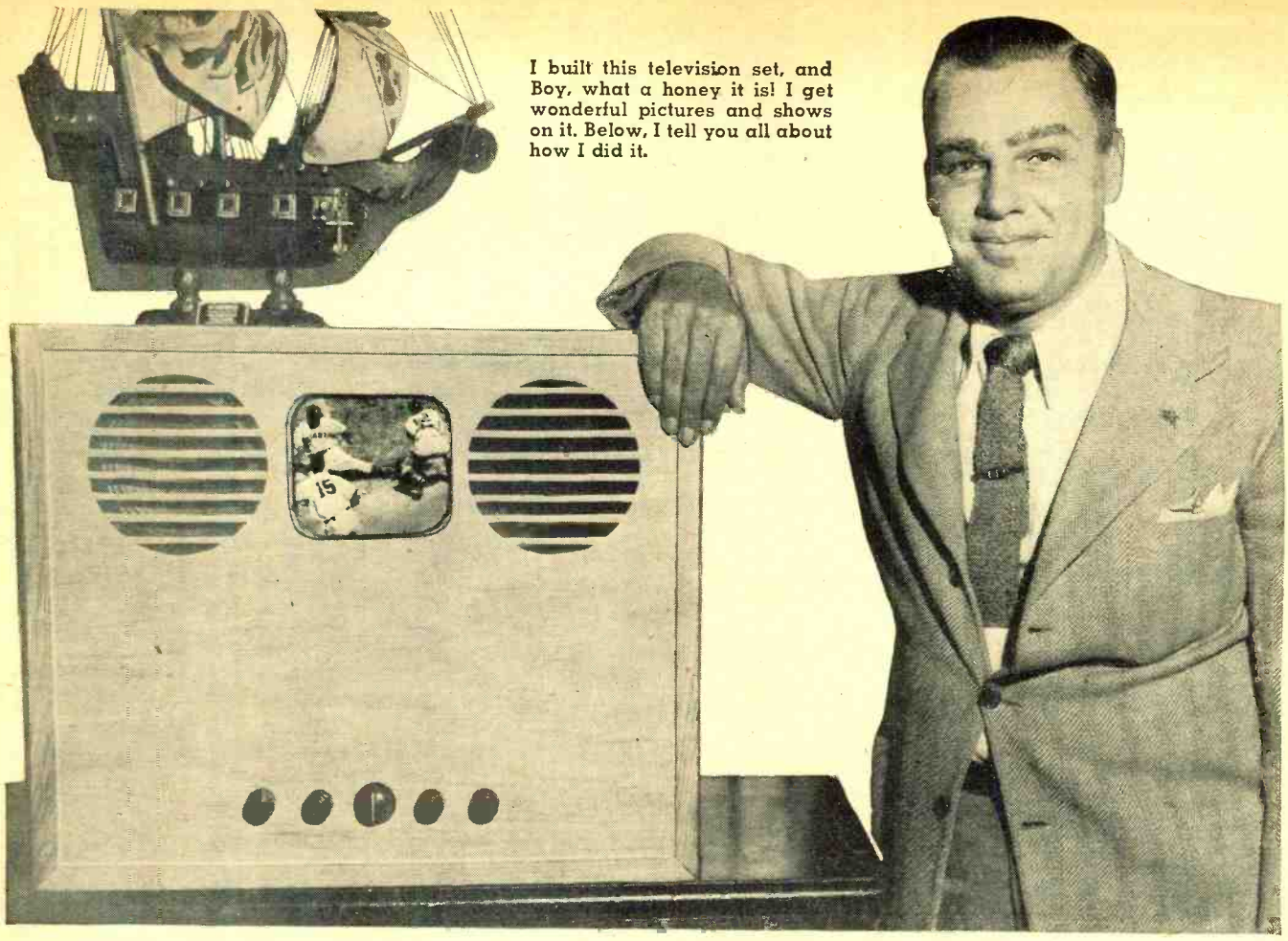
STREET .....

CITY ..... ZONE ..... STATE .....

OCCUPATION .....

☐ I am entitled to training under the G.I. Bill.

Member of National Home Study Council—National Council of Technical Schools—and Television Broadcasters Association

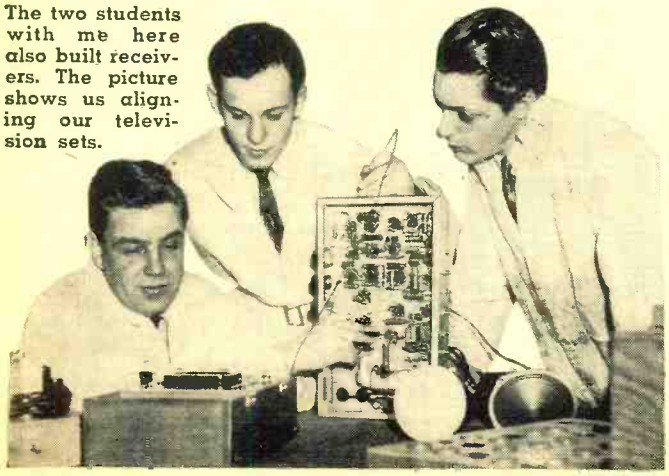


I built this television set, and Boy, what a honey it is! I get wonderful pictures and shows on it. Below, I tell you all about how I did it.

How I Built My Own Television Receiver

By BILL NAGEL

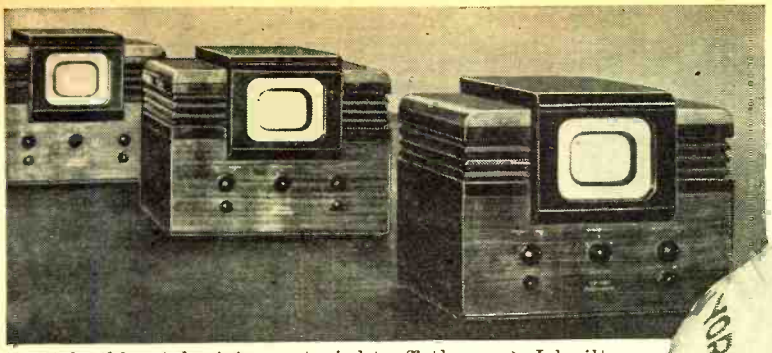
NOT very long ago, television was a complete mystery to me. But not only did I build a complete television receiver chassis—I had a lot of fun doing it. And I've learned so much in a practical way that I'm well on the road to becoming an expert. In a few years from now I'll be able to "write my own ticket."



The two students with me here also built receivers. The picture shows us aligning our television sets.

I always had a yen to get into television, even while I was still in the service. But I didn't know just how to go about it—until I heard about the N.Y.T.I. of N.J. I went there with my discharge papers, and they did the rest. They showed me how the Veterans Administration would pay up to $500 a year against my total educational expenses, under the G. I. Bill of Rights. This meant that I had to pay very little out of my own pocket. It's a big break for veterans like myself—especially when you get subsistence allowances in addition. And part-time jobs are easy to get so you can earn extra money. I held a job all the time I was in school. Of course, all of the students here aren't veterans.

What bothered me at first, was that my mathematics was kind of rusty. It had been some years since I had got out of high school. I soon found that the school had brush-up courses in math and even had facilities for teaching radio math from the beginning to students who had never had the advantage of a high school education. I convinced them that I was sincere and enthusiastic and that I was technically inclined, and so I became a student. Then the fun began. You know, you just



Here is a line of RCA television receivers that I and my fellow students use for comparative test purposes at N.Y.T.I. of N.J. The very latest equipment in television is ours to inspect and study at the school.

can't build a television set right off the reel. I built seven radio sets and had to go through a total of 75 practical electronic experiments, before they would even let me start on a television receiver.

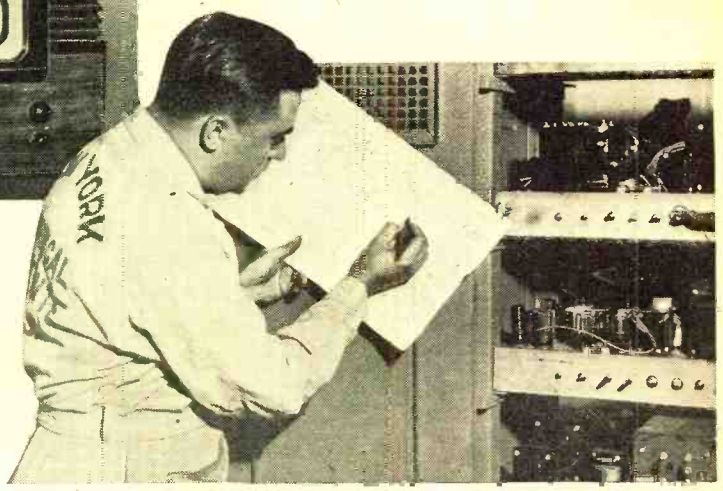
Then I began work in earnest. The instructors around here have plenty on the ball, and it was amazing how fast I progressed. I can't go into all the details here, but I turned out the swell television set you see in the photo. I look mighty proud of myself, don't I? I guess I am.

Boy, school was never like this. You should see the magnificent equipment. Finest in the world! There's a swell gang here—all interested in learning—all radio bugs. They come from all over, because practical television schools are hard to find, and the N.Y.T.I. of N.J. has a wonderful rep when it comes to television. You should see the image-orthicon television camera tube they have here at the school. Imagine a little tube that costs $795! The school cooperates in every way—I don't believe that you can find better training anywhere.

Another thing I like about the N.Y.T.I. of N.J. (which stands for the New York Technical Institute of New Jersey) is the convenient location. It's right in the *heart* of America's electronic industry, (Newark, N. J.), only 19 minutes from New York City. It's close to everything. Big radio, television and electronics manufacturers are nearby—like RCA, General Electric, Western Electric, DuMont, and Edison. So are the big network stations like WJZ, WEAF, WABC, and WOR. This means that the school is always right in touch with the latest developments in radio and television.

The conditions here are really ideal. They have thousands and thousands of dollars worth of the latest types of equipment. In fact, I estimate that each student uses $3,500 worth of experimental and test equipment. And there is a great deal of individual instruction. Classes are small and the instructors really know their business.

I am sure there are a lot of young fellows, particularly veterans, (I was discharged because of disability), who want to get into this field. I understand there are about 120 openings for new day students in the classes beginning this November and December. If you want to get the complete dope about the school, you can have a free bulletin, which illustrates and describes its facilities and equipment; it also tells the classes that may be attended, housing conditions, costs, hours, etc. There is no charge for this bulletin. Just drop a postcard and ask for Bulletin 111. Send your postcard or letter to the New York Technical Institute of New Jersey, 158 Market Street, Newark, N. J.



I want to learn about television transmitters also. Here you see one we have under construction. I hope to enroll for a special evening class on television transmitters.

These are my fellow class-mates (note that I am second from the left, standing) with the television receiver chassis they built at the same time I built mine. I built the cabinet at home later on. Most of the classes are small, so you are sure of a lot of individual instruction, which is very important in learning the technical side of television.

B18587	*R_7—2 megohm vol. control & sw.*
	R_8—470,000 ohm, ¼ w. res.
	R_9—47 ohm, 1 w. res.
	R_{10}—2200 ohm, 1 w. res.
	R_{11}—15 ohm, ¼ w. res.
B17115	*C_1, C_2—Var. cond.*
	C_3—.05 μfd., 200 v. cond.
	C_4—.05 μfd., 400 v. cond.
	C_5—.005 μfd., 400 v. cond.
	C_6—.00005 μfd., 500 v. cond.
	C_7—.0001 μfd., 500 v. cond.
	C_8—.002 μfd., 500 v. cond.
	C_9—.01 μfd., 400 v. cond.
	C_{10}—40 μfd., 150 v. cond.
A19176	*C_{11}—20 μfd., 150 v. cond.*
	C_{12}—20 μfd., 25 v. cond.
AC18255-1	*T_1—Antenna coil*
AC18256-1	*T_2—Oscillator coil*
AC18157-1	*T_3—I.f. coil*
AC18258-1	*T_4—Output transformer*

—30—

Converting the SCR-522

(*Continued from page 35*)

slides, as well as the crystal switch, are disengaged. The crystal switch is then removed by loosening the screws which hold it in place, and cutting the leads to the switch. The crystal socket is also removed.

The three relays may either be removed or left in place. In any event, it will be necessary to disconnect the relay coils as these are meant to be operated on d.c.

An 8¾" by 19" Masonite panel is used to remount the transmitter. Holes should be drilled to line up with the condenser shafts and the meter switch shaft.

The shafts of the tuning condensers are 5/32" in diameter. This is an awkward dimension for coupling to a standard ¼" shaft. The couplings used were taken from some short lengths of flexible shafting, with the end that formerly held the flexible shafting drilled out to fit the condenser shafts. A felt washer was placed between each knob and the panel to furnish a slight amount of friction and prevent the tuning adjustments being disturbed.

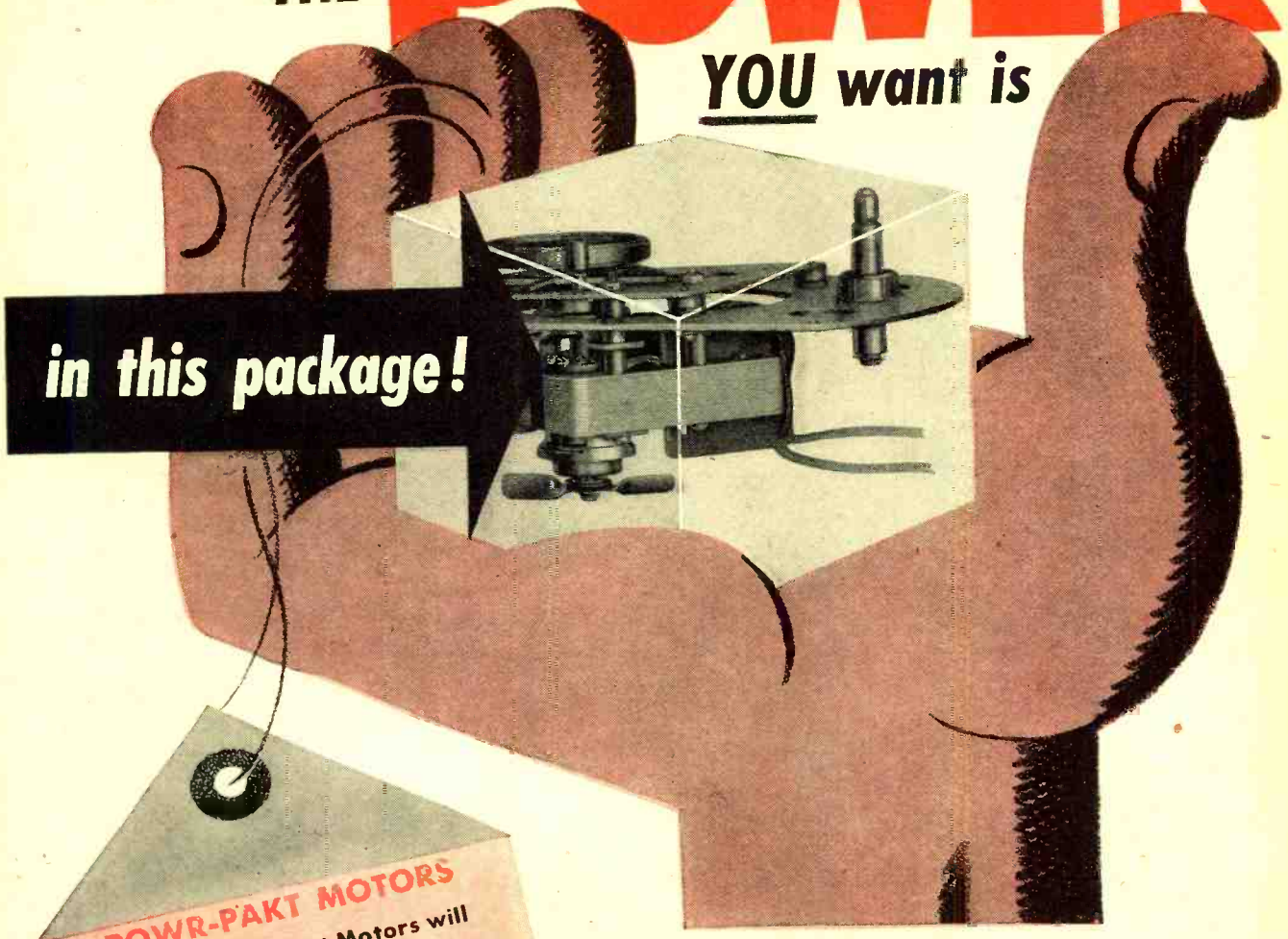
The gain control is relocated on a line with the condenser shafts, just below and to the left of the meter. The gain control is replaced by a standard unit.

The panel is fastened to the transmitter chassis by means of 10-32 machine screws and spacers made from ¼" copper tubing, 1¼" in length. These screws are fastened in the holes formerly occupied by the red painted screws, used to join the transmitter and rack.

Jacks are provided along the lower edge of the panel for microphone and key. The microphone jack is connected to terminals number 1 and 2 on plug 123-1. The keying jack, a closed-circuit type, is connected in series with the ground end of the cathode resistor of the 6SS7 speech tube.

A single-pole, double-throw toggle switch is mounted between the microphone jack and the meter switch, to permit the choice of phone or i.c.w. The leads which now go to the relay number 131 are rewired to this switch. These leads are respectively; the one to the grid of the 6SS7 through the resistor 153-4, which is rewired to the center arm of the switch, the lead

THE POWER YOU want is



POWR-PAKT MOTORS

Alliance Powr-Pakt Motors will open and close valves, switches, operate toys and motion displays, actuate parts in business and vending machines, and can be used as component power sources in electronic control systems.

The Model 80 Phonomotor has been the outstanding favorite of manufacturers and jobbers who want a power source that's smooth, quiet, and time-tested. This is the No. 1 motor for driving turntables and record changers!

For original equipment and replacement, the leading radio manufacturers and jobbers of radio parts *rely* on Alliance Phonomotors and Powr-Pakt Motors to drive their turntables, record changers, recording and tuning devices.

Alliance Motors are mass produced, precision built, and low in cost. Besides Phonomotors, Alliance makes a wide range of small motors designed to meet the special demands of small loads. Write!

WHEN YOU DESIGN—KEEP alliance MOTORS IN MIND

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO

from the gain control, and the one from the junction of resistors 140-4 and 142. Shielded wire should be used for these connections.

Toggle switches are also provided to control the filament and plate supply. The socket for the crystals is remounted on the front panel, and the crystal oscillator rewired for only one crystal. Examination of the circuit diagram furnished with the unit will show how this is accomplished.

The antenna output connector, now in an inaccessible place behind the front panel, is replaced by a conventional coax connector mounted on the rear of the chassis. A terminal strip is also mounted on the rear of the chassis to permit the power supply to be connected.

Power requirements for this unit are 300 volts at 200 ma.; 12.6 volts at 2.35 a.; and 150 volts for bias. Normally this would require two supplies in addition to the heater requirements, but by using a single high voltage supply and grounding a point on the voltage divider, both positive voltage for the plates and negative voltage for the bias supply are available. A suitable supply is diagrammed in Fig. 2. The voltages under load with the components given are, 320 volts for the plates and 160 volts for bias. The power transformer used is one nominally rated to give 500 volts d.c. A dual filament transformer which supplied 5 volts at 3 amps. for the rectifier as well as 6.3 volts was used in conjunction with an additional 6.3 volt transformer to meet the heater requirements. Care should be taken in connecting these two transformers to insure that the 6.3 volt windings add to, and do not oppose, each other. A voltmeter will enable the proper connection to be determined with no difficulty. The entire power unit is built on a 10" by 12" by 3" metal chassis.

To enable metering of the various circuits, a metering circuit with the necessary shunts is built into the transmitter. This circuit is designed for use with a 1 ma. meter. No information is given in the instruction manual as to the internal resistance of this meter, but from the tests made, it is probably of the 100 ohm type. This meter should be connected to the two pins provided alongside the meter switch.

There are six positions provided on this meter switch with only the first five used. Position 1 indicates the plate current of the 12A6 harmonic amplifier, with the meter indicating 50 ma., full scale, in this position. Position 2 meters the plate of the 832 tripler and has a full scale range of 100 ma. Position 3 meters the plate and screen of the final as well as the screen of the tripler, with a full scale reading of 100 ma. Position 4 reads the rectified current of the r.f. diode, the full scale reading in this case being 1 ma. The fifth position measures the grid current of the final with the full scale reading being 2 ma.

The meter should be checked on one

of its ranges by means of a 0-100 ma. meter connected in series with the circuit being metered. Probably the easiest circuit to check is that of the 832 tripler plate. The connection which feeds the "B plus" to the tank circuit of this tube may be found just inside the compartment which houses the final amplifier tube. This connection should be unsoldered and the external meter placed in series with the line.

Comparison of the two readings should now be made. It is probable that the one mil meter will read high. If this is the case, resistance must be added in series with it to bring the reading down to agree with the test meter.

It is only necessary to check the meter on one position of the switch, as once adjusted to the correct reading, the shunts for other positions will be correct.

For appearances sake, nameplates were made up and placed adjacent to the various controls.

When conversion has been completed, the transmitter should be tested by picking a crystal suitable for the final frequency desired, and applying power. The meter switch should be placed in position 1, where it reads the plate current of the 12A6 harmonic amplifier. The oscillator tuning condenser should be tuned for maximum reading on the meter. With the meter switch in position 2, the operation should be repeated, this time tuning the 12A6 plate condenser. The same procedure is followed on position 3, tuning the plate condenser of the 832 tripler. The plate condenser of the 832 final should then be tuned for a dip with the meter switch in position 3.

If the tuning procedure has been properly carried out, all the tuning controls will be in approximately the same position. Any great variation in the position of these tuning controls is an indication that the wrong harmonic has probably been picked.

With the transmitter properly tuned, the antenna may be connected, and the antenna coupling adjusted for proper loading of the final amplifier. This should result in a meter reading of approximately .63 ma. with the meter switch in position 3.

—30—

"Thank you!"

A LINEAR SWEEP GENERATOR

By W. J. HAYWOOD, W2OQB

Construction details for a saw-tooth sweep generator covering 1 to 1,000,000 cycles.

IT IS a well known fact that if a constant current is fed to a high quality condenser, the voltage waveform across the condenser will show a linear rise, while if a very heavy current is drawn from the capacitor, the voltage will drop very steeply—in addition, if the current *withdrawn* is also constant, the voltage will also decrease at a linear rate.

It is therefore possible to represent the ratio of charge to discharge time as I_{ch}/I_{dis}, and if the ratio is made very large, the charge-discharge waveform will be a very sharp saw-tooth, eminently suitable for use in saw-tooth sweep generator circuits.

In listing some of the desirable characteristics of a perfect saw-tooth sweep generator, we might look for:

1. A very high ratio of useful to non-useful waveshape (rapid flyback);
2. Maximum attainable linearity of useful portion (linear sweep);
3. A linear fly-back waveform (although not generally considered, this may be important in order that, in observing a single waveform, the time lost due to flyback may not distort the leading or trailing edges of the waveform since the sweep speed may not be

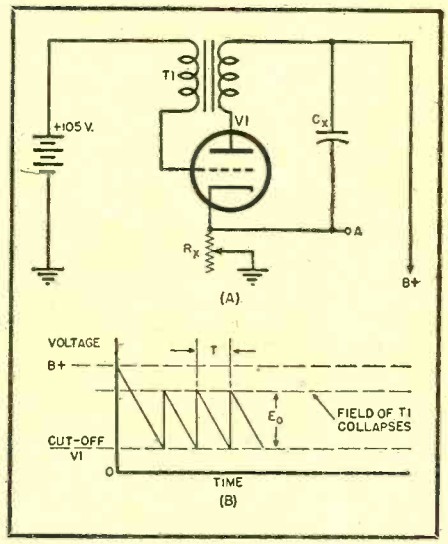
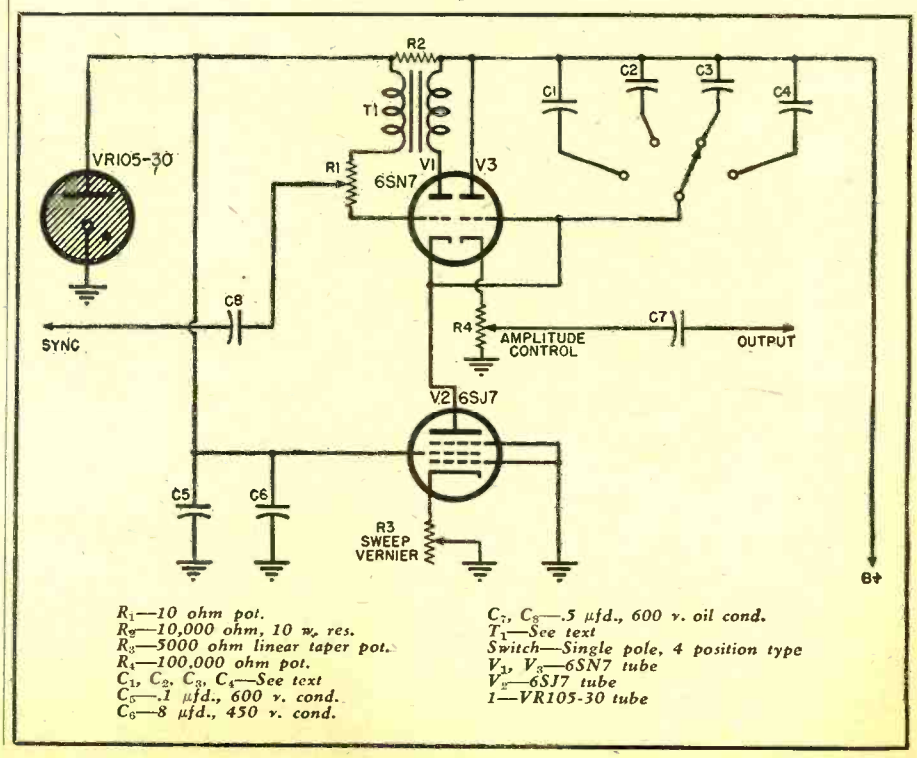


Fig. 2

Fig. 1



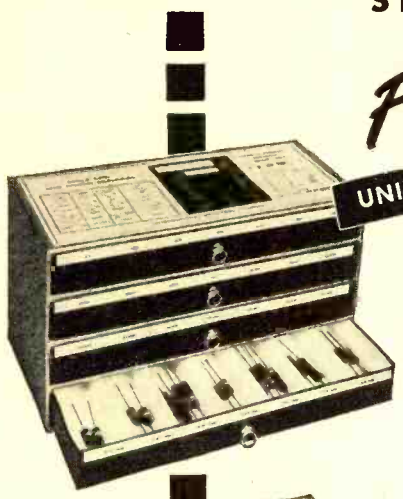
R_1—10 ohm pot.
R_2—10,000 ohm, 10 w. res.
R_3—5000 ohm linear taper pot.
R_4—100,000 ohm pot.
C_1, C_2, C_3, C_4—See text
C_5—.1 μfd., 600 v. cond.
C_6—8 μfd., 450 v. cond.
C_7, C_8—.5 μfd., 600 v. oil cond.
T_1—See text
Switch—Single pole, 4 position type
V_1, V_3—6SN7 tube
V_2—6SJ7 tube
1—VR105-30 tube

YOU CAN GIVE BETTER, FASTER SERVICE with these

3 BALANCED RESISTOR ASSORTMENTS

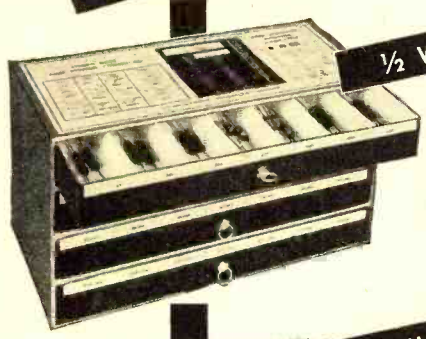
STURDY, HANDSOME Resist-O-Cabinet

FREE WITH EACH ASSORTMENT



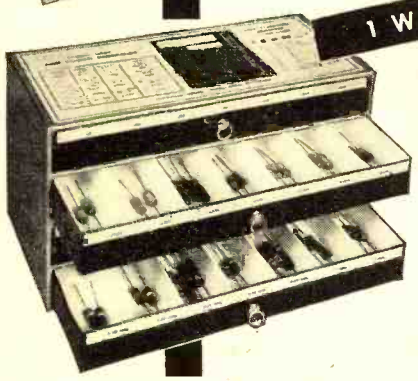
UNIVERSAL ASSORTMENT

Balanced resistor assortment. Includes 59 IRC Type BT Insulated Metallized Resistors and "universal" 10-Watt Power Wire Wound Types AB and ABA. The ABA (adjustable) type makes possible every range from a few ohms up to 10,000 ohms.



½ WATT ASSORTMENT

100 Type BW-½ and BTS Resistors. A complete assortment of most used ranges in the popular ½-Watt Insulated Metallized and Insulated Wire Wound Types.



1 WATT ASSORTMENT

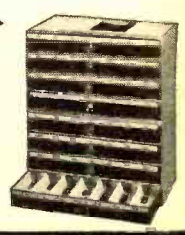
83 Type BW-1 and BTA Insulated Resistors. Every service engineer should have all of these top-quality 1-watt resistance ranges at his fingertips.

No one knows better than you that up-to-the-minute appearance and modern, efficient service pays off in your shop.

That's why IRC offers three Resistor Assortments to equip you for quick, easy resistor replacements on almost any job. Any one or all three IRC assortments, arranged according to type and range, are in neat, sturdy cardboard Resist-O-Cabinets that stack firmly one on top of the other. The cabinets are supplied absolutely *free* with each assortment ordered at standard resistor prices. Get in touch with your IRC distributor *today*

EASY TO STACK——→

Bases of Resist-O-Cabinets are arranged for stacking so that several cabinets may be used to increase stock capacity.



PREFERRED FOR PERFORMANCE · IRC · FIXED & VARIABLE RESISTORS

INTERNATIONAL RESISTANCE CO.

401 N. BROAD ST., PHILADELPHIA 8, PA.

Canadian Licensee: International Resistance Co., Ltd., Toronto

constant at the extreme edges of the scope);

4. Large amplitude waveform (at high sweep rates, 100 kc. or higher; sweep amplifiers must be linear up to the order of several megacycles making desirable a large amplitude waveform to permit the use of direct deflection);
5. Constant amplitude with change in frequency (nothing is more disconcerting to the operator than to run the sweep frequency up a bit, and have to re-set the sweep amplitude or centering controls, or both);
6. Extreme frequency range, very slow to very fast, with few controls (versatility); and
7. Simplicity and economy (no eleven tube, seven control, 565 cubic foot space heaters!).

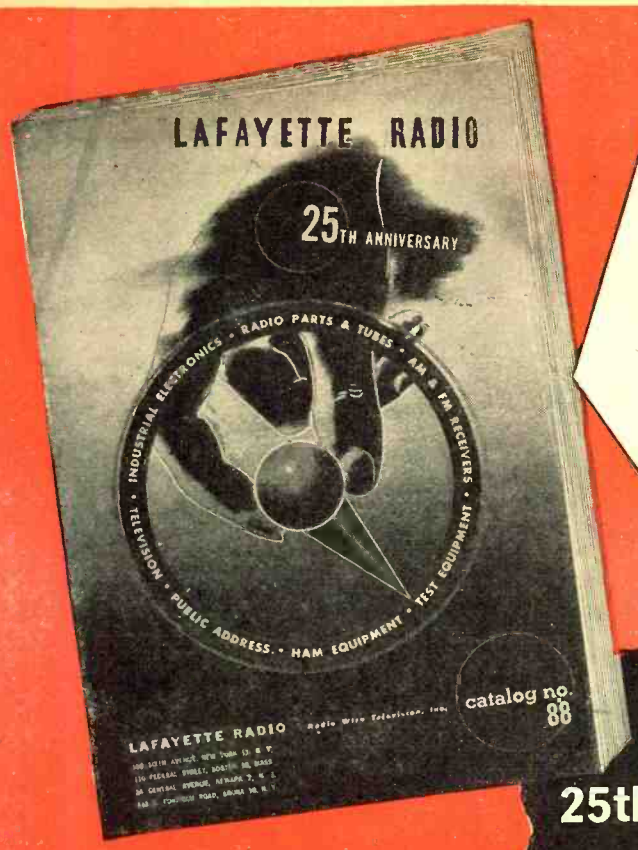
The circuit described herein has been found to meet the above requirements to good effect.

There are several conventional constant current circuits which may be employed to charge or discharge the sweep condenser, together with numerous metastable circuits, such as multivibrators, etc., for the same purpose.

Best results were obtained with a triode blocking oscillator (to discharge the capacity) and a conventional constant current pentode circuit, combined in an unusual manner (see Fig. 1). Upon inspection, it will be seen that a simplified version would resemble Fig. 2. R_x, the variable resistance, is numerically equal to the d.c. plate resistance of V_2, the constant current pentode. Note that only the *plate* current of the pentode is used. For best linearity and range of control, both the suppressor and control grids are grounded.

The action is as follows:

Assume "B" plus is momentarily disconnected, and the filaments of V_1 lighted. Then, the charge on C_x is zero, and no current is flowing in the circuit. If we connect "B" plus, the condenser still has zero charge at the first instant, but the cathode of V_1 is at *"B" plus*. Since the grid is at +105 volts, the tube is cut off. Current flows through R_x to *charge* C_x. Since a constant current flows through R_x (due to E_p/I_p characteristics of the pentode when E_p is greater than E_{sg}), the voltage at point *A* will fall at a *linear* rate from "B" plus to the voltage corresponding to the cut-off bias of the triode. Assume triode cut-off to be 15 volts. Then, when voltage at point *A* has fallen to a value equal to "B"+ minus (the grid voltage +15 v.), the triode conducts. (Note: E_x the voltage across C_x, equals "B"+ minus the cut-off voltage of the tube—increasing "B"+ increases the voltage amplitude at the output). When the triode conducts, plate current flow causes the grid of the tube to be driven positive due to transformer action (regenerative feed-back), which causes the plate current to increase, driving the tube to saturation, provided the constants of the circuit are properly chosen.



YOUR FREE COPY IS READY!

The Complete, New 25th Anniversary Lafayette Catalog of Radio and Electronic Equipment

SPECTACULAR RADIO VALUES!
— HUNDREDS OF CRITICAL PARTS —

Choose the parts you want from our complete stock of over 10,000 guaranteed-quality items. Whatever your needs, supply them from this single, dependable source at money-saving prices. *Lafayette!*

—THE LATEST IN HAM GEAR—

Here is the greatest selection of nationally-known communications equipment: Hallicrafters, National, Hammarlund, R.C.A., Meissner, transmitting tubes, tools and a host of others. Select a "Build-It-Yourself-Kit" and build a complete radio set.

This valuable 144 page catalog offers you the latest, largest line of top-quality *radio parts, amplifiers, test equipment, ham gear, tools, radio sets, phono-radios and other types of electronic equipment and accessories.* Page after page of post-war radio developments —*plus* a special bargain section that lists hundreds of surplus and standard-make radio and electronic parts at slashed-price Lafayette economy. Be one of the first to receive this big, new Lafayette Catalog. It will save you time and money. Rush coupon below today for your FREE copy!

LAFAYETTE RADIO

RADIO WIRE TELEVISION, INC.

100 SIXTH AVE., NEW YORK 13, N. Y. | 110 FEDERAL STREET BOSTON 10, MASS. | 24 CENTRAL AVENUE, NEWARK 2, N. J.

STANDARD PARTS—LEADING BRANDS

Complete line of famous-make radio and electronic equipment of the highest quality. Included are the latest developments. All items are shipped out the same day your order is received. That's Lafayette's famous *Super-Speed* Service.

Paste On Penny Postcard!

MAIL TODAY!

LAFAYETTE RADIO, Dept. RK-6
100 Sixth Avenue, New York 13, N. Y.

Rush my FREE copy of the big, new LAFAYETTE CATALOG.

Name.....

Address.....

City.....Zone.....State.....

Now note that when saturated, the triode discharges the condenser at a *linear* rate and the current under these conditions may reach 200 to 500 milliamperes.

When C_x is discharged, the cathode of V_1 will again be at, or near, "B" plus, and V_1 goes to cut-off. Plate current cannot flow until C_x is charged again, a time determined by R_x. Since R_x is continuously variable, the charge rate of C_x may be varied, and the output frequency of the circuit will be varied in inverse ratio.

Inspection will show that (roughly) f_o will be $1/R_xC_x$, or, more exactly, f_o will be $2I_{Rx}/CE$, indicating that with CE constant, f_o is proportional to I_{Rx}, the charge current of C_x.

Fly-back time depends on two factors:

1. The size of C_x. Since $Q = CE$, where Q = coulombs, then $T = CE/2I$, E being constant and approximately equal to "B"+ minus E_{cutoff}; and I being saturation current of triode;
2. The resonant frequency of T_1. The rate at which I_p of the triode increases to saturation value is a function of the inductance and distributed capacity of the windings. Since the resonant frequency of this combination may be made very high, from two to ten megacycles, this will not affect the *low* frequency output of the sweep circuit, but will tend to limit the upper frequency to approximately one to two megacycles with good waveforms—this is *not* a guess, for we have produced excellent waveforms with a ratio of I_{dis}/I_{ch} of about 15, at a frequency of one mc.

On the other hand, the low frequency output is limited by the fact that as C_x gets larger, the charge time does become in the order of 1 second or more, which is one cycle or less, but note that as $T = CE/2I$ becomes very long, I_{dis}/I_{ch} is also very large, which means that the tube must conduct in the order of *amperes* or the field about the transformer will have collapsed, allowing the tube to go to cutoff before C_x is fully discharged, lowering the available sweep amplitude, although it will *still* be constant with any given size of C_x as R_x is varied.

With a value of 4 μfd. at C_x, sweep waveforms of 150 volts amplitude have been obtained with a frequency of .2 cycles per second, or about 5 seconds-per-sweep.

T_1 must have very tight coupling (powdered iron core preferably) and small physical size. A slight step-up ratio in the plate-to-grid winding is desirable, although too much will limit high frequency because it is not easy to get a high enough resonant frequency in T_1.

In the unit constructed, T_1 was a special transformer with the following specifications:

Primary: 140 turns, No. 32 enameled wire, wound on laminated iron core, ½ on each leg, core size ½" x ½" x 1" high.

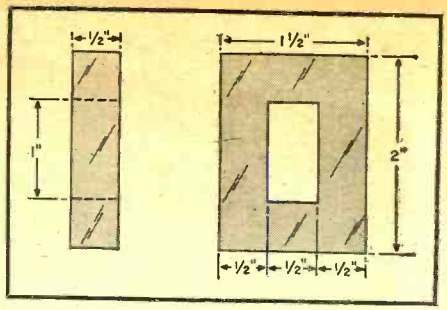


Fig. 3

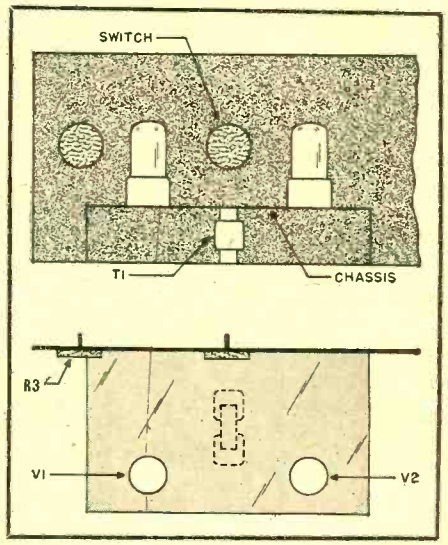


Fig. 4

Secondary: 140 turns No. 32 enameled wire, wound on laminated iron core, ½ on each leg on top of primary.

Core: Finest laminations that can be secured, to make ½" x ½" x 1" stack, shell type winding. (See Fig. 3.)

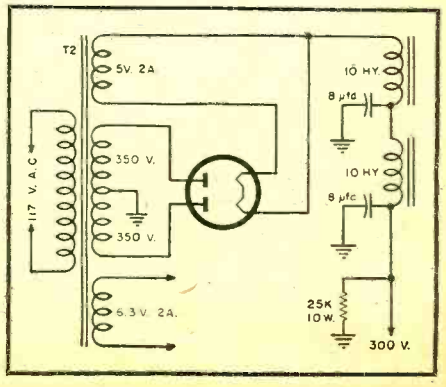
A transformer was also tried, wound on a conventional powdered iron, slug-type antenna coil form, consisting of:

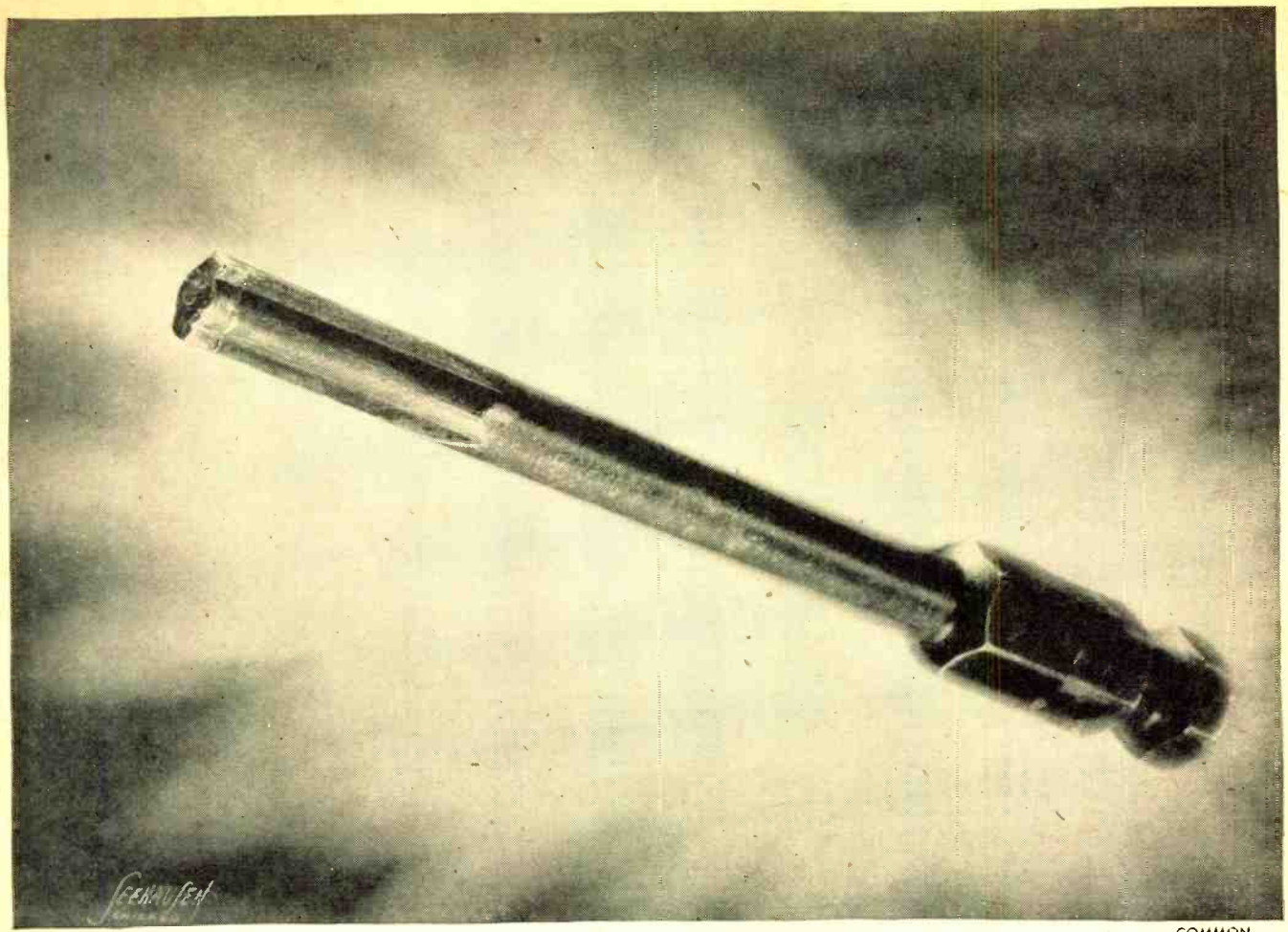
Primary: 2 layers, total turns, 100, of No. 30 enameled wire, wound approximately ½" long x ⅜" diameter.

Secondary: 3 layers, total turns, 150, of No. 30 enameled wire, wound to completely cover primary.

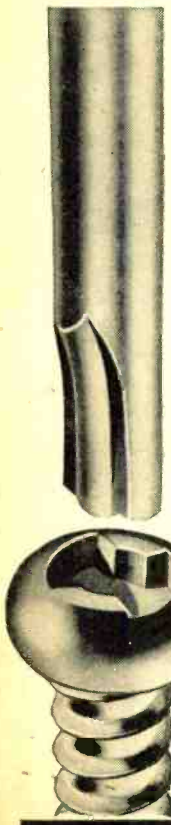
This second transformer was successful, but did not give quite as much

Fig. 5





TYPE "A" ASSEMBLY BIT



COMMON SCREWDRIVER

This Bit DROVE 214,000 SCREWS

IN CONTINUOUS OPERATION

This amazing record of durability was rolled up on an assembly line of the largest automobile corporation in the world.

It is a stock bit, taken out of production shipment and was used in a power driver on $\frac{5}{16}$"-24x$\frac{7}{8}$" flat CLUTCH HEAD door hinge screws . . . an operation calling for unusually high torque driving.

It is important to note that this bit served continuously on the assembly line . . . *that there was no interruption for reconditioning* during this 214,000 driving spell.

Moreover, this bit can be *repeatedly restored to its original efficiency* by a simple application of the end surface to a grinding wheel.

Tool economy is only one of the many exclusive advantages offered by CLUTCH HEAD *for faster, safer, and lower-cost assembly operation. Investigate them.*

CLUTCH HEAD SCREWS

Check the perfect operation of this screw with an ordinary type screwdriver or any flat blade, reasonably accurate in width. Thickness of the blade is secondary.

UNITED SCREW AND BOLT CORPORATION

CLEVELAND 2 CHICAGO 8 NEW YORK 7

amplitude of sweep as the first one. Either transformer must have high losses with a high resonant frequency and tight coupling.

Since $R_x = E_p/I_p$ of the pentode, we can control the pentode bias and thus vary R_x over wide limits. In practice, with R_x a 5000 ohm rheostat, frequency control over a range of about 50/1 may be had for any given value of C_x. This means that very few values of C_x are needed to cover the wide frequency range. Referring to Fig. 1, if $C_1 = 50$, $C_2 = 2500$, etc., increasing 50 times in each step, then f_o will be reduced to 1/50 of its former value, which range is covered by R_3.

By this rule, only five condensers will cover a range exceeding 1 cycle to 1 megacycle.

For any given size of C_x, the output amplitude will be constant over a frequency range of about 50/1, fly-back time will be constant, and the ratio I_{disc}/I_{ch} will be the poorest at the high frequency end of each range, but can easily be 50 or more, except at the extreme high frequencies. Output amplitude will increase with "B" plus and the current capacity of V_1, the discharge tube.

The cathode follower circuit, shown in Fig. 1, will deliver between 100 and 200 volts of saw-tooth swing at a relatively low impedance, the exact voltage will depend on "B+" and the size of the sweep condenser, being slightly less for larger condenser.

The linearity is best at high values of I_p of the pentode, but will depend on the insulation resistance of the capacitor used. Oil filled condensers should be used, the better the quality, the better the waveform at very low values of I_p of V_2 (at the very low frequencies, R_x, the variable resistance represented by the d.c. plate resistance of the pentode, will be very high, on the order of ten megohms in practice, the discharge current of C_x will be in the order of microamperes).

The unit was built up as the sweep for a 2" oscilloscope, the parts layout which is not critical being shown in Fig. 4. A bakelite chassis was used to minimize stray capacity, and T_1 was mounted as close as practical to V_1.

A suggested power supply is approximately 300 volts, d.c. with very low current consumption (about 12 mils). The power supply should have good regulation, and the power may be taken from a conventional scope by tapping into the supply, or a unit similar to that diagrammed in Fig. 5 may be used.

To cover the complete frequency range from one cycle to one megacycle, R_3 and the four position switch are the only controls needed.

METER TYPE TUNING INDICATOR FOR FM RECEIVERS

By FRANK SANTANGELO

FOR proper frequency modulation reception, it is necessary that the carrier frequency being received be tuned to center frequency (zero voltage). Some manufacturers have used tuning eye tubes, while others have used the zero center microammeters, usually connected (in series with a resistor to ground) in the output of the discriminator.

This latter method is generally unsatisfactory as it lowers the output of the FM tuner and, in addition, requires a very sensitive zero center meter in order to obtain good positive and negative voltage deflection.

The circuit shown eliminates the use of an expensive zero center microammeter and does not reduce the output from the FM tuner.

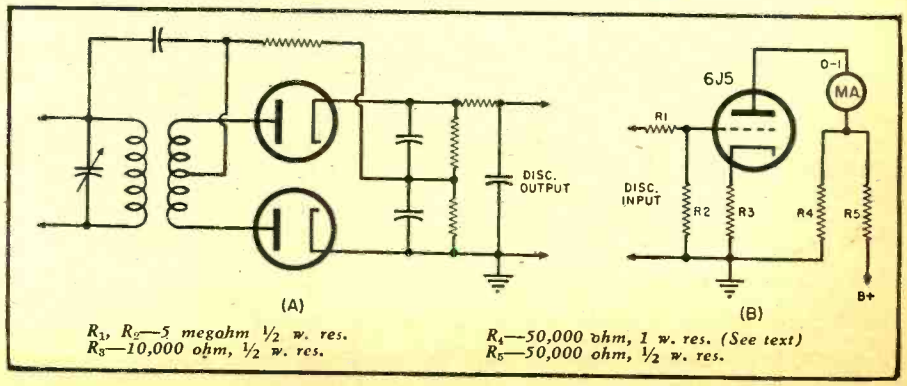
The circuit is essentially a high impedance input vacuum tube voltmeter, adjusted by varying values of R_4 to read half scale on receiver background noise (off station hiss).

By varying this value a zero center is automatically provided (point of zero voltage) therefore, when the receiver is tuned through an FM carrier, the meter will indicate both positive and negative voltage swings, the amount (assuming a reasonably sensitive meter is used, such as 0-1 or 0-5 milliammeter) depending mostly on amplification of the tube used. A glance at the circuit will show that this unit can be separately constructed and attached to any FM receiver.

By using this type of tuning indicator, it is possible to tune in an FM carrier with the greatest of ease.

—30—

Circuit diagram of meter type FM tuning indicator.



R_1, R_2—5 megohm ½ w. res.
R_3—10,000 ohm, ½ w. res.
R_4—50,000 ohm, 1 w. res. (See text)
R_5—50,000 ohm, ½ w. res.

Thus, we have, basically, a triode blocking oscillator whose frequency is controlled by an *RC* network, and a constant current tube replacing the *R* in the *RC* combination, allowing the condenser to charge at a linear rate.

We also find that we have:

1. Sweep amplitude independent of the setting of R_3 for any one value of C_2;
2. Only two controls, R_3 and the four-position switch;
3. Only five high grade condensers cover 1 cycle to 1 megacycle;
4. Linear sweep with linear flyback; and
5. High ratio usable/non-usable waveform.

—30—

QTC

(*Continued from page* 38)

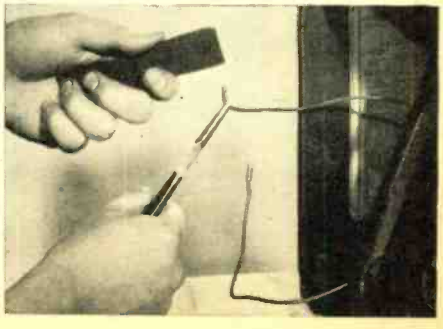
all risk for the $150 . . . so if your ship has recently been returned by your company to the U.S. Maritime Commission you can readily see the outfit can't afford to run too many with the losses involved for the percentage of the profits that the government allows under the new regulations . . . most marine men are of the opinion that nearly all of the present 800 odd ships built during the war and now operated on a charter basis will be returned to the government . . . many will probably be purchased, the operating company can make a more reasonable profit if they own the ship outright, and reenter service . . . others will most likely be tied up for some time.

Shipping generally has been fairly good until the present wave of returning the chartered ships back to the government. It is to be expected that it will return somewhat after the various steamship companies have returned to a more normal postwar operation. . . . As we go to press however, the general maritime strike is still under way and all shipping is tied up for the moment . . . we hope the matter will be settled shortly and that the vessels will be moving . . . it has everything tied up—only the incoming ships being permitted to dock . . . 73.

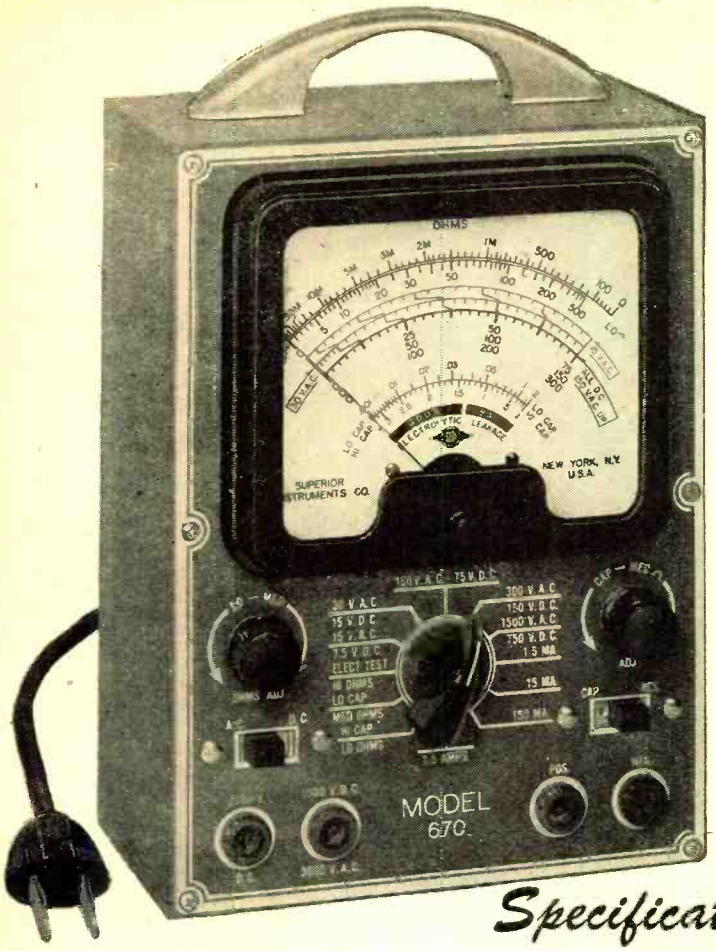
KEEP LOOP AERIALS CLEAN

Noise or fading may result if terminals of the radio loop aerial become dirty or corroded.

The plug-in terminals may be cleaned with emery cloth as illustrated . . . . . H.L.



NOW AVAILABLE FOR IMMEDIATE SHIPMENT!



The New Model 670

SUPER-METER

A Combination

VOLT-OHM MILLIAMMETER plus CAPACITY REACTANCE INDUCTANCE and DECIBEL MEASUREMENTS

Added Feature:

The Model 670 includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 Volts.

Specifications:

D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts
A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5 Amperes

RESISTANCE: 0 to 500/100,000 ohms 0 to 10 Megohms
CAPACITY: .001 to .2 Mfd. .1 to 4 Mfd. (Quality test for electrolytics)
REACTANCE: 700 to 27,000 Ohms 15,000 Ohms to 3 Megohms
INDUCTANCE: 1.75 to 70 Henries 35 to 8,000 Henries
DECIBELS: —10 to +18 +10 to +38 +30 to +58

The Model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5½" x 7½" x 3".

$28.40 NET

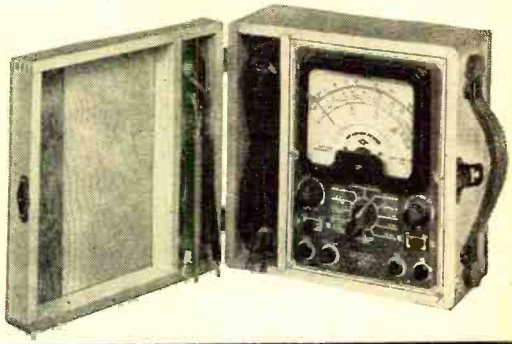
Please place your order with your regular radio parts jobber. If your local jobber cannot supply you, kindly write for a list of jobbers in your State who do distribute our instruments or send your order directly to us.

Model 670P

The Model 670P is identical to the Model 670 described in detail except housed in a hand-rubbed, portable oak cabinet complete with cover.

The Model 670P comes complete with test leads and all operating instructions.

$35.75 NET



SUPERIOR INSTRUMENTS CO.

Dept. RN 227 FULTON ST., NEW YORK 7, N.Y.

10-METER VERTICAL COAXIAL ANTENNA

By C. V. HAYS, W6RTP

Construction details for fabricating a concentric, vertical antenna for use at very-high frequencies.

THE long-awaited opening of the ten-meter amateur band found the author in need of an antenna which could be depended upon to give the maximum in performance on the following counts:

1. Ability to work DX.
2. Economy, plus ease of construction and erection.
3. Ability to work in any direction equally well.
4. Maximum efficiency in any weather.

Undoubtedly a rotary array is the logical answer to most of the above, but with materials tied up in priorities and what not, a satisfactory beam was out of the question.

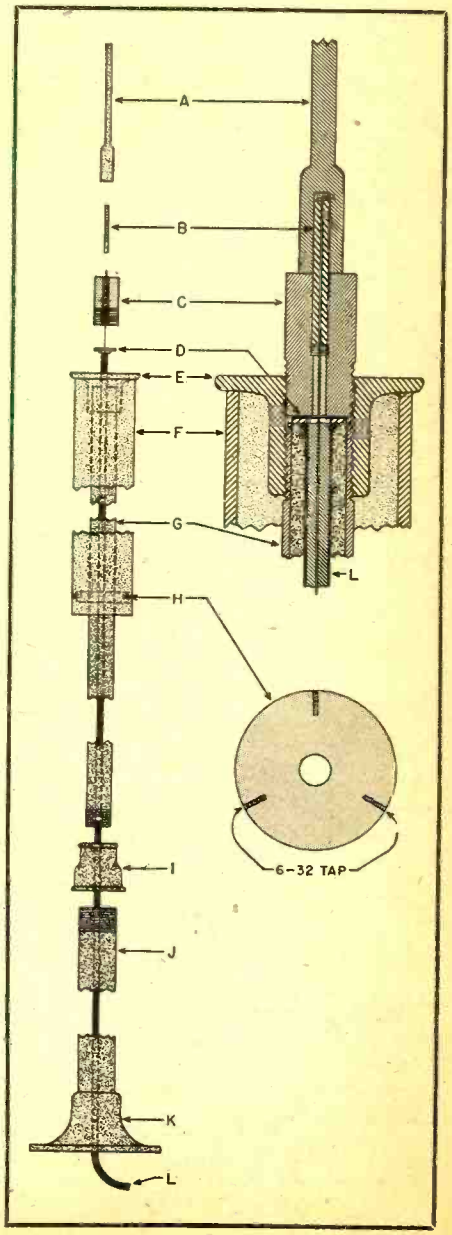
After working for the past four or five years with commercial and military radio, the author was fortunately able to pick an antenna design on the basis of proven performance under practically all conditions. The design chosen was that of the coaxial, or concentric, vertical antenna, widely used in v.h.f. work.

Due to the method of feed and mount, this type of vertical antenna operates in a highly efficient manner. Briefly, the usual drawback of vertical antennas is the feed method employed. Use of an open line to the "J" type of vertical results very often in a quite serious distortion of the vertical directivity pattern, causing the major radiation lobe to assume an angle so high that optimum efficiency is virtually impossible.

The above named defect, in conjunction with the distorted pattern caused by proximity to the mounting structure, rules the "J" out. The widely used horizontal doublet was rejected because of the practically vertical radiation of a great deal of wasted power, as well as the more or less directional effect in a broadside plane. This left the "Brown ground-plane vertical" and the "vertical coax" to be considered.

The ground-plane vertical is an excellent performer but has one serious drawback to the average ham, namely, impedance matching. The resistance of this antenna is roughly 21 ohms, a value requiring more or less complicated design. The vertical coax, on the other hand, can be fed with a 70 or 50 ohm feeder directly, with about equal results.

Probably the main reason for a lack of performance in many antennas of



Construction details for 10-meter vertical coaxial antenna. (A) "whip" auto antenna, (B) brass stud ¼"-20, thread drilled lengthwise with #40 drill, (C) insulator tapped ¼"-20 inside and threaded with ¾" pipe die on lower end, (D) brass washer, (E) brass floor flange, (F) brass tubing, (G) ¾" galvanized pipe, (H) doughnut insulator, (I), ¾"-1" bell reducer, (J) 1" galvanized pipe, (K) 4" galvanized flange for 1" pipe, (L) either 50 or 70 ohm coaxial feeder cable.

Jensen Speech Master REPRODUCERS

...for clear, crisp, intelligible Speech* Reproduction

Designed especially for speech reproduction in intercommunication and public address applications, this Speech Master family of JENSEN Reproducers, delivers clean, sharp, understandable announcements and orders. Like all JENSEN products, these Speech Masters were completely engineered to do their job efficiently and well.

MODEL NJ-300 SPEECH MASTER (Railroad Type). PM design. Widely used in railroad intercommunication in locomotives, cabooses, signal towers and yards. Rugged case protects against shock and vibration; withstands dust, smoke and the elements. Voice coil impedance 12 ohms; power rating, 10 watts. Space provided inside case for 500-ohm impedance transformer. Overall height 11-3/4"; width 6-25/32"; depth 4-13/16". Holes provided in base for mounting in any position.

MODEL AR-10 SPEECH MASTER *ALNICO 5* design. Specially constructed reflex horn increases efficiency in mid-frequency range, giving added effectiveness and "punch" to speech quality; prevents direct access of rain and snow to speaker diaphragm. Voice coil impedance, 4 ohms and 45 ohms; power rating, 6 watts. Space provided inside for ½" x ½" transformer. Overall diameter 10"; depth 8". Complete with mounting bracket.

MODEL AP-11 SPEECH MASTER (Panel mounting). Similar to AP-10 but without base. Mounts in 4-27/64" cut-out; clearance eyelets for mounting screws. Depth 4½" from front panel. Screws and drilling template included. Voice coil impedance 4 ohms or 45 ohms; power rating, 5 watts.

MODEL AP-10 SPEECH MASTER (Desk or Wall type). PM design, desk or wall mounting. Complete with base and tilt adjustment. Double dustproofed. Rubber covered 36" cord. Internal mounting bracket for ½" x ½" transformer. Voice coil impedance 4 ohms or 45 ohms; power rating, 5 watts. Height 6-¾"; depth 5⅛"; diameter 5". Finish hammered gray with satin chrome trim.

MODEL NF-300 SPEECH MASTER (Navy Type). Developed for use as a loud speaker and microphone. Special case design over-rides wind and background noises for talk-back. Enclosed case and protective screen render this model proof against weather, dust and moisture *ALNICO 5* PM design. Power rating, 10 watts; voice coil impedance 12 ohms. Mounts in 5⅜" cut-out; six screw holes in rim. Overall diameter 6-7/16"; depth (from front of panel) 2-9/64". Finished in Munsel N4-5 gray enamel.

MODEL AP-20 SPEECH MASTER Heavy-duty unit for high-level paging and call systems in noisy industrial installations. PM design. Furnished with eyebolt for overhead suspension but available with stand for wall or table mounting. Voice coil impedance 8 ohms; power rating, 25 watts. Overall diameter 13½"; depth 9"

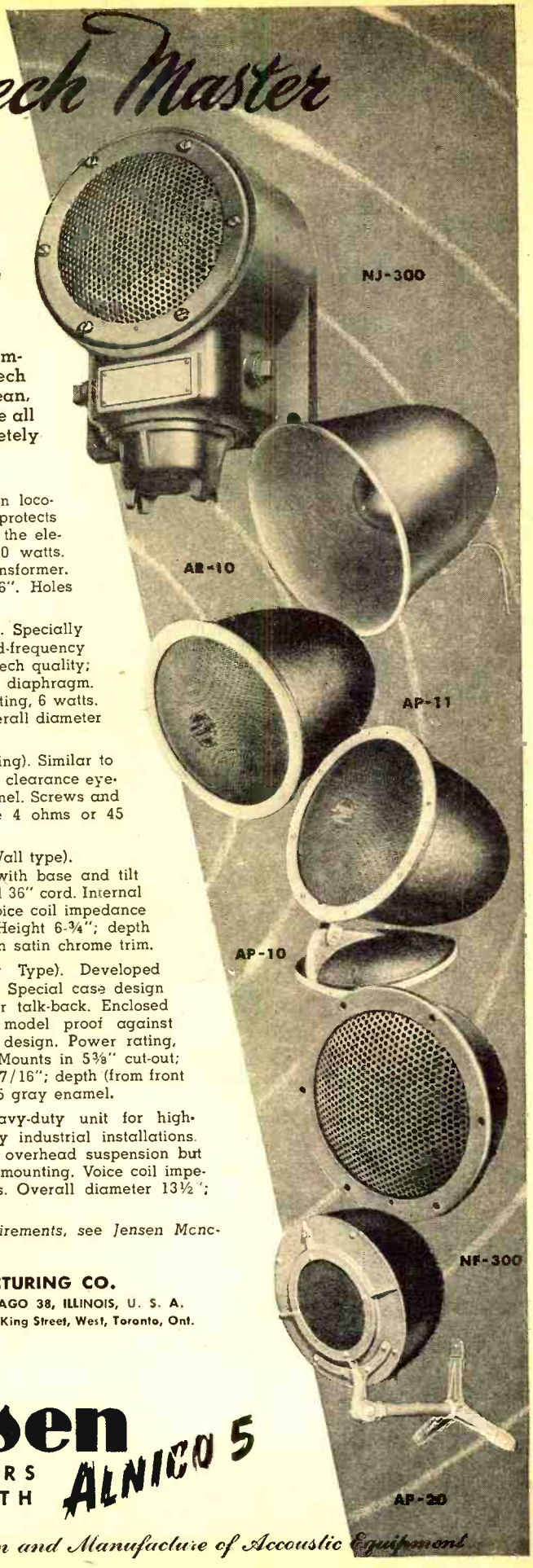
**For full discussion of Speech requirements, see Jensen Monograph No. 4.*

5 MONOGRAPHS AVAILABLE

If you haven't yet procured these five valuable technical booklets, order now—either from your dealer or direct—at 25c each.

1. Loud Speaker Frequency-Response Measurements
2. Impedance Matching and Power Distribution
3. Frequency Range in Music Reproduction
4. The Effective Reproduction of Speech
5. Horn Type Loud Speakers

25¢ each



JENSEN MANUFACTURING CO.
6617 S. LARAMIE AVENUE, CHICAGO 38, ILLINOIS, U. S. A.
In Canada: J. R. Longstaffe, Ltd., 11 King Street, West, Toronto, Ont.

Jensen SPEAKERS WITH ALNICO 5

Specialists in Design and Manufacture of Accoustic Equipment

this type erected by hams is a misunderstanding of the proper element lengths, data being limited as to the proper formula for determining the element lengths. Without going into the why's and wherefore's, we will simply give the formula found most suitable for this type of antenna.

Length of upper section (the whip) equals freq. in mc. divided into 235.6

Length of lower section (the skirt) equals freq. in mc. divided into 243.3

For convenience, a list of the proper lengths for every 100 kc. in the ten-meter band is given below. Due to the high "Q," or sharpness of resonance, operation is not advisable more than 100 kc. from the optimum frequency.

Seamless brass tubing is to be preferred on several counts for the "skirt," but copper, aluminum, dural, steel tube conduit and galvanized pipe are all acceptable—results being practically the same if a good job is done in constructing the antenna.

Referring to the constructional drawing (A) is the whip; (B) is the ¼"-20 brass screw, drilled lengthwise with a No. 40 drill; (C) is the insulator (plexiglass, bakelite, etc.); (D) is the brass washer, ½" i.d., ⅞" o.d.; (E) is the 2½" brass floor flange, tapped for ¾" pipe; (F) is the 2½" thinwall brass tubing; (G) is a ten-foot section of ¾" pipe; (H) is a "doughnut" insulator of plexiglass, lucite, etc.; (I) is a ¾"-1" bell reducer; (J) is a ten-foot section of 1" pipe; (K) is a 4" galvanized floor flange, tapped for 1" pipe; (L) is 50 or 70 ohm coaxial feeder.

Vertical coaxial antenna element lengths for the ten-meter band.

28.1 mc.—	Whip equals 8' 7⅞"
	Skirt equals 8' 4⅝"
28.2 mc.—	Whip equals 8' 7½"
	Skirt equals 8' 4¼"
28.3 mc.—	Whip equals 8' 7 3/16"
	Skirt equals 8' 3⅞"
28.4 mc.—	Whip equals 8' 6 13/16"
	Skirt equals 8' 3 9/16"
28.5 mc.—	Whip equals 8' 6 7/16"
	Skirt equals 8' 3 3/16"
28.6 mc.—	Whip equals 8' 6 1/16"
	Skirt equals 8' 2 13/16"
28.7 mc.—	Whip equals 8' 5¾"
	Skirt equals 8' 2½"
28.8 mc.—	Whip equals 8' 5⅜"
	Skirt equals 8' 2 3/16"
28.9 mc.—	Whip equals 8' 5"
	Skirt equals 8' 1 13/16"
29. mc.—	Whip equals 8' 4 11/16"
	Skirt equals 8' 1 7/16"
29.1 mc.—	Whip equals 8' 4 5/16"
	Skirt equals 8' 1⅛"
29.2 mc.—	Whip equals 8' 4"
	Skirt equals 8' 13/16"
29.3 mc.—	Whip equals 8' 3⅝"
	Skirt equals 8' ½"
29.4 mc.—	Whip equals 8' 3 5/16"
	Skirt equals 8' ⅛"
29.5 mc.—	Whip equals 8' 2 15/16"
	Skirt equals 7' 11 13/16"
29.6 mc.—	Whip equals 8' 2⅝"
	Skirt equals 7' 11½"
29.7 mc.—	Whip equals 8' 2 5/16"
	Skirt equals 7' 11 3/16"

Our People

For twenty-six years, since the very beginning of radio broadcasting, Air King has been steadily growing. Now over five hundred employees, trained to the high standards required by our armed services and working in modern plants with the newest and most efficient equipment can produce over three thousand sets a day.

During the war all of Air King's facilities were devoted to the making of Radar and special electronic devices. Now with all this skill and experience, Air King, the most highly integrated producer in its field, turns again to civilian production and offers a complete line of AM, FM, and Television receivers—the finest that Air King people have ever set their trained hands to make at prices indicative of high efficiency and high production.

AIR KING RADIO

AIR KING
RADIO
Brooklyn

Division of HYTRON RADIO & ELECTRONICS *Corporation*

The Royalty of Radio Since 1920

PY2QK—Santos, Brazil	Q5R7
KA1JB—Philippine Is.	Q5R5/8
W6SOV—Philippine Is.	"5x5"
K7FBN—Juneau, Alaska	Q5R7/8
W6PUL—Hawaiian Is.	Q5R9
VE5TQ—Br. Col. Night short skip	Q5R6/8
VE3AIU—Ont., Can.	Q5R7/8
VE4SY—Sas., Can.	Q5R7
VE4AKI—Sas., Can.	Q5R9
W5JZQ/W6—Ariz. Night short skip	Q5R9plus
W6PUZ—Tinian Is.	Q5R6
W2LFE/K6—Haw. Is.	Q5R9plus
W9QMD/KE6—Johnston Is.	Q5R9plus
W1HCH/K6—Haw. Is.	Q5R9plus

Table 1. Partial list of stations worked. Practically all districts in U.S. give Q5R9 reports, with many commenting on FB signal from the 60-watt rig used at W6RTP. Many of the DX stations worked were from CQ's and reception on a homemade super with the antenna is as good as the transmitting reports.

Any garage or similar place equipped for brazing can do the job of brazing the flange (E) to the skirt (F), at small cost, after which (A) and (F) cut to the formula given, the insulator (C) is tapped and drilled for the screw (B), and threaded for an inch on one end with a ¾" pipe die; the washer (D) is carefully soldered to the outer conductor of (L), of which some three inches of the inner conductor and insulating material have been left above the trimmed-off outer conductor. With the section of pipe (G) slipped up through the bottom of skirt (F) and screwed firmly into flange (E), the feeder (L) is slipped down through the assembly from the top, with the washer (D) coming to rest against the end of the pipe (G), a half inch or so below the surface of flange (E). Next screw the ¼"-20 screw (B) into the insulator (C), which in turn screws into the upper half of flange (E), jamming washer (D) firmly between it and the pipe section (G), insuring a good connection for the outer conductor of feeder (L). The upper end of the inner conductor of (L) will fit nicely through the No. 40 hole previously drilled through screw (B)—trim the wire flush and solder to the screw, completing the feeder connection. Screw whip (A) onto the inch or so of the screw (B) left above the insulator (C), fit the lower section of pipe (J), with the bell reducer (I), onto the ¾" pipe (G), fit flange (K) on the bottom of the 1" pipe, and your antenna is complete. Couple to the final tank coil with a one or two turn link and you're ready for ground wave; short skip; long skip; north, south, east and west, with an equally strong signal.

The complete cost of the antenna as built by the author was under $8.00, including a quart of aluminum paint, and six hours of work. See Table 1 for an idea of what to expect from your vertical coaxial.

—30—

WE SHIP ANYWHERE IN THE WORLD
INTERNATIONALLY FAMOUS

FLANAGAN RADIO CORPORATION

RADIO TUBES

SEND FOR COMPLETE LIST OF AVAILABLE RADIO TUBES AND PRICES

SUPER-METER

THE NEW MODEL 670

A combination VOLT-OHM MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS. Added Features: The Model 670 includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 volts.

$28.40

CHANGERAK

Makes an ideal work and display fixture for selling new Record Changers. All new combination sets are now being made with Record Changers. Cash in on this business. Order your CHANGERAK now!

$11.95

FREE CATALOG

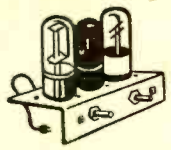
Send for free catalog and prices of hard-to-get Radios, Radio Tubes, Radio Parts, Pickups, Motors, Condensers, Tube Checkers, Volt and Ohm Meters, Signal Generators, Signal Tracers, etc. Please mention Radio News when writing.

FLANAGAN'S SPECIALS

Rayon A-C Cords	15c ea.
Phono-Motors (self-starting) 9 in. Plush Plate included	$4.20 ea.
Knobs (50 Assorted) Push on and screw types	$2.50 box
5-Tube Punched CHASSIS	39c ea.
Rubber Zip Cord (Spools—1000 ft.)	$15.50 spool
2-Conductor Stranded No. 20	
100-Foot Roll Push Back Wire	75c
All Rubber, Rubber Plug A-C CORDS	25c ea.
100 Feet Spaghetti	$1.00
4 x 4 Dial Windows	7c ea.
AC-DC Antenna Hanks (For all radios)	10c ea.
100-Foot Roll HOOK-UP WIRE	50c
INSULATED RESISTOR KITS (over 100) All wanted sizes—List price $12.50	$2.00 box
100 Assorted 10-Watt WIRE WOUND RESISTORS	$12.50 per 100
10 Assorted VOLUME CONTROLS (No switches)	$1.50
Medium single output for 50L6	60c ea.
COMPLETE JEWEL ASSEMBLY With jewel, socket and bracket	10c ea.
LITTLE FUSES (All glass)—1¼ Amperes	1c ea.
U. S. Army THROAT MIKES Extension cord and switch 50c extra	$1.65 ea.
Three-tube PORTABLE RECORD PLAYERS Tone control—Beautiful cabinet	$36.40 ea.
ANTENNA LOOPS (For all small sets)	48c ea.
JACKSON SOLDER IRONS	$1.60 ea.
DIAL CABLE (Braided Bronze—Braided Rayon)	1c ft.
Official U. S. Army TELEGRAPH KEYS	50c ea.
CRYSTAL MICROPHONES (American Model D7TP.)	$8.44 ea.
MULTI-METER (New model PB210) AC-DC Portable type	$35.75 ea.
Standard SIGNAL GENERATORS,	$49.50 ea.
CARBON RESISTORS (Box of 100 most needed sizes)	$1.29 box
INSULATED TIP JACKS (Red or Black)	8c ea.
AUTO AERIALS	$1.45 ea.
Brand New CARBON HAND MIKES	$1.50 ea.

PHONO AMPLIFIERS

An Exceptional Value!



3-TUBE AC-DC

Completely Wired, with tubes and ready to operate. Uses a dynamic speaker. 450 ohm field. Complete with tubes, 50L6, 35Z5, 12SQ7, less speaker.

$7.44

CRYSTAL PICKUPS

COMPLETE WITH HARDWARE

LATEST DATE OF MANUFACTURE

$2.19 *each*

PHONO-MOTOR

SELF-STARTING PLATE INCLUDED

$4.20 *each*

TUBE TESTER

THE NEW MODEL 450

Speedy Operation Assured by newly designed rotary selector switch which replaces the usual snap, toggle, or lever action switches. We can give you detailed specifications. The model 450 comes complete with all operating instructions. Size 13" x 12" x 6".

$39.50

FLANAGAN
RADIO CORPORATION
N. E. Cor. 7th & CHESTNUT STS., Philadelphia 6, Pa., U. S. A.

LETTERS *from our readers*

FAVOR REQUESTED

"MANY thanks for the March, April, May editions of RADIO NEWS which you kindly sent for the only dollar I was able to obtain. Our people have now clamped down on all dollars so I suppose I've had it.

"RADIO NEWS is ideal for 'Kivvy Street' servicemen like myself. Unfortunately we have no equivalent periodical in Britain.

"Perhaps there may be some of your readers who would care to send on their used copies to a place where they would be very acceptable?"

14572057 CFN Bolton B.A.
Telecom
22 ARMD. BDE. w/S R.E.M.E.
British Army of the Rhine

Here is a chance for some of you readers to be a pal. Copies of RADIO NEWS *may be addressed to Mr. Bolton at the address given above.*

* * *

HERE'S HELP

"IN THE July issue of RADIO NEWS, many readers commented on the difficulty they had in attaching the parts lists for the RN Circuit Page on the back of the same 3 x 5 card that contained the diagram.

"It can be done by cementing the top edge of the parts list to the top edge of the card and then folding under the excess length of the list so that it matches the 3 x 5 inch size. This edge is left uncemented and is easily unfolded when reference is made to a particular set.

"I hope this will help to solve some of the problems attached to this department. It's a swell service and we're all for it."

C. H. Hartwell
Chicago, Illinois

See, it is really simple after all!

* * *

WANTS CLASS D LICENSES

"IN READING the "Letters From Our Readers" column in your September issue, I noted the comments made by Mr. Roger Harris of Los Angeles and those added by you, covering the proposed issuance of class D licenses to interested persons capable of passing theory exams, but lacking the required code proficiency demanded by class A, B and C amateur licenses.

"In my opinion your comments failed to cover the proposal completely for several reasons. Among these are the following:

"First, and most important, the generosity of the FCC has provided the ham with 7 bands above the 200 mc. proposed minimum and these are, I'm certain you will agree, pitifully unmanned today. The amateur must show some activity on these "very high" and "super high" frequencies if he hopes to retain them.

"Most of the amateurs now holding A, B and C licenses, with many exceptions, I'll agree, have pioneered the 160, 80, 40, 20, 10 and 5 meter bands and these bands are "home" to them. The "rush" to occupy the shorter wavelengths hasn't been much more than a slow crawl.

"As a radio operator instructor in the Marine Corps, I had many good operators for "phone" work who could not, in spite of intensive instruction, master those beastly dots and dashes. These men were by no means considered as persons contributing toward lowered standards of phone operation. Quite the opposite was generally true. These men worked harder to improve their operating methods and practices to make up for their lower code speeds.

"Second, the funds with which the FCC amateur section operates are provided by all citizens and the amateur is expected to provide public services either directly or indirectly. An example of indirect service is the fact that the necessary equipment for the class D licenses will provide jobs in the radio industry and thus help to raise our standard of living.

"Increased demand will necessitate improved high frequency equipment and manufacturing techniques, thereby providing an abundance of high, ultra-high and super-high frequency equipment at tremendously lowered prices. You will certainly agree that the new FM and television equipment needs just a "little" such aid! We will all benefit, class A, B, C and private citizens alike from increased demand resulting from the class D ham.

"Third, I think anyone interested in operating above 200 mc. has plenty of the experimenter in his blood.

"For the record, my license is class A."

James R. Wilburn, W3KYH/4
Oak Ridge, Tenn.

You have some good points there, Mr. Wilburn.

* * *

SPEAKER PROBLEMS

"I HAVE about forty speakers of varying types and sizes. When requiring a speaker, however, I have found it more convenient to purchase one to fill the requirements than to "cut and try" in utilizing one on the shelf.

"This situation is caused by the total lack of information (other than stock numbers) on the speakers themselves. The field coil presents no problem, but it is the voice coil impedance that defies measurement.

OUR LATEST SPECIALS FOR SERVICEMEN, AMATEURS, AND EXPERIMENTERS!

POWER TRANSFORMERS—Ideal for radio construction or replacement. Primary—110V, 60 Cycle. Filament and high-voltage windings are center-tapped. Specify whether 6.3 or 2.5 V is wanted.

For 5-6 tube sets: 650V, 45MA; 5V fil. and either 6.3 or 2.5V fil. $1.75

For 6-7 tube sets: 675V, 50MA; 5V fil. and either 6.3 or 2.5 V fil. 1.90

For 7-8 tube sets: 700V, 70MA; 5V fil. and either 6.3 or two 2.5V fils. 2.35

For 9-15 tube sets: 600V, 150MA; 5V fil. and a 6.3V fil. only 2.95

Transmitting type filament transformers—5000V insulation—2.5V, 20Amps. 1.49

5V, 10Amps—$1.98; 6.3V, 8Amps—$1.98; 2.5V, 25Amps and 6.3V, 3Amps. 2.25

AUTO-TRANSFORMERS—May be used on 90 to 250 volts for step-up or step-down applications. Up to 300 Watt capacity 1.95

FILTER CHOKES—200, 300, 400, or 500 ohms—Heavy duty—99c; Midget type—59c; 250MA, 35 ohms DC—Fully shielded in black crackle case, only—$1.95. **AUDIO TRANSFORMERS**: Single plate to single grid 3:1—79c; Single plate to P.P. grids—79c; Heavy-duty, class "AB" or "B" P.P. inputs—$1.49; Midget output, for AC-DC sets—69c. **UNIVERSAL OUTPUT TRANSFORMER**—tapped for various impedances—89c; **MIKE TRANSFORMER**—Single or double button—79c. High fidelity MIDGET MIKE to grid transformer, similar to UTC ouncer units $3.00

TUBES—A Warehouse Full of Them!—Order all types needed, not just the critical types, and we'll do our best to supply you completely!

SELENIUM RECTIFIERS—Dry disc type, 1½" by 1", 1.2 Amp. maximum, suitable for converting DC relays to AC, for supplying filament source in portable radios, converting DC meters to AC applications, and also may be used in low current chargers 99c

TRIPLETT METER RECTIFIERS—Full wave, may be used for replacement, or in construction of all types of test equipment $1.25

E-Z WIRE STRIPPERS—Cleans insulation from solid or stranded wire swiftly, neatly, and without damaging wire. A real time saver. Standard model—$3.95; Automatic model—Stays open after grip is relaxed until wire is removed.... $4.95

SILVERTONE CABINETS—Walnut finish—excellent replacement cabinets—Model 1923, 11x18x20; Model 4465, 15x10x8; and Model 4619, 9x10x16½. Each $1.50

FIRESTONE PORTABLE CABINETS—Two tone, leatherette covered carrying cases, sloping dial—Ideal for rejuvenating banged-up portables $3.95

PHONO CABINETS—With speaker grille—$7.75; Without—$8.50. Both types leatherette covered with well designed grips and hardware.

PORTABLE AIR COMPRESSOR—Attaches to ¼ H.P. motor. Just the thing for refinishing radios, painting cars, blowing out chassis, etc. 100 lb. gauge and syphon type gun with 12 feet of rubber hose included. Pressure adjustable to stay constant at any pressure up to 100 lbs. ..... Net Price, $21.60

RECORD CHANGERS—These are beauties—two post, with featherweight plastic and chrome pick-up, plays 10" and 12" records intermixed! Complete with blue leatherette, mahogany or walnut stained cabinet, your choice. Ready for attachment to any radio at the give-away price of only $24.95

CRYSTAL PHONO PICK-UP—Latest design. Features needle pressure compensation to reduce record wear. Excellent replacement for any record player $2.75

110V, 60 cycle phono motor & table 5.95

Motor and Crystal Pickup together 7.95

AUTO ANTENNAS—Cowl Type 3-section type with triple plated chrome, complete with shielded leads—66"—$1.50; 96" (4-section)—$2.75; "Rocker" antenna, adjustable to any angle for rocket and torpedo bodies, 72"—$2.75; Fender and Cowl types—adjusts from 20" to 50"—$3.00; Underhood type—mounts on either side of regular and alligator hood—no holes to drill on body of car. 72"—$2.50; Disappearing 50" fender type $3.75

RADIO HANDBOOK—Published by Editors and Engineers—Tenth Edition $1.95

All Rider's Manuals and publications at current prices.

MICROPHONES—Bullet crystal mike—Only $5.45; Bullet dynamic mike—$7.45; Both are nationally advertised brands and sold elsewhere at much higher prices. **SHURE T-17** single button mike, made for Signal Corps., has press-to-talk switch in handle, and is complete with cord and plug—Only $2.75! Midget Mike—Made for Signal Corps. Single button type, with stretched duraluminum diaphragm. Gold plated finish. This unit makes an excellent lapel mike, or concealed pick-up. Specially priced at 95c

CONDENSERS—Guaranteed one year! Priced in lots of ten or more, either one type or assorted. 50mfd. 150v—53c; 25mfd. 35v—23c; 20-30mfd. 150v—46c; 20-20mfd. 150v—35c; 20mfd. 150v—23c; 10mfd. 450v—32c; 10mfd. 35v—23c; 8-8mfd. 475v—65c; 8mfd. 450v—45c; 8mfd. 200v—20c. **PAPER CONDENSERS**—600 W.V., .25mfd.—23c; 1mfd.—11c; .05mfd.—11c; .02mfd.—9c; .01mfd.—9c; .006mfd.—8c; .5mfd.—36c; 1.0mfd.—45c; Screwneck aluminum can type—16mfd.—600 P.V.—85c; 16mfd.—550 P.V.—65c; Mica condensers—any size—15c or 100 Micamold assorted for 59c

RELAYS—Sigma No. 4RJ—2000 ohm, SPDT—May be adjusted to operate on less than one milliampere! Ideal for photo-electric and electronic control circuits. Regular price $8.50, now only $2.50; **GUARDIAN SPST RELAY**—12 to 24 volts, 1400 ohm, center-tapped coil for operation in balanced current circuits if desired—$1.25; **GUARDIAN** 3-make, 1-break, 12 to 24 volts—$1.00 each, or 5 for $3.75; **SPST**, normally open, works on AC or DC, only—65c; 4-pole (3-make, 1-break), 400 ohm, AC or DC, excellent for plate circuit of tube, photo-cell amplifiers, etc. $1.75

BENDIX SCR-522—Very High Frequency Voice Transmitter-Receiver 100 to 156 MC.—Pushbutton Selection of 4 Channels—Crystal Controlled and Amplitude Modulated—15 Watt Output and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has 10 tubes and transmitter 7 tubes, including 2 832's. Furnished complete with 17 tubes and power supply for 12 or 24 volts, also remote control boxes, cable connectors and antenna. This job was good enough for the joint command to make it standard equipment in everything that flew, even though each set cost the govt. $2500.00. Your cost $75.00

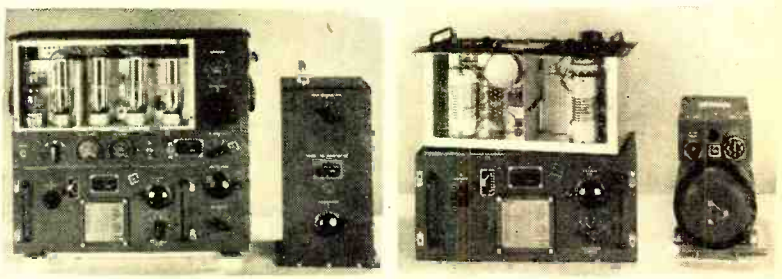
General Electric 150-Watt Transmitter; Brand New! Only $67.50

This is the famous Liaison transmitter used in U.S. Army bombers and ground stations during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world.

The entire frequency range is covered by means of seven plug-in tuning units which are included. Each unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel.

Here are the specifications: FREQUENCY RANGE: 200-500 Kc. and 1500-12,500 Kc. (Will operate on 10 and 20 meter band with slight modification.) OSCILLATOR: Self-excited, thermal compensated, and hand calibrated. POWER AMPLIFIER: Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class "B"—uses two 211 tubes. POWER SUPPLY: Supplied complete with dynamotor which furnishes 1000 volts at 350 milliamperes. Complete instructions are furnished to operate set from 110V AC. SIZE: 21½ x 23 x 9½ inches. Total shipping weight, 250 lbs., complete with all tubes, dynamotor power supply, seven tuning units, antenna tuning unit, and two profusely illustrated instruction books, all in the original factory packing case.

These transmitters are priced to move fast; quantities are limited! Order today, and be the proud owner of one of the finest rigs obtainable.



14-Tube UHF Superheterodyne Receiver—$39.95

This beautifully constructed receiver was designed especially for Signal Corps communication service, and is one of the finest and most sensitive sets ever manufactured. Operating from 110V 60 cycles, this set has two tuned RF stages, tuned converter and oscillator, five IF stages, using iron-core IF's, a diode detector, tuning eye, and a two stage amplifier that will drive a speaker or phones. The frequency range is 158-210 Mcs.

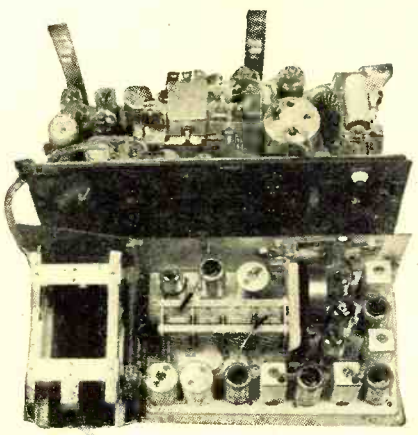
It is a simple matter to operate on other bands by making a slight alteration in the tuning coils. A complete set of tubes is included with each receiver, along with a circuit diagram and parts list. The high-voltage power supply delivers 150 milliamperes, and is well filtered by a heavy-duty choke and three 7 Mfd. oil-filled condensers. This buy of a life-time cost the government about $700. Amateurs and experimenters will never again be able to purchase fine equipment at such a tremendous saving!

The finest in government surplus radio equipment—immediate delivery! Write for surplus sheets!

General Electric RT-1248

General Electric RT-1248 15 tube transmitter-receiver with TERRIFIC POWER (20 Watts) on any 2 instantly selected, easily pre-adjusted frequencies from 435 to 500 Megacycles. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 2-955's as first detector and oscillator, and 3-7H7's as IF's, with 4 slug-tuned 40MC. IF transformers, plus a 7H7, 2-7E6's, and 2-7F7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for telephone use as in a taxicab, or for any kind of remote control applications, as with drone airplanes. Supplied with 15 tubes in original factory packing. Priced at only $29.95 10% less if ordered in quantities of two or more.

SCR-284 Transmitter-Receiver



Made to be used in Army jeeps and trucks, as well as in the field, or as a headquarters set, the SCR-284 is particularly adaptable for all amateur, experimental, marine, aircraft, police, and mobile applications.

The receiver is a 7-tube superheterodyne, featuring an RF stage, four double-tuned 455 KC iron-core IF transformers, two audio stages, a beat frequency oscillator for CW reception, and is powerful enough to operate a large size speaker. The transmitter employs a calibrated crystal oscillator, a buffer amplifier, and a pair of RK-75 tubes in the final amplifier stage. The speech amplifier and modulator will operate with any ordinary mike, or for $2.75, we can include a Signal Corps mike, complete with "press to talk" switch. A built-in antenna tuning circuit, including an RF ammeter, will match the transmitter to any length of antenna. The transmitter plates are supplied by a 500 volt, 160 MA dynamotor which operates from either a 6 or 12 volt automobile battery. The transmitter output is 25 watts, and operates on both phone and CW. The frequency range is 3760-5825 KC. Operation on other bands may be facilitated by the use of plug-in coils. Circuit diagrams and operating instructions are furnished.

These sets are specially priced at $39.95, complete with set of 13 tubes and crystal. The dynamotor, which must be used, if it is not desired to use 110V AC, is $15 additional. Where a compact and dependable medium power unit is desired, this set is unbeatable!

BUFFALO RADIO SUPPLY, 219-221 Genesee St., Dept. 11N, BUFFALO 3, N.Y.

"The 400 cycle "blocked impedance" value can be obtained, but the other impedances cannot. At first, I thought that the "blocked impedance" might be approximate enough for satisfactory match, but calculations based on it alone still results in evident mismatch, even if the mechanical impedance in modern speakers has been reduced to a minimum.

"Therefore, it would be a great boon for the idle units here and elsewhere, if a method within the reach of ordinary servicing equipment could be devised whereby a reasonably accurate figure could be arrived at.

"I read your magazine thoroughly and marvel at the wealth of information it contains, but somehow seemingly small problems like the one above seldom find attention and therefore a solution."

D. W. Baird
Ashland, Wisconsin

Have any of our readers a practical and simple solution to Mr. Baird's problem?

* * *

A RATHER BIG ORDER

"SINCE many new men, thru war service, have acquired an interest in radio recently (count me in), I would like to suggest an ambitious, helpful undertaking for you. Most of these new 'radio men' want to build (and can use the experience) radio, sound and test electronic equipment. Only having recently become acquainted with your magazine, we, then, have missed many good articles you've no doubt printed in the past.

"I would like to see reprints, in pamphlet or booklet form, of past RADIO NEWS articles collected and bound perhaps in groups such as: Broadcast Receivers, S.W. and Ham Receivers, P.A. Systems and Audio Amplifiers, Ham Transmitters, General Ham Equipment, Electronic Test Equipment and General Servicing Notes.

"Such pamphlets should sell for about $1 each and would be more useful in separate groups, something like the above listing rather than one large book at $5 or more with all topics included.

"Is it too ambitious a project for you?"

Edward A. Bogusz
Paterson 3, New Jersey

Under ordinary circumstances this wouldn't be too ambitious a project for us to tackle. In fact we have wanted to offer this service to our readers for some time. Our inability to secure the necessary newsprint to put out such specialized booklets has us stopped for the time being, but it is high on our list of projects which will be undertaken when the paper is again available.

* * *

SIGNAL TRACER

"MANY thanks to you for the information on building an r.f., i.f. and a.f. signal tracer, as published in your January and April issues.

"I made mine exactly as outlined by the second article and was very well pleased with the results. I didn't have a speck of trouble. It took right off the first time that I tried it.

"I think this type of tracer is tops because it is so simple to operate."

Frederick G. Arndt
Albion, Michigan

Mr. Arndt's success with this construction can be traced, undoubtedly, to careful attention to details and meticulous care in wiring the unit.

* * *

TREASURE FINDER

"THE September, 1946 RADIO NEWS had an article by W. E. Osborne on 'Treasure Finding Modernized.' This article had more cold facts, broad coverage and common sense on the subject of detectors than I've run across in the line since entering the field during War I.

"Such articles, plus a builder's supplement for beginners are a good serv-

CONDENSER TESTER

FROM Oscar E. Blair, Jr. of Baltimore, Maryland comes this suggestion for a simple and inexpensive condenser tester of his own design.

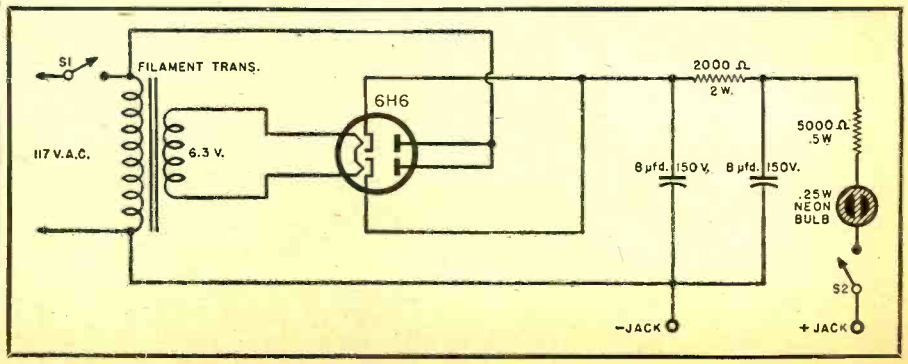
Essentially the unit consists simply of a "B" power-pack with a neon light in series with the positive lead.

According to the designer, the tester works exceedingly well showing up leaky or shorted condensers from any size from 10 μμfd. on up.

For use, the suspected condenser is simply connected across the two jacks. If the condenser is good, there will be a momentary flash of the neon bulb as the condenser charges. If the condenser is open this flash will not be observed. Leaky or shorted condensers will show up by a glow in the neon bulb.

Condensers of the electrolytic type should not be tested with this unit.

—30—



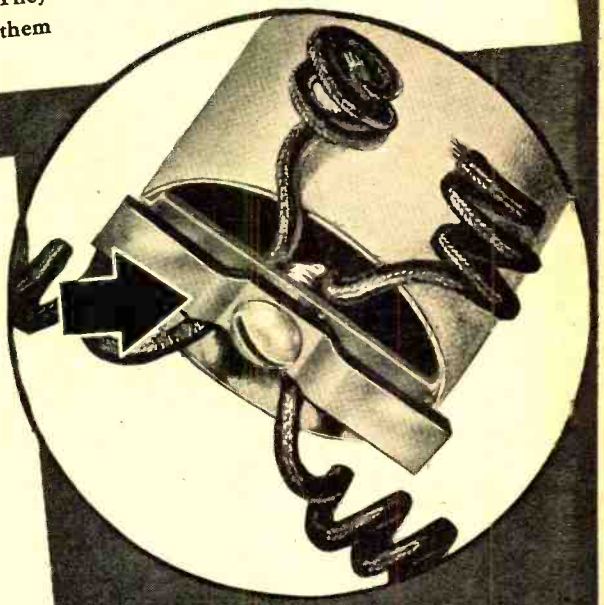
IT TAKES RADIO NOISES OUT OF FLUORESCENT LAMPS

IF-37 FILTERS

Only $1.11 each NET

Sprague IF-37 Filters are specifically designed for fluorescent lamp interference suppression. They offer the most effective way to suppress "hard-to-stop" interference conducted down the power line to remotely located receivers. One filter is required for each auxiliary. They are installed simply by connecting them directly to each fixture across the incoming leads.

Note to Radio Dealers: Install Sprague IF-37 Filters on every fluorescent light in your own store to suppress noise for better, quieter radio and television demonstrations!

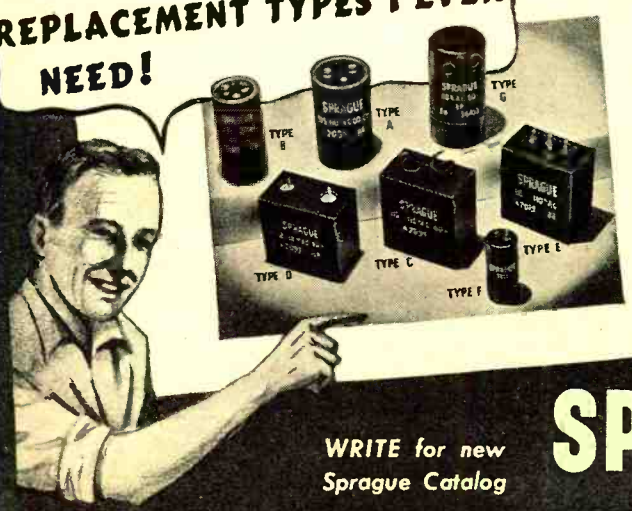


A NEW SPRAGUE ATOM

Handiest, most convenient dry electrolytic capacitor for vertical chassis mounting!

In Type LM Universal Mounting Replacements, Sprague offers a new Atom dry electrolytic which can be mounted in any position to replace inverted can, spade-lug or similar vertical-mounting capacitors. Equipped with special mounting devices to replace screw type can mounting, LM Atoms fit *any* chassis hole from 3/16" to 7/8" diameter. Their separate positive and separate negative leads can be connected together to get common positive or negative sections. Because they prevent section-to-section electrolysis, they are especially recommended to replace old common positive condensers. Like all Sprague Atoms, Type LM Capacitors are made with famous Sprague etched foil and are completely sealed and moisture-proofed.

THESE ARE ALL THE MOTOR-START CAPACITOR REPLACEMENT TYPES I EVER NEED!



MAKE MONEY ON REFRIGERATOR REPAIR JOBS

When you've repaired the radio . . . why not repair the refrigerator, too? Make one trip pay for *two* jobs! Use these Sprague Universal Motor-Start Capacitors for every motor starting need. The seven shown here are all you'll require. They're always in stock . . . quick, easy to install . . . and absolutely dependable! They always fit—the terminals are right for quick installation. For details on how to select the exact unit needed for any standard motor, write for Sprague booklet: "A NEW COMPLETE STORY ON MOTOR STARTING CONDENSERS." It's free!

WRITE for new Sprague Catalog

SPRAGUE PRODUCTS COMPANY

NORTH ADAMS, MASSACHUSETTS

Jobbing Distributing Organization for Products of the Sprague Electric Co.

ice to readers of all classes in any line, as they combine results from wide experience, technical advice and a human side for 'use appeal'."

A. L. Murphy
Trona, California

A second article, dealing with the construction of such a treasure finder, appears in this issue.

* * *

SERVICE SHOP ITEM

"YOUR RADIO NEWS is tops. I wouldn't miss a copy.

"Here is a little service shop helper that is a 'must' in every ham shack or shop. Needing a small-parts cabinet I purchased (in the dime store) several knife, fork and spoon boxes. I found the drawer pulls on the next counter. The rest of the project was simple. I built a small box to house the drawers using little slats as drawer slides. Incidentally, the drawers are used sideways as it takes less frontage on a shelf. These drawers which are 13½" x 8½" x 2" are invaluable for housing resistors, condensers and other small radio parts and hardware."

Frank H. Coxson
Greenville, Pa.

Here is a practical idea that many of our readers might like to adopt.

* * *

DO YOU DX CEYLON?

"I RECEIVED the June issue of RADIO NEWS, I find it interesting, especially the Circuit Page, as it is a great help to amateurs and radio servicemen.

"Am an ex-serviceman from the Signal Corps, from the Instrument Mechanic Section, so have taken a keen interest in radio.

"Kandy, the town where I live, is the center of the tea plantation and

RADIO "INSURANCE"

MANY of our readers have inquired about the "radio insurance" method of conducting a service business. Up to the present we have had few details of this type of repair plan, however, full details have been furnished us by E. R. Wright, Chief Engineer of Radio Engineering of New Haven, Conn., whose copyright plan it is.

According to Mr. Wright, the "Wright Radio Service Plan" is available to radiomen for a small fee which entitles them to yearly or lifetime participation in the plan, the amount of the fee and the number of service shops so licensed being governed by the population of the town or city.

The plan has produced a noticeable leveling off in service charges in areas where it is in operation and has succeeded in driving out the fly-by-night operator who has been operating to the disadvantage of all honest operators.

The "radio insurance," as offered, sets a flat fee for the servicing of radios for a given year. The rates for such service are not specified as local conditions will affect such charges. The advantage of the plan is that the serviceman has a guaranteed income, whether the sets under the "plan" need servicing or not. In addition, he still may collect his regular profit on replacement parts required to effect needed repairs.

—30—

Announcing...

the new BLILEY CCO..

crystal controlled oscillator *for* RADIO SERVICE TECHNICIANS

With this instrument, Bliley, the pace-setter in frequency control for 15 years, sets a new standard for **proficiency** and **accuracy** in the radio service field.

In the Bliley CCO, low temperature coefficient crystals, stable to within ± 0.1%, provide—

—DIRECT CRYSTAL CONTROL, with instant selection of the 5 most commonly used i-f frequencies—175kc, 262kc, 370kc, 455kc and 465kc.

—DIRECT CRYSTAL CONTROL at 200kc for r-f alignment.

—DIRECT CRYSTAL CONTROL at 1000kc for short wave alignment.

There is an external socket for addition of special frequencies, a three position modulation selector and a five step attenuator with vernier output control from 0 to 15 volts.

There's no guesswork in radio service with the CCO. It's a Bliley "techniquality" product, engineered for the professional radio service technician.

Ask your Bliley distributor for Bulletin 32

Bliley
CRYSTAL CONTROLLED OSCILLATOR

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA

the hill capitol of the island. It was also the capitol of the Sinhalese kings before the island was captured by the English in 1815. We also have a few miles away a Botanical Garden of world fame and I wish if you are only here to see the few wonders of our island.

"Am anxious to come in contact with some of your readers in America and Canada. I wonder readers in Europe and America hear our station Ceylon —on wavelengths 428-8 and on 61.2 meters and Radio SEAC, Ceylon—on wavelengths 25.46 meters, 19.84 meters and 49.38 meters.

"With best wishes and kind regards to all."

Thuan. M. W. Jamion
69, Halloluwa Road
Kandy, Ceylon

Here is a chance for some of you DXers to start an interesting correspondence on shortwave matters.

* * *

TECHNICAL DATA

"JUST a word to let you know you are putting out a swell magazine, especially the Circuit Page.

"Also, I was very much interested in the article by Mr. Stevens in the August issue on Cathode Followers in amplifiers. However, Mr. Stevens expresses a need for a cathode type tube similar in characteristics to a 6A3 (2A3) or 6B4 for this application. For the benefit of anyone interested as I am, I should like to point out that the 6A5-G has been on the market for several years and has electrical characteristics identical to the 6A3 even to the heater ratings, but having cathode-heater rather than filament."

Richard Gaines
Stephenville, Texas

Many thanks to Mr. Gaines for passing this information along to our readers.

* * *

AVIATION RADIO ENTHUSIAST

"I AM greatly pleased to see your new circuit department and have entered my subscription for three years to Radio News. I don't want to miss any.

"Please print circuits of the light plane radios as soon as possible. And how about more dope, stories and technical data on light plane radio equipment in Radio News each month. I'm sure it would help sell more magazines."

Stanley T. Herrick
Plaistow, New Hampshire

An article covering the installation of radio equipment in personal planes appears in this issue. We hope that it will be of help to our readers who are interested in radio equipment for light planes.

* * *

REQUEST FOR ARTICLES

"RADIO NEWS is tops and I have copies dating back ten years or more.

"There are a few things I hope you will be able to work out which I think, and probably lots of other men too, are needed. I am referring to a system whereby you would print in bold letters at the top of the page the title under which you could file either the page, or list on cards for future reference. Also I would like to see you put ads on the back of pages carrying articles.

"How about articles on appliance repairs, service benches, business forms and methods."

Sherman's Appli. Repair Shop
Detroit, Michigan

We are always on the lookout for good writers on the subjects you requested. When we find articles that are suitable for Radio News, we will pass them on to our readers. As for your suggestions on the make-up of the book, this is a little more difficult to do than you might expect. We are giving our readers the Circuit Page backed up by ads to facilitate filing for future reference. We would like to remind our readers that a yearly index appears each January for your convenience.

* * *

HONORS FOR MISS SULLIVAN

"I AM writing just a few lines to congratulate you for your fine work on the trans-receiver born out of your handiwork, your knowledge of radio principles and your diligent effort. The appearance is very neat and, undoubtedly, its performance will reach all expectations.

"I am enclosing a heavy wire connection that has become a symbol to our radio fraternity that comprises

SUPER PRO

Series 400

Less QRM---Phone or CW

When the bands are active it only takes one minute to find that you need Hammarlund's patented variable crystal filter to have a successful QSO—either phone or CW.

Look to the future! When the number of Hams doubles or trebles you will need the crystal filter that weeds-out the QRM . . . If you can't hear 'em, you can't work 'em!

Price (SP-400-X)
$342.00
Including Speaker

THE SIGN OF QUALITY
ESTABLISHED 1910

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., NEW YORK 1, N.Y.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

the old-timers Northeastern Division of Radio Experimenters of Mexico. The story behind this wire connection is that it was made by me and sent to a newcomer into hamdom who was having trouble in making neat heavy wire connections. Eventually he sent it along to somebody else and in turn, again, it was forwarded elsewhere until finally it returned to me. Since that day we have adopted it as a symbol of our club and, if you permit me, I beg to you that you keep it as a souvenir from your friend in Old Mexico.

"At this particular time I am not on the air on my own and all my activities go through XE2JN, this city, as we all are piling our efforts toward a 0.5 kw. Club Station.

"I sincerely hope that in the near future we might be able to contact by means of Amateur Radio, till then MORE POWER TO YOU."

Ing. Horacio Mattei A. Gte.
Calle Belden No. 1510
Nuevo Laredo, Tam.

-30-

Spot Radio News

(*Continued from page* 14)

well ahead of the prewar monthly rate of 1,100,000. It goes without saying that the industry is expending every effort to impress upon OPA the significance of CPA's findings. High production should lead to decontrol. But how soon the CPA production figures will lead to free enterprise is still a moot question in Washington. . . . Incidentally, the radio industry contributed its share to the summer-end employment totals for the nation, hailed by CPA as "four million higher than the war-time level of a year ago." Civilian employment was reaching the 60,000,000 mark as Labor Day rolled 'round, with the increases showing most markedly in non-agricultural fields. A record large buying public seemed indicated for the holiday season.

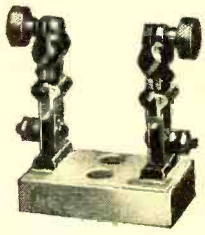
REGARDLESS OF OPA's ATTITUDE on decontrol, the industry continues to push for an early decision. A recent conference was called by Radio Manufacturers Association President R. C. Cosgrove in Washington. Industry leaders met with OPA officials. RMA announced after the conference that immediate steps were under way for accumulating the required information on the radio industry's production, inventories, and sales in preparation for the filing of formal decontrol petitions. "We will exert every effort and tap all of the radio industry's resources in this fight to bring about decontrol of the industry through processes provided by Congress in the new OPA extension act," Mr. Cosgrove said, and emphasized the significance of current production records: "Radio set production, by unit volume, is already greater than it was before the war, and it will probably increase this fall

Tubes are . . .
CHARACTERS!

AMATEUR

123-209

BROADCAST



124-212

INDUSTRIAL
ELECTRONIC

122-244

Handle them with Johnson Sockets

SOCKET—	BASE OR TYPICAL TUBE
123-209	Med 4
123-210	Pin Bayonet
123-211	Standard Jumbo 4 Pin
123-216	Giant 5 Pin Bayonet
124-212	833 A
124-213	152TL
124-214	1500th
124-215	204A
120-267	9000 series
120-277B	Miniature
121-235	
121-245	Acorn
121-265	
122-101	829
122-217	Small 7 Pin
122-224	4 Pin
122-225	5 Pin
122-226	6 Pin
122-227	7 Pin Med.
122-228	Octal
122-234	RK72
122-237	7 Pin Large
122-244	Super Jumbo (Industrial No. 412 Base
122-247	826
122-248	826
122-275	Giant 5 Pin
124-220	899R

There are many types in the tube family. Like humans they differ in appearance and performance. Each makes individual demands on its socket. A JOHNSON socket accomodates the 4-250A where provision for adequate heat dissapation is a major requirement. JOHNSON designed the first ceramic socket for miniature tubes where the socket must hold the small pins firmly and still accomodate minor variations without fracturing the envelope.

JOHNSON has achieved unusual prominence through skill in engineering both ceramics and metal to meet these demands. Experienced electronic engineers recognize and provide for tube and circuit requirements. Confidence, cooperation and assistance on the part of tube manufacturers explain the more complete line, and why JOHNSON is the only manufacturer producing some types.

When you need sockets look to JOHNSON. The price is usually no more, frequently less.

For more information write Dept. Z

JOHNSON
a famous name in Radio

E. F. JOHNSON CO. WASECA, MINN.

as well as attain a better balance between the supply of consoles and table model receivers. We believe that the industry can make a strong case for decontrol at the earliest opportunity." He warned, however, that it is going to take time. "Because of the lengthy procedures and detailed data required before it can petition for decontrol and on account of the long wait periods allowed for decisions by OPA officials and the decontrol board, it is unlikely that we can obtain a decision on decontrol for several months, probably not before December."

ONE OF THE OLDTIMERS in radio, Zeh Bouck, passed away recently after a short illness. Formerly associated with RADIO NEWS, Mr. Bouck was well known for his many contributions on radio subjects to various technical publications.

TWO PROMINENT FIGURES in the radio industry, Charles Golenpaul and Walter Jablon, have been appointed directors of the 1947 Radio Parts and Electronic Equipment Trade Show Corporation. It would be difficult to find two men better suited for this important job.

THE YEAR 1946 will be the biggest on record as far as the Federal Communications Commission is concerned, work-load figures already tabulated in Washington indicate. As an indication, 70,000 hams now have licenses. Between May and August, a total of 12,500 were processed, and the work is now current. Equally heavy is the load of applications for new AM stations—almost as many as the number of AM stations now operating. A total of 850 new applications are now pending, as compared with 977 stations already licensed. In addition, 303 construction permits have been granted. Some 65 FM stations are now on the air and 510 have either construction permits or conditional grants. This is in addition to 250 pending applications. Six licenses have been granted for television, plus 27 construction permits and 30 pending applications. And on top of all this, late summer and early fall found the Commission swamped with requests from municipalities for two-way radio systems. Almost every city in the nation wants a system installed. FCC is processing all applications as quickly as possible and looking toward 1947 with expectation of more work than this year.

FCC ALSO REPORTS a boom in radiotelephone service, despite wartime restrictions. Reports filed with the Commission show that the number of paid radiotelephone conversations increased from 49,493 in 1940 to 297,726 in 1945. The latter year showed a 97 per-cent increase over the previous year, while the first quarter of this year showed 120,150 calls—up 61 per-cent on an annual basis over 1945. Radiotelephone calls—if you're inter-

MID-AMERICA
HAS EVERYTHING FROM "A" TO "Z"

ANTENNAS
32½" Collapsbl Vertical 49c
10 Mtr Collapsbl Vertical $1.49
12½ Foot Telescopic $1.95
Phantom A-27, 2-4.5 mc $1.49

CABLE
Co-Axial RG8U Standard
Amphenol 52 ohm.
Per 100 ft. ..... Per ft. 8c
Per 1000 ft. ..... Per ft. 6c
Co-Axial RG54-A/u, 58 ohm
Per 100 ft. ..... Per ft. 7c
Per 1000 ft. ..... Per ft. 5c
Eight cond. shielded, colored rubber ins. six of #20, two of #16. Heavy rubber jacket, external tinned woven shielding. O.D. 9/16".
Per 100 ft. ..... Per ft. 10c
Per 1000 ft. ..... Per ft. 7½c

COIL FORMS
Kit of 10 Ceramic transmitting coil forms $1.49

CONDENSERS
Kit of 10 Bathtub condensers $1.49

AIR PADDER CONDENSERS—
Ceramic Insulation, Screwdriver Adjmt.
100 mmf 29c
140 mmf 49c
Following sizes available—5, 15, 25, 35 and 50 mmf, each 19c
KIT of 10 Asstd. Air Padder Condensers $1.49

G.E. PYRNAOL CONDENSERS

MFD	VDC	PRICE	MFD	VDC	PRICE
.25	1000	39c	.1	7500	$1.95
1	500	39c	4	1500	$2.95
1	600	49c	10	1000	$2.95
2	600	89c	12	660	$3.50
1	1000	98c	15	1500	$3.95
6	600	98c	1.5	6000	$4.95

HEAVY DUTY OIL FILLED CNDNSRS

MFD	VDC	PRICE	MFD	VDC	PRICE
.075	16000	$4.95	3	4000	$ 4.50
1.5	6000	8.95	10	6000	24.95

Dual 1 mfd 3000 VDC $3.95
Dual 1 mfd 7500 VDC $9.95

TUBULAR PAPER CONDENSERS

MFD	VDC	PRICE	MFD	VDC	PRICE
.01	600	9c	.3	200	10c
.006	1000	10c	.1	1000	15c
.05	600	10c	.004	1600	19c

VARIABLE CONDENSERS

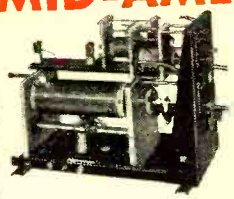
GANG	MMF	PRICE	GANG	MMF	PRICE
2	10	49c	1	500	$1.29
1	50	49c	2	370	$1.49
1	13	69c	3	75	$1.49
2	35	98c	4	140	$1.95

MISCELLANEOUS CONDENSERS
Hi-voltage Mica. Kit of 10 pieces, from 600-2500-volts $2.95
Hi-voltage Mica. Kit of 10 pieces, from 3000-5000 volts $5.95
Mica. Kit of 25 pieces. Asstd sizes from .00005 to .001, 300-600 v., per kit $1.98

DYNAMOTORS
Kit of 3 listed below $4.95
SIZE: 3⅞" x 6" long, excluding shaft. R.P.M. 4000.

INPUT VDC	INPUT AMPS.	OUTPUT VDC	OUTPUT AMPS.
6-9	6.4	450	60
12	3.5	480	42
24	1.75	480	42

MID-AMERICA SPECIALS



AT-3 Antenna Tuning Unit
An outstanding achievement in high frequency design! Covers all frequencies between 1.5 and 18 MC without use of plug-in inductance. Tunes any single wire antenna from 15 ft. whip to long wire. Ceramic insulation constructed to withstand high r. f. voltages. Simple to operate. Black wrinkle finish case measures 10¼" wide, 14½" high, 24" deep. Packed for shipment—wt. 56 lbs. Less 12 mmf and 50 mmf vacuum condensers . . . . . SPECIAL PRICE $26.95

SPEAKERS

5" Alnico Speaker, 4 Ohm VC, Limited Quantity $1.70
6" PM 2.5 Alnico V . $2.95
10" PM, 18 oz. slug . $7.95
AP-10 JENSEN Speechmaster, 5 Watt PM in metal housing less base . . $6.95

HEAVY DUTY LINE FILTER

Solar Elim-O-Stat
Type EN106, CSL53199, 20 amps, 115 V.A.C., 600 V.D.C. SPECIAL $1.79

QUANTITY BUYERS
Dealers . . . Jobbers . . . Industrials . . . Schools . . . and other quantity buyers — write for special trade discounts on items listed as well as hundreds of others.

HAND SET
Type TS-13
Telephone type with 200 ohm carbon mike and 2000 ohm earphone plus talk switch and cords with plugs $2.95

HEAD SET
Type HS-23
8000 ohm impedance, with cushions, 12" cord and PL-54 plug $1.50

INVERTERS
Input 27 VDC 35 amps, output 115 VAC 4000 cps $4.95
Input 24 VDC 1 amp., output 26 VAC 400 cps 6 VA $1.95

KEYS
Transmitting J-38 ..... 75c
Automatic Keyer TG-10-H with oscillator and 25 watt amplifier. 110 VAC, 60 cycle operation (less tubes) $39.95

MICROPHONES
Single button carbon hand mike, with press-to-talk switch, 5 ft. cord with PL-68 three circuit plug $1.75
Single button carbon lip mike. Fastens over upper lip, attaches to headset. With short cord and PL-291 plug 89c
Single button carbon mike. Attaches to headset and held in front of mouth by bracket. Aviometer type 9042 ..... 98c
KIT of 3 microphones, as listed above $2.95

GUARANTEED
All items shown in this ad are guaranteed as rated by nationally-advertised manufacturers and are new, unused and in perfect condition.

Motor Speed Controls
10 ohm, 7.07 amp, 500 watt, flush mounting $3.95
12.5 ohm, 10 amp, 500 watt, bracket mounting $3.95
175 ohm, 3.7 amp, 800 watt, 125 volts, bracket mounting $4.95

POWER SUPPLIES
Portable vibrator type, input 6/12/24 VDC, output 200 VDC 120 ma $1.95
Mobile, dynamotor type, input 12 VDC 12 amps, output 275 VDC 110 ma, and 500 VDC 50 ma, complete with fuse and filters $9.95

RECEIVER
Long Wave Receiver RAK-7, 15 to 600 KC, 110 VAC operation, complete with power supply and tubes $64.50

RECTIFIER
Dry Disc
Full-wave, 64 VAC input, 30.2 to 33.5 VDC output at 5.2 amps $4.75

RESISTOR KITS
20 asstd—5, 10, 25 watt wire wound, popular sizes $1.79
10 Candohms 5 to 20 watts, IRC or equiv 75c

RHEOSTATS
50 ohm, 25 watt 59c
70 ohm, 25 watt 59c
2500 ohm, 25 watt 79c

SWITCHES
Antenna
DPDT Hi-voltage, knife 39c
MICROSWITCHES
Type C, white top, SPST, normally closed, #WZ-7RSTC2 ..... 39c
Type C, #BZ-R5, SPDT 39c
Type C, #BZ-3RDTC, SPDT 39c
GE #CR1070C103-A3 momentary SPST normally closed 39c
PRESS-TO-TALK
DPST, NO, with 5 ft cord, UL-68 and JK-48 ..... 24c
PUSH BUTTON
10 Button, momentary contact, non-locking, right hand 49c
10 button, momentary contact, non-locking, left hand 49c
5 Button, pos. action, locking 49c
4 Button, pos. action, locking 49c
TOGGLE
Lever type, 3PDT 10 amp 250 VAC 59c
Push type SPST NO, 3 amp 250 VAC .. 29c
KIT OF 10 SELECTOR SWITCHES .. $1.49

TUBES
Immediate Delivery
6AC7 ..... 97c
6AG5 ..... $1.19
6J6 ..... 97c
6SLTGT 79c

TRANSFORMERS
Universale output transformer, single or push-pull tubes to any voice coil. Rate at 10 watts $1.20
Power transformer, primary 105-125 VAC 60 cps, Secondary 5 volts 190 amps. $14.95

TRANSMITTER
8C-223-A, 80 meter band; phone, CW, ICW; VFO or crystal controlled; 25 watt output $22.50

Transmitter-Receiver
Portable FM Transceiver SCR-510, range 5 miles, 20 to 27.9 MC, crystal controlled with 80 crystals, complete .. $79.50

VOLUME Control
Kit, 10 volume and tone controls, no witches, long shafts $1.79

WIRE
Single conductor #18 solid, rubber ins. OD 1/8" black, green only
Per 100 ft. 69c
Per 1000 ft. $5.45
Two conductor, #14 stranded with external tinned woven braid, O.D. ⅜"
Per 100 ft. ..... Per ft. 8c/ft.
Per 1000 ft. ..... Per ft. 6c/ft.

ZILLIONS
of other big-value parts, transmitters, tubes, and electronic equipment listed in MID-AMERICA'S Catalog. It's free for the asking. Just send coupon below and your FREE copy will be mailed at once.

IMPORTANT!
To assure fastest possible service and delivery, please send 25% deposit with your orders. Balance C.O.D. Send orders to store address. All prices shown are F. O. B. Chicago warehouse.

FREE Catalog

Mid-America Co., Inc., Dept. E-116
2412 S. Michigan, Chicago 16, Illinois
Send me at once—ABSOLUTELY FREE—your brand new catalog listing hundreds of "hard-to-get" radio parts, transmitters, and electronic equipment . . . ALL AT MONEY-SAVING PRICES.

NAME _____
ADDRESS _____
CITY _____ STATE _____

MID-AMERICA CO.

STORE	WAREHOUSE
2412 S. Michigan Ave.	2307 S. Archer Ave.
Chicago 16, Ill.	Chicago 16, Ill.
PHONE: VICtory 5987	PHONE: VICtory 7820

ested in making one—can be transmitted to forty-eight countries outside North America these days. Included are such far-off spots as Australia, Japan, Russia, Sweden and Switzerland.

-30-

Audio Oscillator

(*Continued from page* 51)

signal voltage across this control is approximately 15 volts, while most amplifiers require an input of only ½ volt or ¼ volt. A logarithmic-taper control, connected as shown in Fig. 5, spreads the low-output range over a wide arc and makes it easy to adjust for these outputs while still allowing for greater output if desired.

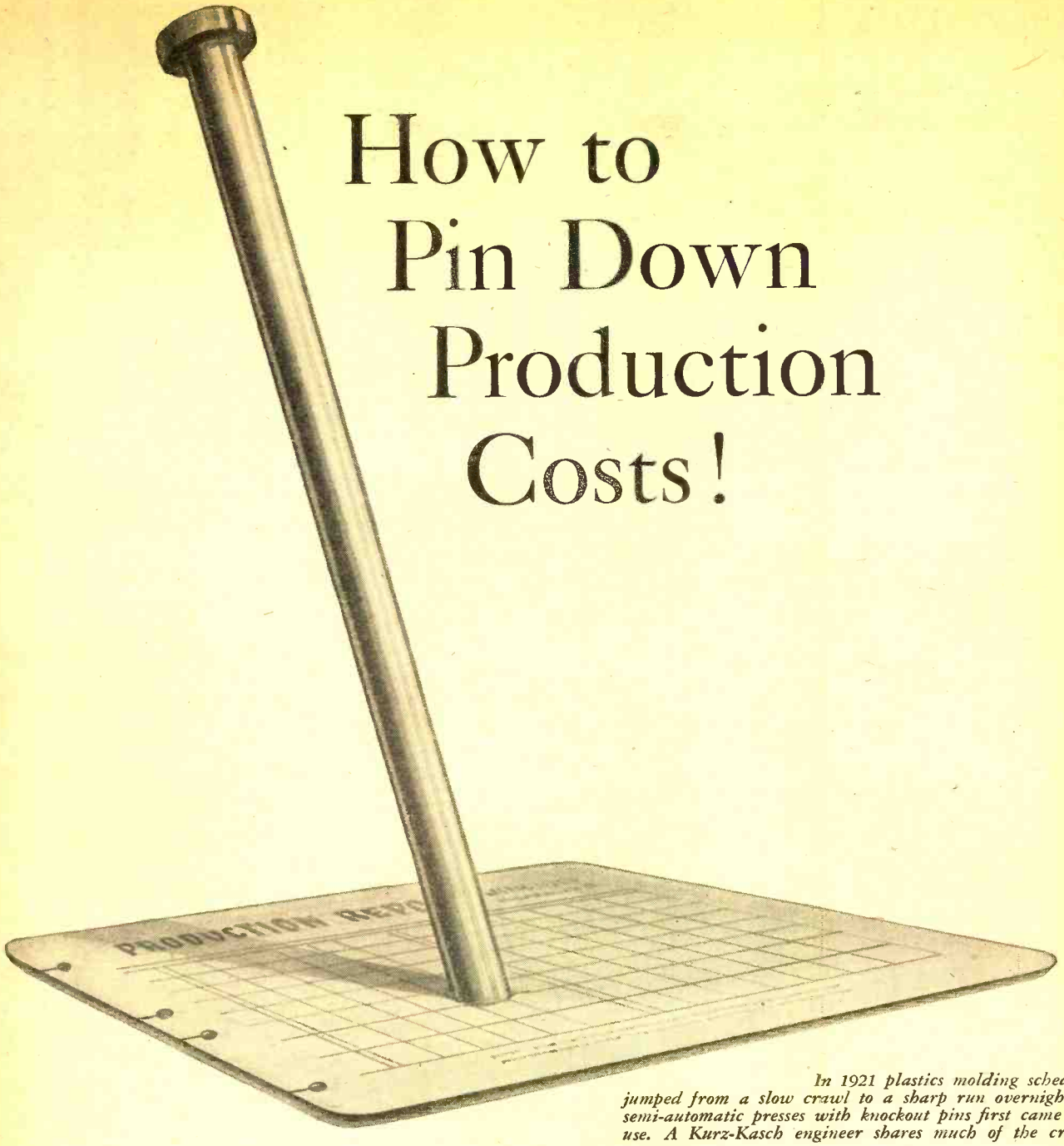
Placing the unit into operation is a relatively simple matter, and, wired correctly, it will work the first time it is turned on. As a rough performance check, connect a pair of high-impedance headphones to the output, set the output control to a fairly low value to avoid overloading the circuit, set the frequency dial about mid-scale, and adjust the feedback control until oscillations just take place as indicated by a tone in the headphones. Then swing the frequency dial back and forth over the entire range. Very little adjustment of feedback should be required to produce oscillations from the lowest frequency, where the dial is fully clockwise, up to a frequency which is above the range of audibility.

It will be noted that the unit will stop oscillating some distance away from the high-frequency end of the dial. This is normal, and is a result of loss in gain caused by lowered impedance of the potentiometer. Oscillations should not drop out, however, until the frequency is somewhat above the audible range. It is not advisable to try to force oscillations in this dead region at the high end of the dial through the use of the feedback control; because the audio frequency so obtained will be no higher than the upper limit observed with a normal setting of the feedback control, and a considerable adjustment of feedback will be required when returning to lower frequencies.

The over-all frequency range can be checked with the aid of an oscilloscope or a comparison oscillator whose frequency calibration is already established. If, for some reason, it is desired to shift the frequency range, this can be done by changing the values of C_1 and C_2. Making either capacitor smaller will raise the frequencies, and vice-versa. Changing these values will not extend the over-all frequency range but will simply shift the entire range of the instrument higher or lower as desired.

Some extension of the over-all range can be obtained through the substitution of a 1 megohm double potentiometer for the .5 megohm unit specified for R_1 and R_2, along with suitable readjustment of C_1 and C_2. This will

How to Pin Down Production Costs!



In 1921 plastics molding schedules jumped from a slow crawl to a sharp run overnight, as semi-automatic presses with knockout pins first came into use. A Kurz-Kasch engineer shares much of the credit!

TOMORROW'S improved molding practices will grow out of bright ideas simmering *today* in some progressive molding plant—paying dividends to the customers whose production will benefit before the crowd.

New production ideas have been an *old* Kurz-Kasch habit since the birth of the plastics industry. *See* how they'll benefit you—*send* for your free booklet, "A Businessman's Guide to the Molding of Plastics"—on your business letterhead, please.

Kurz-Kasch

For Over 29 Years
Planners and Molders in Plastics

Kurz-Kasch, Inc., 1429 S. Broadway, Dayton 1, Ohio. *Export Offices:* 89 Broad Street, New York, N. Y.
Branch Sales Offices: New York • Chicago • Detroit • Los Angeles • Dallas • St. Louis • Toronto, Canada.

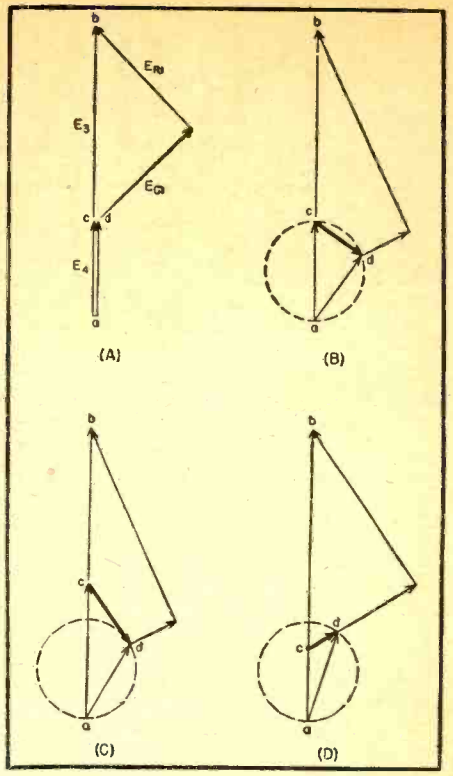
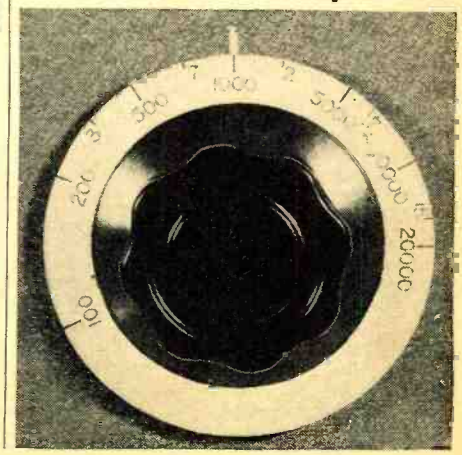


Fig. 7. Vector relationships in bridge circuit of Fig. 3. Letters on the vector diagram correspond to similarly lettered points in Fig. 3. (A) Bridge perfectly balanced. Cathode-grid voltage (c-d) on tube 1 is zero. (B) Changes in vector diagram from that of (A) where frequency changes. Vector c-d takes on various values as point d moves in a circle. (C) Same as (B) with resistor R_3 smaller than the value required for balance. (D) Same as (B) with resistor R_3 larger than the value required for balance. Note that vector c-d may be in phase with the voltage a-b. Under these conditions, oscillation occurs.

just about double the frequency range, but, of course, the calibrations on the dial will be more crowded.

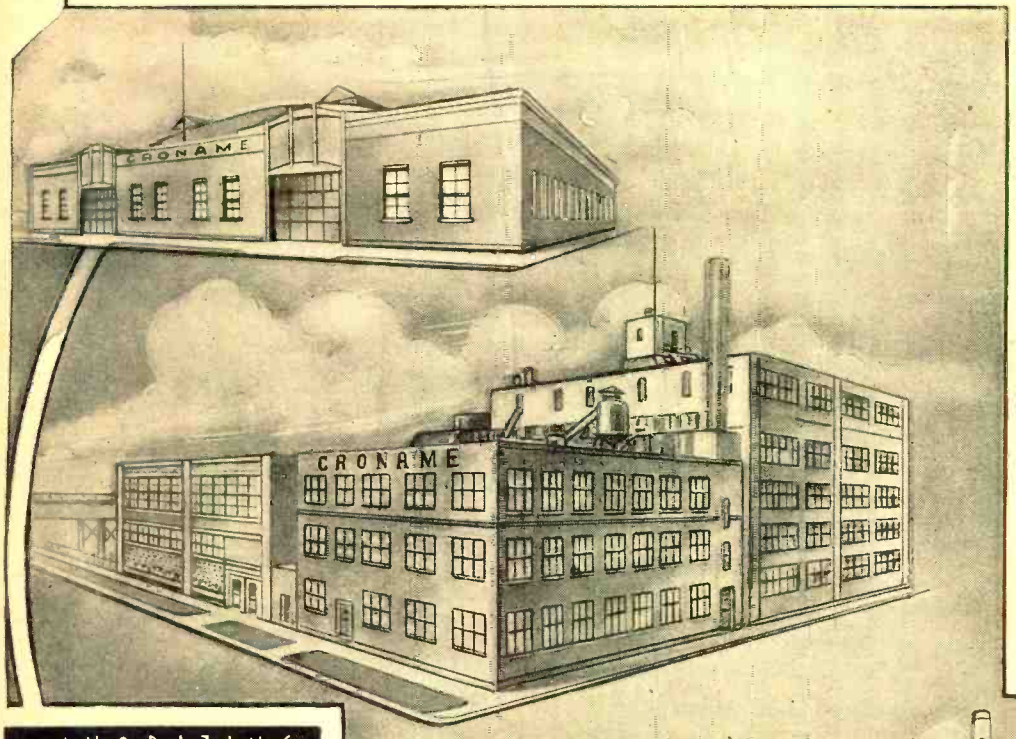
Once the frequency range has been established as desired, the oscillator is ready for calibration by comparison with a known source. Before calibrating, it should be understood that both the setting of the feedback control and the amount of loading on the output

•Fig. 8. Close-up of main tuning dial, showing how frequency calibrations space out when potentiometer is correctly connected.



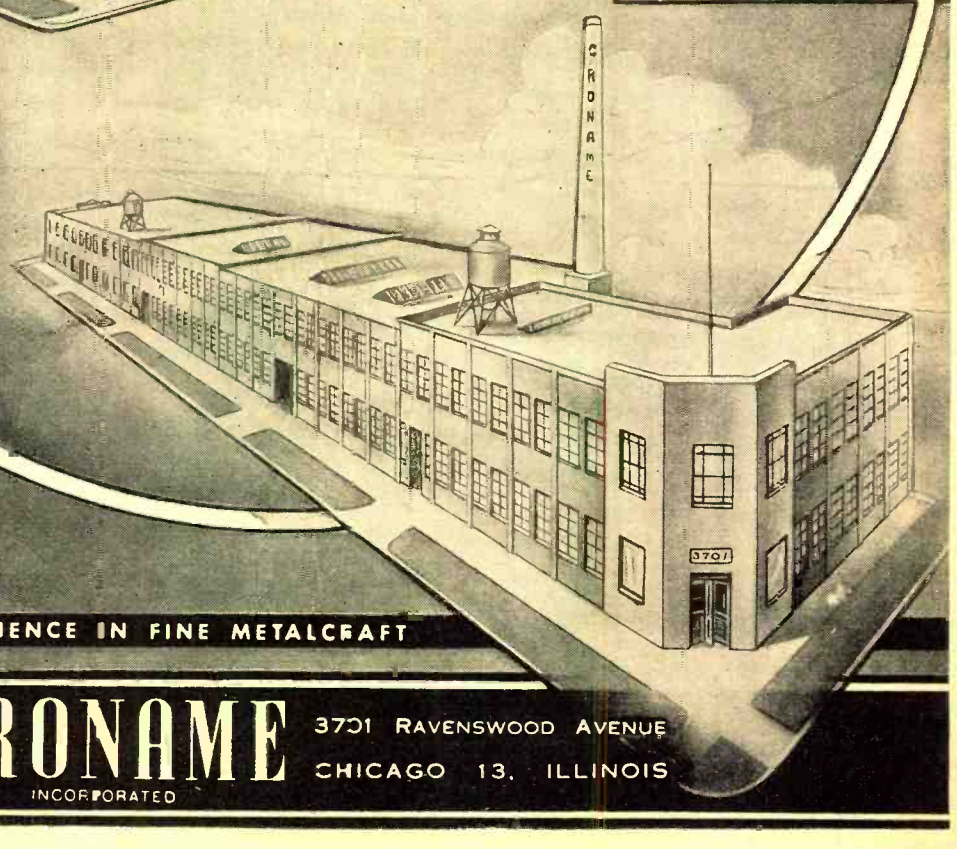
CRONAME *Facilities*

FOR ELECTRONIC COMPONENTS AND FINE METALCRAFT



ENGINEERING
ETCHING
LITHOGRAPHING
EMBOSSING
ENGRAVING
STAMPING
ALUMINUM WELDING
& HEAT TREATING
ASSEMBLIES
SOLDERING
METAL FINISHING
PLATING

ANODIZING
PARKERIZING
OXIDIZING
FLUORESCENT
PHOSPHORESCENT
DECORATED GLASS
GLASS DIALS
DECORATED PLASTICS
FORMED PLASTICS
RADIO TUNING UNITS
REMOTE CONTROLS



OVER 40 YEARS EXPERIENCE IN FINE METALCRAFT

ARMY E NAVY

CRONAME
INCORPORATED

3701 RAVENSWOOD AVENUE
CHICAGO 13, ILLINOIS

will affect the frequency. Therefore, it is necessary to calibrate the unit with some high impedance device connected to the output, such as an oscilloscope or a high impedance amplifier input circuit. In addition, it is necessary to adjust both the feedback control and the frequency control for each frequency of calibration in such a manner that a sine wave is produced at the desired frequency. Of course, an oscilloscope is ideal for determining whether or not the unit is delivering a sine wave; but in the absence of such an instrument, the feedback control should be adjusted just slightly beyond the point where it breaks into oscillation. A good sine wave will be obtained until the feedback is advanced considerably beyond this point.

Another consideration in calibration is that most commercial two-gang potentiometers have considerable backlash. Therefore, each calibration point should be determined only after turning the main tuning dial in some certain direction, whether right or left as desired.

In using this test oscillator, it should be borne in mind that it is by no means intended as a precision instrument, and frequency calibrations can be off as much as five or ten per-cent. However, it is very stable for all its simplicity, and once set to deliver a sine wave at some frequency it will maintain a reliable signal of constant output and good waveform for long periods of test.

—30—

New Amateur Transmitter

(*Continued from page* 39)

This is particularly desirable on the higher frequency bands which usually are open for a limited number of hours each day. Five separate tank coils are utilized (10 and 11 meters use the same coil), each with its own variable link. The link couples the antenna or feeders to the cold end of the plate coil. All links are mechanically coupled together and are operated by a control knob on the front panel. They feed directly into 52 ohm to 73 ohm transmission lines. For higher impedance transmission lines an external tuning circuit should be employed. Either balanced or unbalanced antennas can be used.

6. *V.f.o. control.* This was accomplished with a high degree of success. The dial is calibrated directly in frequency. The exciter unit will be discussed in detail in the latter part of this article.

7, 8, 9. *Power supplies.* Economical design dictates that the power supplies be kept to a minimum. A high voltage supply, low voltage supply, and a bias supply provide all the d.c. power required by the 30K. A single high voltage supply feeds both the r.f. power amplifier and the modulator tubes. Since the 4-125A tube requires high voltage and low current, as do the 75TH modulators, a pair of 866A rectifiers can deliver easily the required plate current for both stages. The low voltage supply provides voltage for the 4-125A screen, the speech amplifier, and the modulator driver. It also supplies bias voltage for the 4-125A and the modulator tubes. With the 4-125A biased to cut-off, keying can be accomplished in the exciter.

10. *High efficiency.* In the 30K circuit, plate efficiency of the 4-125A is between 75 and 80%. The tank and coupling circuits are designed for low loss, thus delivering maximum power to the antenna.

11, 12, 13. *Speech equipment.* Speech amplifiers and modulator equipment are on one chassis located in the transmitter cabinet. The audio input will accommodate either crystal or high impedance dynamic microphones. The amplifier is conventional, with the exception of the speech clipper and filter employed.

Prior to the development of the 30K, a considerable amount of investigation in the laboratories had proved the advantages of audio peak clipping. In congested frequencies such as amateur bands, or in adverse atmospheric conditions, peak clipping raises the effective modulation level and provides greater intelligibility at the receiving end. It also prevents overmodulation, because audio peaks and transients are clipped before reaching the modulator.

A low pass filter, following the speech clipper, attenuates all frequencies above 4000 c.p.s. This cut-off frequency is high enough to preserve the naturalness of the voice, yet eliminates excessive bandwidth. In field tests, listeners have reported that the 30K takes a comparatively narrow band width in amateur bands.

A pair of *Eimac* 75TH tubes are utilized as modulators. The modulation transformer has a separate winding for modulating the 4-125A screen.

A manually operated "phone-c.w." switch is located in the modulator unit, and is controlled by a knob on the front of the transmitter. For c.w. operation, this switch opens the filament circuit of the modulator tubes and shorts the secondary of the modulation transformer.

The audio gain in the speech amplifier is controlled by a knob on the front panel. The clipping level is adjusted manually from the rear of the cabinet, and can be set to occur at any desired percentage of modulation.

14. *Single control operation.* The transmitter plate switch and the exciter switch are connected in series. Just by leaving the transmitter switch in the "On" position, the exciter switch will have complete control of transmitting and receiving functions. The exciter switch has an extra section for use as a receiver disabling switch.

If push-to-talk operation is desired, the "push-to-talk" switch is connected in series with the plate control section of the exciter switch. Both transmitter and exciter switches are left in the

"transmit" position. An extra relay is then necessary for disabling the receiver. Calibration procedure is unchanged. Terminals are provided for operation of a receiver disabling relay, and also for an antenna changeover relay in the transmitter.

15. *Accessibility.* The cabinet is of sturdy welded steel construction. All units, tubes, and wiring are easily accessible through the full length rear door. Electrical interlocks break all high voltages when the cabinet is opened. The door may be locked with a key to prevent entrance by unauthorized persons.

All operating controls are conveniently located on the front panel. Meters are mounted on an insulated panel located behind a glass window near the top of the transmitter. Another window permits observation of the 4-125A r.f. amplifier.

Exciter Unit

The exciter unit for the 30K can be adapted easily to drive a variety of higher powered transmitters. All circuits are ganged together and controlled by a single tuning knob. The variable frequency oscillator is a peacetime application of a rugged and highly stable wartime development. The dial is calibrated directly in frequency, and is accurate to within 1 kc. in the 40 meter band. Accuracy on the other bands is directly proportional. The 1 kc. allowable deviation includes the frequency error due to all normal operating conditions. The v.f.o. operates in the 160 meter band.

One control bandswitches all circuits simultaneously. The exciter covers the 80, 40, 20, 15, 11, and 10 meter bands. In the "calibrate" position, the exciter can be tuned to zero beat with a received signal without turning on the transmitter.

Electronic keying provides fast, clean c.w. operation. When the key is removed from the jack, the circuit is automatically closed for phone operation. The exciter output is fed through a 73 ohm coaxial transmission line to a link on the grid coil in the transmitter.

Operation of the exciter is extremely simple—one control switch, a bandswitch, and single dial tuning. It can be used either as a transmitter or as a versatile exciter. Frequency control is rapid, accurate, and reliable.

Field Tests

The 30K has been given strenuous and critical tests in actual amateur operation. The ease and reliability of operation were firmly established. As was expected, the speech clipper was highly satisfactory, and effectively raised the modulation level. The signal was kept clean, and intelligibility was definitely increased. The low-pass audio filter maintained a narrow band width. It can be said truthfully that the clipper enabled the operator to obtain and maintain solid contacts that would have been lost otherwise in static and crowded frequencies.

-30-

Facsimile for the Home

(*Continued from page 49*)

simile program material of popular appeal, the larger the sale of paper and the more often the customer will return to the store for refills. The paper is manufactured with a moderately high moisture content, packaged in moisture-proof cans and loaded into the home recorder in a humidor, obviating any moistening process in home or store.

There are no rapid reciprocating mechanical motions in the facsimile mechanism. The only operation necessary on the part of the user, after he had loaded his recorder, is to adjust the volume control. Finished copy unrolls to be read at the reader's convenience.

Copy is produced by tapping into the output of the FM discriminator, feeding it through a recorder amplifier to the recorder unit. The recorder amplifier not only does the conventional job of building up the signal to values necessary to mark the paper electrolytically but furnishes pure d.c. for marking the paper. It also controls framing and synchronization in the recorder.

The recorder resembles a typewriter mechanism, having feed rollers and a printer-bar. Paper passes from the storage humidor under the printer-bar and over a drum on which a wire is wound in helical form to complete the circuit from printer-bar —through the paper to the helix wire.

Both drum and helix rotate at the relatively slow speed of 360 r.p.m., the effect of the helix being a lateral contact across the paper, line by line. The degree of blackness produced electrolytically, at any moment, is proportionate to the current passing through the paper, and this in turn, is controlled by the received radio signal. After the mark is made at the helix bar, the paper moves up another 1/105 of an inch to mark the next line. It then passes over a miniature heating unit and ironing unit which drive out all moisture, and thus the paper issues clear and crisp.

The printer-bar furnishes some of the ingredients to the electrolytic process which marks the paper. It must therefore be renewed, after every two or three rolls of paper are used. But this is so easily done that service attention is unlikely. The printer-bar is a thin blade of iron 8 inches long, corresponding to the length of each printing line, and is of negligible cost. Aside from lubrication, tube replacement and occasional cleaning there is substantially no service attention required by the home recorder.

Broadcasting of facsimile newspapers and printed matter in association with AM and FM sound programs may be started in about a dozen leading cities of the country sometime next year. If it catches on, servicemen will

Flattery on KENYON T-LINE TRANSFORMERS *Doesn't Go To Our Heads* IT KEEPS US AHEAD!

"Imitation" is the sincerest form of flattery—so, being human, we're "flattered" that our "out front" T-LINE is the most copies-of-all transformer housings! Competitors were quick to see the superiority of T-LINE over the "horse and buggy," unpotted open-type transformers—and adopt this improved design principle.

More power to them! But, meanwhile Kenyon Designers are still ahead with these—

KENYON T-LINE ADVANTAGES

- UNIVERSAL MOUNTINGS—die-punched in a single, simultaneous operation, so that they ALWAYS REMAIN EXACT!
- Electrically and Mechanically FOOL-PROOF LUGS—DEPENDABLE under EVERY CLIMATIC CONDITION!
- UNIFORMITY and BEAUTY of APPEARANCE assured in finely designed ONE STYLE CASE in durable, black dull satin finish enamel!
- PROVED-THROUGH-SERVICE EXCELLENCE of electrical and mechanical design that today is being produced from AVAILABLE MATERIALS at LOW COST!

TRANSFORMER TROUBLE? CONSULT KENYON!

You are cordially invited to present your transformer problems to Kenyon Engineers. Pioneers in transformer development and design, we SPECIALIZE in "SPECIAL UNITS" for the electronics field and other commercial and industrial users. Our seasoned advice is, of course, yours—entirely without obligation.

KENYON TRANSFORMER CO., Inc. 840 BARRY STREET NEW YORK, U. S. A.

have to become familiar with the home recorders and be ready to service them.

Some thought has been given to how extensive this training need be. But if printed matter will not convey the necessary information to the trade, prospective manufacturers stand ready to provide for training servicemen at their plants. Whether this will be necessary is not clear as yet but it will be before quantity production receivers are available because a considerable period of experimental programming will precede presentation of any general facsimile broadcasting service. During this period, a quantity of pre-production recorders will be in the hands of typical home users to gain experience in programming and service problems.

Though the accent primarily has fallen on commercial home facsimile, an interest is being awakened in the amateur who also can get printed matter and pictures into his home by radio facsimile.

For producing a picture of about 105 line screen on a 360 r.p.m. drum, the bandwidth is about 6000 cycles. This is somewhat too much for a typical "ham" radio-telephone transmitter. But it would be no trick at all to make a special ham-type home recorder which operates at half speed, by switching the two-pole synchronous motor to four-pole operation. This would cut down copy speed to 14 square inches per minute but it would still have plenty of speed. Using a standard typewriter with solid single space copy, it would deliver 115 words a minute, which still is moving it along.

Since amateur operators are interested in long distance communications, synchronization through power systems would be impractical, but satisfactory automatic synchronization systems are available which overcome this difficulty. They depend upon the use of pulses, transmitted between scanning lines, to govern the receiver-motor speed.

Nobody can tell when amateur facsimile will be available because, at present, attention is being focused on the BCL field. But one or two familiar makers catering to the amateur field are studying the production problem with a view to making a low-cost amateur-BCL machine and slow-speed narrow band scanner for amateur transmission.

Transmitting scanners and demonstration recorders made by the *General Electric Company* will be available to FM broadcasting stations early in 1947, and quantity production home recorders may appear late in the year. Since such things as fancy hardwood cabinets do not confuse production for the amateur market, it is more than likely that essential components or complete recorders and scanners for amateurs will be available before the public has a chance to buy facsimile recorders in quantity. —30—

What's New in Radio

(*Continued from page* 68)

ception of distant or weak stations.

The EC-113 covers three bands, 535 to 1625 kc., 2200 to 7100 kc. and 6900 to 22,000 kc.

Hallicrafters Company, 2611 South Indiana Avenue, Chicago, Illinois will supply additional information about their home receiver line upon request.

POCKET TESTER

Robson-Burgess Manufacturing Company of Omaha, Nebraska, has recently introduced a pocket size unit which indicates shorts, leakage,

grounds and voltage for routine testing and repair work.

Known as the Meg-Lite, this unit operates on 115 volts, a.c. or d.c. Leakage resistance to 200 megohms can be checked and voltages from 90 to 500 volts, a.c. or d.c. can be indicated. The

unit can be switched to either high or low sensitivity as required for the particular circuit to be tested.

Prices and deliveries on this pocket Meg-Lite will be furnished by *Robson-Burgess Manufacturing Company*, Omaha, Nebraska.

EXPORT TABLE MODELS

Two new table model receivers, designed for the export market, are currently in production at the Chicago plant of *Stewart-Warner Corporation*.

The Model 9013-A has three bands covering from 13 to 550 meters. This superheterodyne has selective manual tuning and a 6 inch PM dynamic speaker. The circuit features ten tuned circuits for all bands and four watts power output. Designed for a.c. operation, it has five tubes and rectifier; power transformer of 50-60 cycles with taps at 110, 125, 150, 200, 225 and 245 volts; plug-in for phonograph; external antenna connection, and completely impregnated components to withstand tropical operating conditions.

The Model 9017-A (illustrated) is housed in a dark walnut-finished plastic cabinet. This receiver is a popularly priced a.c.-d.c., three-band superheterodyne with five inch speaker and five tubes and a rectifier. It is de-

SECURE DIAL CORD KNOT

RADIO dial cords of the type illustrated have a habit of becoming loose at the knots where the cord is attached to the spring or to the hook on the dial drum.

The application of cement of the kind used for radio speakers will keep these knots in place for a much longer time. . . . . H.L.

WHATEVER YOU NEED IN RADIO OR ELECTRONICS

PARTS...SETS...KITS
TESTING EQUIPMENT...TOOLS
PUBLIC ADDRESS EQUIPMENT
TRANSMITTERS

YOU CAN GET IT AT NEWARK!

SERVICEMEN

Three big stores, each carrying tremendous stocks, are ready to serve you with tools, replacement parts, test equipment, sets or anything else you need. Wire, write or telephone if you can't visit one of our stores. If you can visit with us you'll find our trained staff of tremendous help to you.

SERVICE

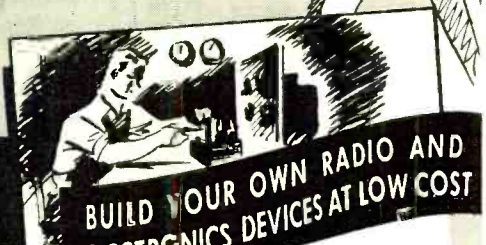
Mail orders are shipped the same day they are received. You don't have to wait when you buy from Newark. On special inquiries, we give you full information, prices and delivery dates promptly. Newark will give you service that will help you serve your customers better.

PUBLIC ADDRESS SYSTEMS FOR EVERY NEED AND PURPOSE

No matter what your public address needs may be, Newark has the outfit that will do the job for you. All the well known, standard makes are carried in stock. Delivery is fast and dependable . . . in New York and Chicago we maintain our own delivery system . . . for out-of-town customers we ship orders the same day they are received.

All our stores are staffed by trained men who know public address needs and can help you select the outfit that will best serve your purpose. If your needs are unusual, they know how to make up special combinations to satisfy them efficiently.

If you can, visit one of our stores. If you can't come to see us, write, phone or telegraph and your inquiry will be answered promptly and fully. Newark has the stock, Newark has the 'know how', Newark can help you.



BUILD YOUR OWN RADIO AND ELECTRONICS DEVICES AT LOW COST

With Newark's kits and parts you can easily build radio receivers, transmitters, amplifiers, and other exciting radio and electronics devices.

• • •

Make a good radio receiver for yourself or a fine record player with automatic changer at tremendous savings. You can construct these and many other radio and electronics devices easily. Our men know how to make them and will gladly show you if you can visit one of our stores—or will explain clearly by mail.

FOR GOOD BUYS AND A GOOD TIME VISIT OUR BIG BARGAIN COUNTERS

These big bargain counters in all our stores, are loaded down with special items available in quantities too small to advertise. Marvelous war-time sets, new small gadgets you can have fun with . . . all sorts of new parts and special things you'll want to see. Come in, look around and ask all the questions you wish. Come in often you'll have a wonderful time.

WRITE FOR OUR BIG BARGAIN BULLETIN LISTING THE LATEST AVAILABLE EQUIPMENT

Magazines are printed months before you read them, stocks change, new things are developed and made, so we give you the very latest news about the very newest things in radio and electronics in our Big Bargain Bulletin. Send for your copy today and know all about the latest equipment first. When writing address Dept. G1.

NEW YORK
242-50 W. 55th St.
New York 19, N. Y.

NEWARK ELECTRIC COMPANY, INC.

CHICAGO
323 W. Madison St.
Chicago 6, Ill.

New York City Branches: 115-17 W. 45th St. & 212 Fulton St.

signed for 117 volt operation on 50 or 60 cycles, and external adapters are provided for operation on high voltages if desired.

Details of both of these receivers will be furnished by *Stewart-Warner Corporation,* Chicago, Illinois, upon request.

G.E. COMBINATION RADIOS

General Electric Company has recently previewed their line of Musaphonic home radios which feature several innovations.

The new line makes use of the *G.E.* tuning system which features the use

of silver-plated variable inductances. According to the company, this system surpasses the efficiency of gang condensers and is highly effective in the new high FM frequencies and short-wave bands.

Other improvements include a completely redesigned audio system, a single tuning indicator for both AM and FM reception, a "fool-proof" tone arm on the record player and the company's exclusive electronic reproducer.

Shown is the Model 43 of the line. This console radio-phonograph combination is available in knotty pine cabinet of contemporary design.

Details of the line will be furnished by *General Electric Company,* Electronics Department, Syracuse, New York.

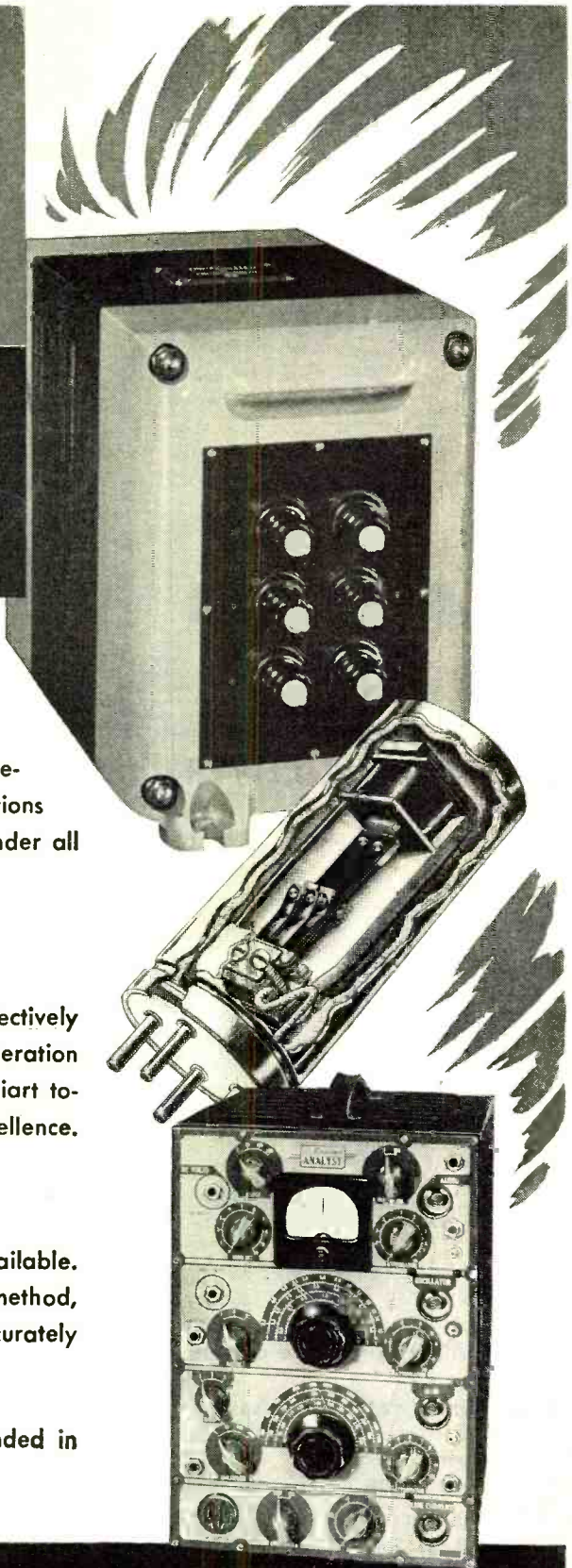
LINE VOLTAGE CONTROL

The Type V-10 Variac, designed to meet requirements for variable line voltages in various servicing applications, experimentation work and labo-

ratory testing, has been announced by *General Radio Company* of Cambridge, Massachusetts.

Their new 115-volt models are rated at 10 amperes, with a 15 ampere maximum which coincides with the capacity

3 Standards OF ELECTRONIC QUALITY



THORDARSON TRANSFORMERS

A quality line . . . backed by 51 years of outstanding transformer manufacture. Designed for every electronic requirement, these new Thordarsons make difficult installations easy and are your assurance of top-notch performance under all conditions. Ask for them today.

RADIART VIBRATORS

Radiart Vibrators are sealed against air and moisture, effectively preventing point oxidation and guaranteeing effective operation under conditions too tough for ordinary units. Specify Radiart today. Look for the Red Seal . . . your guarantee of vibrator excellence.

MEISSNER ANALYST

The most modern and complete service instrument yet available. Tests receivers and locates faults by the signal tracing method, fastest and most reliable method to date. All controls accurately calibrated with functions clearly indicated.

Thordarson-Meissner-Radiart products listed and recommended in Photo-Fact Folders.

ELECTRONIC DISTRIBUTOR AND INDUSTRIAL SALES DEPARTMENT

MAGUIRE INDUSTRIES, INCORPORATED

936 N. MICHIGAN AVENUE · CHICAGO 11, ILLINOIS

of commonly used outlets, plugs, cords, etc.

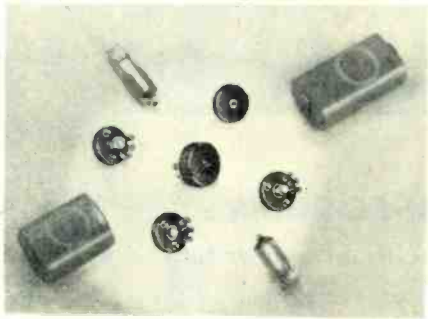
The output voltage of these new Variacs is continuously variable from zero to 17% above line voltages. The line is available in 6 models, 115 volt and 230 volt service.

Additional information will be forwarded by *General Radio Company*, 275 Massachusetts Avenue, Cambridge 39, Massachusetts, to those requesting it.

MINIATURE RADIOHM

Centralab is currently in production on a new Model 1 Radiohm specifically designed as a volume attenuator for hearing aids, pocket radio receivers and miniature amplifiers.

This new type unit will be available in 500 ohms to 5 megohms in six different tapers. Features of this new Radiohm include, dust shield to keep out foreign matter, three optional mounting locations, optional cam for external switch operation, separate assembly knob, twin resistor contact, terminals insulated and independent of mounting, and tolerance ± 20% standard for all values and curves.



Photos, construction drawings and additional information are included in a temporary bulletin, Form No. 394, which is available from *Centralab*, 900 East Keefe Avenue, Milwaukee 1, Wisconsin.

MULTIWIRE CONNECTORS

Alden Products Company has recently added a new series of multiwire connectors to its line of electrical components.

These connectors provide that the two elements of each combination lock together by means of a generous sized knurled locking ring that engages slots in the opposite member. When the connector is locked, a rubber gasket exerts reverse pressure on the ring to make the assembly vibration proof, at the same time sealing out moisture from the prongs.

The shielding on the cable is brought inside the metal shell and its pigtail (or wire soldered to the shield) is brought back through a hole in the shell and soldered, thus providing strain relief.

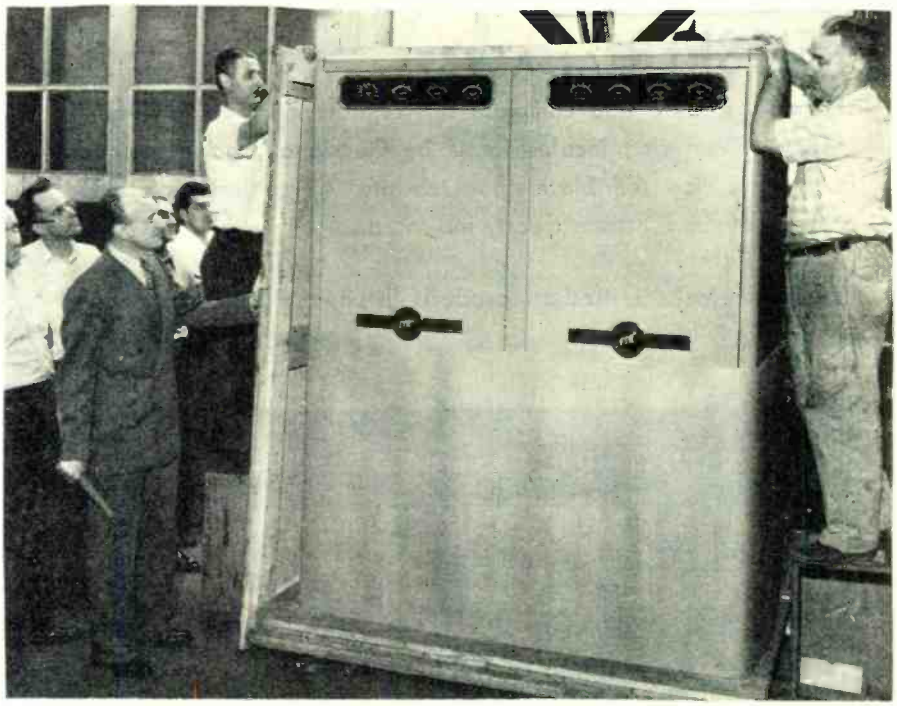
Additional details and a technical data sheet on this line of connectors will be furnished by *Alden Products Company*, 117 North Main Street, Brockton 64, Massachusetts.

RECTIFIER PLATES

The *Seletron Division* of the *Radio Receptor Company* has recently introduced their new 5" x 5¾" selenium rectifier plates built on aluminum to the trade.

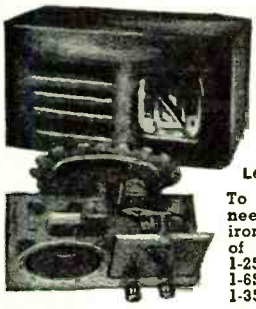
Developed specifically for high current capacity and especially applicable for electroplating and battery charging, although not limited to this use,

The first FM transmitter to be shipped by the Federal Telephone and Radio Corporation of Newark, New Jersey, is crated for delivery by special truck to radio station KOWH, Omaha, Nebraska, the Omaha World-Herald station. This 1 kw. equipment will use a new FM square-loop antenna, a Federal development. The transmitting station is a house which was purchased and moved to the proper location.



LIBERTY — First in Radio Values

6-Tube "Super Het" Radio Kit



Complete including attractive Walnut cabinet. Pictorial diagram furnished. All parts mounted.

YOUR COST $14.95

Less Tubes, Wire, Solder

To assemble all one needs is a soldering iron and 30 minutes of your time. Uses 1-25L6 1-25Z6 1-6SQ7 1-6SK7 2-6SJ7 or 1-50L6 1-35Z5 2-12SJ7 1-12SK7

5-Tube "Super Het" Radio Kit

Complete including attractive Brown Bakelite cabinet. Pictorial diagram furnished. All parts mounted. App. size 9 x 5 x 6 inches. Uses one 25L6—one 25Z6—one 6SA1—one 6SQ7—one 6SK7 or one 1-50L6 1-35Z5 1-12SA7 1-12SQ7 1-12SK7

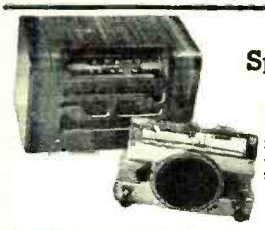
YOUR COST $12.95

Less Tubes, Wire, Solder

Portable Phonograph Kit

Attractive Leather Covered cabinet. Complete with motor, pick-up, amplifier. Size 14x7½x19 inches. Uses one 25L6—one 25Z6—one 6C5. Tone and volume controls.

YOUR COST $23.95 Less Tubes, Wire, Solder



IMMEDIATE DELIVERY
Special 5-Tube "Super Het" Kit with SLIDE RULE DIAL

Plated chassis. Beautiful Walnut Cabinet. Built-in antenna. Dimensions 6⅝x7⅞x12¾ in. Uses one 12SA7—one 12SK7—one 12SQ7—one 50L6—one 35Z5. Pictorial diagram furnished.

YOUR COST $19.95

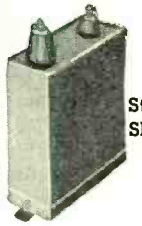
Less Tubes, Wire, Solder

RADIO LINE FILTER

This radio line filter is designed to steady a choppy or rippling line—and to filter out power line noises, fluorescent light noises, elevator noises, RF noises, etc., which are super-imposed on the line by passing them into the ground.

YOUR COST $5.95

ATTENTION!! RADIO AMATEURS



OIL FILLED CAPACITORS

Standard Brands

Shipping wt. 1 lb.

Impregnated Porcelain high tension terminals.

	YOUR COST
2 mfd.—1000 V.	$1.60
4 mfd.—1000 V.	2.20
4 mfd.—1500 V.	2.80
8 mfd.—1000 V.	2.80
2 mfd.—1500 V.	2.20

X-MITTING MICAS

.00075— 600V	12c			.02 —1000V	20c
.0005 — 600V	12c			.01 —1250V	20c
.0001 — 600V	12c			.002 —1200C	20c
.00025— 600V	12c	.04	— 600V 12c	.0004 —2500V	25c
.02 — 600V	15c	.003	— 600V 12c	.0051 —2500V	25c
.022 — 600V	15c	.001	—1000V 20c	.005 —2500V	25c
.027 — 600V	15c	.01	—1000V 20c	.0035 —2500V	25c

BRANDS

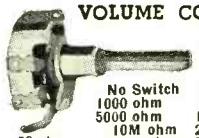
Record Changer

complete with motor and pick-up. Fully Guaranteed.

List $37.50

YOUR COST $19.50

VOLUME CONTROLS



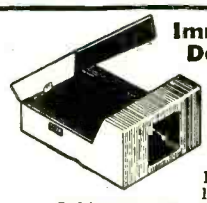
YOUR COST 25c each

No Switch	40M ohm
1000 ohm	50M ohm
5000 ohm	100M ohm
10M ohm	200M ohm
50 ohm	20M ohm 750M ohm
100 ohm	1 meg 800M ohm
700 ohm	25M ohm 2 meg

Duals Your Cost, 35c ea.

100 M—100 M ohm 100 M— 15 ohm

Immediate Delivery



your cost $7.75

Portable leatherette Cabinet for Electronic Phonograph. Size 7x14½x18 inches

AN EXCEPTIONAL VALUE

3 tube A.C. D.C. Phono Amplifier Kit—less tubes, with speaker — uses 6C5—25Z6—25L6—

YOUR COST $4.95

LATEST MODELS SUPERIOR TEST EQUIPMENT

The New Model 450 TUBE TESTER

Speedy operation assured by newly designed rotary selector switch which replaces the usual snap, toggle or lever action switches.

Tests all tubes up to 117 volts including 4, 5, 6, 7, 7L Octals, Loctals, Bantam, Junior, Peanut, Television, Magic Eye, Hearing Aid, Thyratrons, Single Ended, Floating Filament Mercury Vapor Rectifiers, etc. Also pilot lights.

Tests shorts and leakage up to 3 Megohms in all tubes.

Tests both plates in rectifiers.

Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.

Uses a 4½" square rugged meter.

Works on 90 to 125 Volts 60 cycle A.C.

Extra Service—The Model 450 may be used as an extremely sensitive condenser leakage checker.

Housed in portable leatherette covered cabinet complete with all operating instructions. Net wt., 8 lbs.

YOUR COST $39.50

The New Model 600 SET TESTER

A new combination tube tester and multi-meter.

A complete testing laboratory all in one unit.

Incorporates all the features of the Model 450 plus the following Multi-Meter Specifications:

D.C. Volts (at 1,000 ohms per Volt) 0 to 7.5/15/75/150/750/1,500 Volts.

A.C. Volts 0 to 15/30/150/300/1,500/3,000 V.

D.C. Current 0 to 1.5/15/150 Ma. 0 to 1.5 Amp.

Resistance 0 to 2,000/20,000/200,000 ohms 0 to 20 Megohms.

Decibels (based on 0 decibels equals .006 Watts into a 500 ohm line). —10 to +18DB, +10 to +38DB, +30 to +58DB

Model 600 is housed in a beautiful hand rubbed cabinet complete with test leads, tube charts, and detailed operating instructions. Size 13"x12½"x6".

YOUR COST $62.50

The New Model 680—5000 OHMS per VOLT VOLT-OHM MILLIAMMETER

A single scale is used for all voltage (both A.C. and D.C.) and current ranges. Thus all readings are plain and obvious. Radio servicemen will be delighted with this time-saving innovation. Measures: D.C. VOLTAGES to 1500 volts; A.C. VOLTAGES to 1500 volts; RESISTANCE to 2 megohms; OUTPUT VOLTS to 1500 volts; D.C. CURRENT to 150 MA; DECIBELS to +58 D.C. Housed in hand-rubbed oak, portable cabinet. Complete with self-contained battery, test leads and instructions.

Your Cost $27.65

Model CA-11 SIGNAL TRACER

*Signal intensity readings indicated directly on meter.

*Only one connecting cable—No tuning controls.

*Highly sensitive—uses an improved vacuum tube voltmeter circuit.

*Tube and resistor—capacity network are built into the Detector Probe.

*Weighs 5 lbs. Measures 5"x6"x7".

*Provision is made for insertion of phones.

YOUR COST $18.75

The New Model 705 SIGNAL GENERATOR

RANGES:

From 95 kc to 100 mc, continuously variable. Calibration accurate to 2% through broadcast bands, within 3% for high frequency bands. Planetary drive condenser, direct reading calibration, output modulated or unmodulated. Self-contained electronic modulation 400c sine wave available for external use. Special feature provided in having two degrees of modulation at both approxim. 30% and 80%.

YOUR COST $49.50

TERMS: 10% Deposit with Order—Balance C.O.D.—Minimum Order $2.00

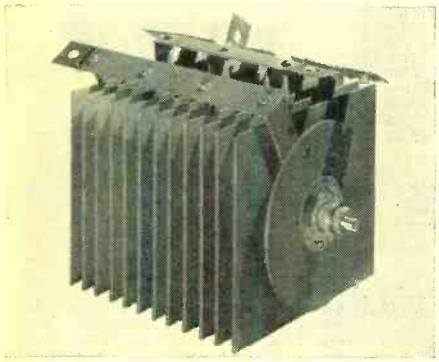
Catalog 1946-47 in preparation—Get your name on our mailing list NOW!!

LIBERTY SALES CO., INC.

115 WEST BROADWAY
NEW YORK 13, N. Y.
BArclay 7-6063

these rectifier plates feature long life and minimum weight with maximum heat dissipating value when arranged in suitable combinations of series or parallel plates, according to the company.

Full details of the new selenium rec-



tifier plates will be furnished by the *Seletron Division* of the *Radio Receptor Company,* 251 West 19th Street, New York 11, New York.

FATHOMETER

Of interest to small boat enthusiasts and servicemen who install and maintain marine equipment is the new, compact Fathometer which was recently announced by *Raytheon Manufacturing Company's Marine Division, Submarine Signal Company* of Boston, Massachusetts.

The entire system, consisting of a control unit, projectors and a vibrapack power supply unit, can be quickly and easily installed. The components of the control unit, i.e., signal generator, echo amplifier, indicator and driving mechanism, are mounted in a single spray-proof case about one foot square and four inches deep.

The unit gives accurate depth measurements within a range of 400 feet at a rate of 360 soundings per minute. These can be checked with the charts to identify underwater landmarks, and assist in determining position regardless of fog, darkness or weather conditions.

Additional data on this unit will be furnished by *Raytheon Manufacturing Company,* 60 East 42nd Street, New York 17, New York, upon request.

PORTABLE COMBINATION RADIO

Fada Radio and Electric Company, Inc. are currently announcing their new Model 647 deluxe portable radio-phonograph combination with automatic record changer.

The unit is housed in a two-tone luggage type case with a genuine leather handle. The record changer is capable of handling both ten and twelve inch records with the cover closed.

The radio is a six-tube superheterodyne with untuned r.f. stage. Four controls regulate the operation of the unit, including tuning, tone, on-off volume control and phono-radio switch. A specially designed loop antenna eliminates the necessity for external connections to the radio. An illumi-

nated slide rule dial permits easy tuning.

Additional information on this model and other radios in the company's line will be furnished upon request to *Fada Radio and Electric Company, Inc.,* Long Island City, New York.

TABLE MODEL COMBINATION

Production has recently been started on the new Model F-617 combination radio with automatic record changer, according to the announcement made by *Templetone Radio Mfg. Corp.* of New London, Conn.

The set is housed in a mahogany finish wood cabinet with a heavy solid wood front. Full view slide rule dial with a fluorescent plastic pointer and large numbers are features of this unit. The lid is mounted with a full-length piano type hinge and has a ratchet type adjustable self-support.

The automatic record changer han-

There's only 1 RIDER MANUAL

BUT IT'S IN FOURTEEN VOLUMES

Rider Manuals are the only single source upon which you can depend for authoritative servicing data on pre-war American made receivers.

Rider Manuals cover the things which our 16 years of specialized publishing have proved you want and need; supplying such vital material as receiver schematics, voltage data, resistance values, chassis layouts and wiring, and trimmer connections.

Further evidence of our continuing service to the servicing industry will be found in the forthcoming Volume XV. This new volume will contain specially prepared and highly refined servicing information available from no other source—not even from the set manufacturer. This supplementary material is information you need, offered in a form that will make it most useful to you. It will result in the saving of servicing time—an increase in production worth many times the price of the volume!

Our advertisement next month will announce Volume XV and give important details on the revolutionary and exclusive features it will contain.

With Volume XV as with the other fourteen volumes "You're right with a Rider Manual!"

Volumes XIV to VII	each volume	$15.00
Volume VI		11.00
Abridged Manuals I to V	(1 volume)	17.50
Record Changers and Recorders		9.00

JOHN F. RIDER PUBLISHER, INC.

404 FOURTH AVENUE, NEW YORK 16, N. Y.

Export Division: Rocke-International Corp., 13 East 40th Street, New York. Cable ARLAB

RIDER RADIO BOOKS KEEP YOU IN TOUCH WITH SUCCESS

This new Rider Book, soon to be announced, will be of lasting usefulness to everyone interested in any phase of radio.

The Cathode Ray Tube at Work
Accepted authority on subject . . . $4.00

Frequency Modulation
Gives principles of FM radio . . 2.00

Servicing by Signal Tracing
Basic Method of radio servicing . . 4.00

The Meter at Work
An elementary text on meters . . . $2.00

The Oscillator at Work
How to use, test and repair . . . 2.50

Vacuum Tube Voltmeters
Both theory and practice 2.50

Automatic Frequency Control Systems
—also automatic tuning systems . . 1.75

A-C Calculation Charts
Two to five times as fast as slide rule 7.50

Hour-A-Day-with-Rider Series—
On "Alternating Currents in Radio Receivers"
On "Resonance & Alignment"
On "Automatic Volume Control"
On "D-C Voltage Distribution" $1.25 each

RADAR—JUST OUT — $1.00
Entertaining, Revealing, even a layman can understand explanation

dles twelve 10" or ten 12" records. The tone arm is equipped with a permanent type needle.

Distribution of this combination will

be through *Temple* distributors but additional information will be supplied by *Templetone Radio Mfg. Corp.* of New London, Conn., upon request.

I.F. TRANSFORMERS

National Company, Inc. of Malden, Massachusetts, has recently introduced a line of new i.f. transformers designed for high frequency AM and FM applications. All of these transformers operate at 10.7 mc. and can be used

(*Continued on page* 160)

Signal Generator

(*Continued from page* 34)

The signal generator will only be useful if accurately calibrated. One may imply that it is necessary to purchase a second signal generator in order to calibrate the first. This is, of course, not essential since existing radio stations furnish accurate frequency standards. For example: broadcasting stations, accurate to 20 cycles, can be used for calibrating the first two bands.

Frequencies between 550 and 1600 kc. are calibrated by beating the fundamental of the signal generator against the broadcasting stations in any broadcast receiver. Care must be taken not to beat images when using a superheterodyne. Remember that an image will be off by a frequency twice that of the i.f. The frequencies below 550 kc. are calibrated by beating the second harmonic of the signal generator against the broadcasting station. Be careful when approaching the intermediate frequency of the broadcast receiver as spurious beats will be heard.

Errors can be more easily discovered if the calibration is first made with curves on graph paper. Direct calibrations can later be printed on the main dial. Before calibration is attempted, mark one main dial scale from zero to one hundred.

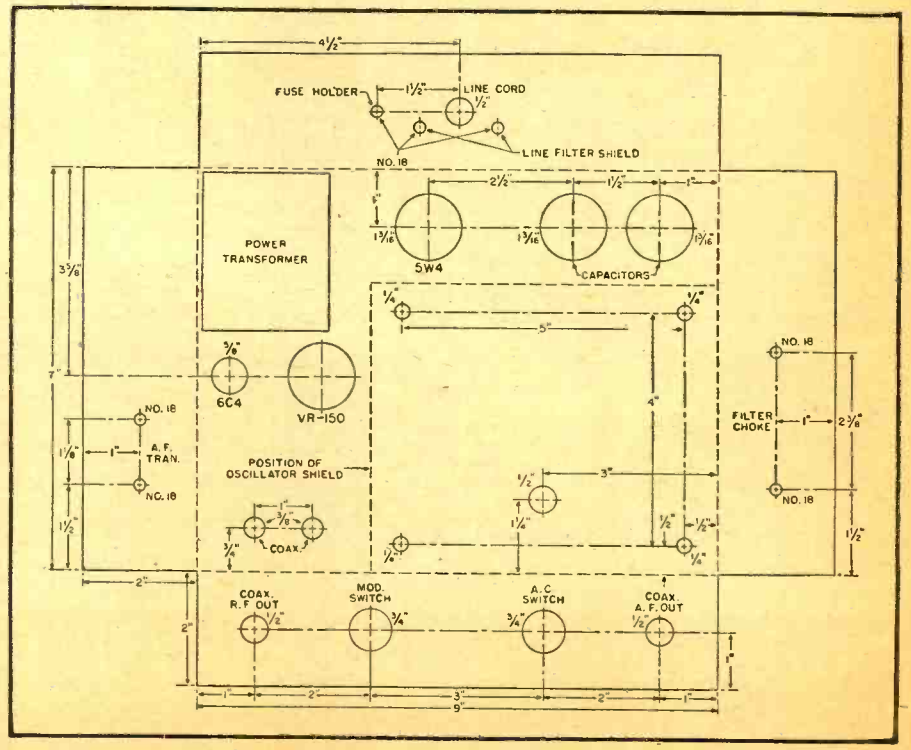
Calibration of the higher frequencies is certainly more difficult. Radio station WWV, operating on 2.5, 5, 10 and 15 mc., is, by far the most useful frequency standard. If an all-wave receiver is not available, it is recommended that a simple regenerative receiver be constructed for picking up WWV.

Another useful item for working in conjunction with WWV is an accurate 100 kc. oscillator, either self excited or crystal controlled. As each signal generator point is recorded against WWV, the harmonics of the 100 kc. standard are used for 100 kc. check points plus or minus WWV.

Adjust the iron cores of each coil so that the various bands just overlap by a small amount.

—30—

Mechanical layout shows chassis construction for all-wave signal generator.



Technical BOOKS

"ELECTRONIC TUBES, TRANSMITTING TYPES," compiled by the Electronics Department, General Electric Company. Published by *General Electric Company,* Schenectady, New York. 600 pages. Price $2.00.

Of particular interest to equipment designers, broadcast engineers, and experimenters, this 600 page book recently issued by *General Electric Company,* contains photographs, outline drawings, ratings, performance curves and application data on 94 tube types, covering the full scope of AM, television FM and communications. Also included in this book is data on the Phasitron and Lighthouse tubes.

This manual is subject to periodic revision at an annual fee of $1.00 applicable after December 31, 1947. Until that date new and revised data will be supplied to book owners without additional charge.

The book is being distributed by the *General Electric Company,* Schenectady, New York.

* * *

"RADIO SERVICE STANDARD RATE BOOK" by Robert T. Oelrich. Published by *Oelrich Publications,* Chicago. 44 pages. Price $1.00.

Many radio servicemen who have been attempting to establish fair and equitable rates for the servicing of radios will welcome the appearance of this book.

While it may not be practical to adopt the rates in toto, this book provides a basis of comparison for the serviceman. The book is divided into six sections, covering auto radios, a.c.-d.c. battery portables, console radios, table model radios, record players and record changers. Each of these sections outlines the general servicing procedures for each type of set, and lists standard rates for various types of repair services.

Parts prices and tube prices are conveniently listed, plus suggested standard rates for labor, service calls, pickup and delivery, estimates and alignment.

Also included is a digest of crystal cartridge data and a registry of electronic manufacturers.

The book is being distributed through radio parts jobbers.

* * *

"ELECTRIC MOTOR REPAIR" by Robert Rosenberg. Published by *Murray Hill Books Incorporated,* New York. 570 pages. Price $5.00.

This book has been designed as a thoroughly practical "how-to-do-it" text for the beginner, apprentice, student or mechanic. The publishers have even designed the book differently from the ordinary text in order that it might be of practical value in the service shop. The book is divided into two sections, each section spiral bound so that the text may be used in conjunction with the correlated illustrations.

The author has concentrated on troubleshooting and repair of common a.c. and d.c. motors. Complete instructions on rewinding have also been included. In addition to discussing specific motors, the book covers motor control systems, synchronous motors, generators, synchros and electronic control of motors. Each subject discussed is followed by a quick-reference summary of troubleshooting and repair suggestions which serves as a working guide on specific jobs.

Over 900 drawings, which fully illustrate each point discussed in the text, enhance the value of the book for the student as well as the man-on-the-job.

* * *

THE PUBLISHER of "Radio Tube Vade Mecum, 1945," reviewed in the September, 1946, issue of RADIO NEWS, has advised us that in order to facilitate the handling of orders for this book, *Editors and Engineers, Ltd.,* of 1300 Kenwood Road, Santa Barbara, California, have been named distributors for the text.

It is no longer necessary for orders to be forwarded to Belgium. *Editors and Engineers, Ltd.,* have advised that the 1946 issue, mentioned as being available soon, is expected shortly. A price of $2.50 in U.S. currency has been set.

—30—

Should agencies be used to collect delinquent accounts?

This is a question which every serviceman-dealer must answer. Here are the pros and cons on it.

By J. A. HAROLD

ALTHOUGH there is plenty of "easy money" around now, the day will come when delinquent accounts become a major problem of postwar businessmen. When collections become difficult businessmen are sorely tempted to resort to collection agencies as a solution to the problem of eliminating overdue accounts on their books.

Yet, before the creditor succumbs to the wiles of a solicitor and begins beating the brush for a collection agency, he might well pause and consider all the angles inherent in turning over accounts for collection. Two alternatives will probably be presented to him by the solicitor: (1) outright purchase of the accounts, or (2) collection on a commission basis.

Where accounts are purchased outright, the price offered for run-of-the-mill delinquent accounts may net the creditor as little as ten cents on the dollar. If on a commission basis, he may pay fifty per-cent for bills collected. Granted that the collection agency may, by its work, justify such fees in some instances, nevertheless the businessman may ask himself whether from his own self-interest the services of an agency are warranted, either from the standpoint of the discount or commission or from even more compelling considerations.

While the agency is acting for the creditor he is not subject to the creditor's control. The collection agent's one and only interest is to collect the debt by fair means or foul, let the bad will created by his actions be visited upon the creditor, if it must. In the mind of the debtor, let us be clear, the action of the agent is going to be the action of the creditor, and the debtor will not make any fine distinction between the two. Methods that the creditor would hesitate to use the agency will have no qualms in utilizing.

Effective in pursuing dead-beats—and they are unexcelled in this field of activity—they are no less zealous in the harassing of honest debtors who, potentially at least, represent a part of the good will that has made the creditor's success in business possible. Small town businessmen, especially, should think twice before allowing collection agents from nearby cities to come in and roust around once-valued customers. Such customers may have a wide circle of friends who, aware of the circumstances behind the non-payment (even if the creditor is not) may adversely affect the creditor's business. Under such conditions the selling of a $50 debt for $5 becomes an expensive transaction for the creditor as he puzzles over certain valued accounts dropping away.

"If I can't collect a delinquent account myself with my methods I don't want a collection agency to do it," an unusually successful businessman told me. He is noted for the good will that he enjoys in his community.

"The real test of good will," he explained "is in collecting old accounts. You can't preserve that good will if you treat customers down on their luck as if they were rascals. The businessman can usually do everything to collect a bill that an agency can. The point is that the businessman has ethical considerations that stop him. These same considerations should prevent him from allowing an agent to do what he, the businessman, would not. In any event, the businessman should understand that he must accept the consequences of the acts of the agency as far as good will is concerned.

"Three of the most valued customers I have today once headed a list of bad debts that, save for second thought, I would have turned over to a collection agency. One of them, today, is my best friend, and I wince everytime I think of it. Pushing him around wouldn't have gotten him to pay up any quicker than I did by using a little common sense and sympathetic understanding."

No objection can be raised to the use of collection agents in running down dead-beats. The trouble is that creditors rarely make fine distinctions between purely old accounts and dead-beats. And, collection agencies thrive on catching honest delinquents in every batch of accounts turned over to them. These people eventually pay, have no intention of doing otherwise. The collection agency, pushing these debtors around to make their presence felt, usually do exactly what the creditor can do; sit it out until the debtor's financial circumstances take a turn for the better.

"I'd as soon hire a so-called 'business-building organization' to come into my store as to hire a collection agency," another successful businessman said. "In either case their sole interest is in the commission—not in the continuing success of the businessman whose survival in business may

be even more dependent upon good will than upon the non-payment of a scattered few debts that have accumulated in the course of business."

The methods resorted to by collection agencies are many and varied, but all are distasteful to honest debtors and the merchant should think long ere he unleashes them against once valued customers. Not only may they be depended upon to use every legal trick of their calling, not a few step over the line in their zealousness and in so doing, occasionally, run afoul of the law. Collection agencies operating as branches of private detective agencies have a penchant for using badges in an abuse of authority. Creditors should be warned that, under certain circumstances, they may be legally liable, along with the agency, for acts committed by agency employees.

If the merchant feels that he must resort to the services of a collection agent he should take sufficient time to weigh each debt before surrendering it for collection. He should consider all consequences as against the amount he may realize if collection is made. He should try to view each case objectively asking himself if the circumstances of the debtor do not warrant waiting.

Unemotionally and impersonally he should try to determine which debtors are dead-beats and which are not, separating the sheep from the goats. An honest delinquent debtor may be a great asset in the future, if efforts are made to salvage his account and at the same time preserve his good will.

The temptation is great to vent one's ire on the honest delinquent debtor out of anger at inability to effect collection from the dishonest. The creditor can't get at the dead-beat and is only too likely to take it out on the honest debtor who apologetically acknowledges his debt.

Many debtors feel as badly about their debt as does the creditor, but don't know how to convey this feeling to the creditor and so, from a sense of shame and panic, take refuge in dodging the creditor until they can pay the bill. The creditor, therefore, shouldn't be too quick in assuming that dodging is the mark of a dead-beat, at least until other evidence supports such a conclusion. If able to pay, and the debtor does not, then the creditor is certainly safe in assuming he is dealing with a dead-beat.

Unlike your honest debtor, the case-hardened dead-beat is usually glib and ready with circumstantial stories and excuses for his failure to pay. Unless he is new at the racket he knows all of the legal tricks of his nefarious trade and, after a few interviews with him, the creditor can usually identify him for what he is.

If you must use a collection agency do so only as a last resort. Good will is too hardly won to dissipate it, let alone employ someone to destroy it!

-30-

Within the INDUSTRY

CAPT. WILLIS E. CLEAVES, U.S.N., has recently joined the *Collins Radio Company* of Cedar Rapids, Iowa, as aviation sales manager. Captain Cleaves has been placed on inactive status and has requested retirement after 22 years of commissioned service, most of the time in aviation radio communications.

A graduate of the U. S. Naval Academy at Annapolis in 1924, Capt. Cleaves has seen duty as communications officer on board a destroyer, as officer in charge of the Radio and Electrical Section of the Engineering Division of the Bureau of Aeronautics at Washington, D. C., and also fleet aviation communication duty.

* * *

D. K. ROBERTS, for the past four and one-half years associated with the Marine Division of the *Sperry Gyroscope Company,* has been added to the sales engineering staff of the *Press Wireless Manufacturing Corporation* of New York.

Before joining the *Sperry* company, Mr. Roberts served the *National Broadcasting Company* for seven years as engineer and announcer.

* * *

SAMUEL J. McDONALD, JR., was recently appointed to the sales staff of the Radio Tube Division of *Sylvania Electric.* He will serve the distributor sales division in the New York and Philadelphia territories. Mr. McDonald graduated from Brown University in 1938 and was connected with *Lever Brothers* and the *Sherwin-Williams Company* prior to his appointment as personnel supervisor for the Salem, Mass., *Sylvania* plant in 1943.

* * *

RALPH C. POWELL, formerly General Sales and Advertising Manager of the *Presto Recording Corporation,* has resigned to engage in business under the name *R. C. Powell & Co., Inc.* at 730 Fifth Ave., New York City. The company will handle the national distribution of a number of new electronic devices through offices located in ten cities.

Mr. Powell joined the *Presto Corporation* in 1936 where he introduced the idea of recording network radio programs for delayed broadcasting, a procedure which is now generally used among broadcasting stations. Prior to his association with the *Presto Corporation* he was engaged in the installation and management of broadcasting stations.

* * *

J. J. BRODERICK has been appointed assistant manager of the Special Products Sales Division of the *Farnsworth Television & Radio Corporation,* Fort Wayne, Indiana. The Special Products Sales Division is in charge of contract sales, automatic record changers and other special products.

Mr. Broderick joined *Farnsworth* in 1940 as assistant manager of distribution services. He later became assistant to the *Farnsworth* sales manager, and then assistant purchasing agent. Prior to his present appointment he handled general administrative assignments for E. H. Vogel, vice-president in charge of sales.

* * *

EDWARD C. BEASLEY, formerly with *General Electric Supply Corp.,* has been appointed to the sales staff of the Koiled Kord division of *Kellogg Switchboard and Supply Co.,* Chicago. Mr. Beasley will direct sales and promotion of the Koiled Kord products in the Southwest and will maintain his headquarters in Texarkana, Arkansas.

Mr. Beasley's former positions include sales manager for the *W. B. Davis Electric Supply Company,* Memphis, Tennessee, Arkansas representative of the Little Rock branch of *General Electric Supply Company* and resident inspector for the *Chicago Signal Corps Inspection* Zone, Chicago, Illinois.

* * *

JENSEN MANUFACTURING COMPANY is the new name recently given the *Jensen Radio Manufacturing Company.*

To avoid any misunderstanding that might arise regarding the company's products, they have eliminated the word "Radio" from the corporate name. No change has been made in the Jensen organization and the company will continue to manufacture loudspeakers.

* * *

A. A. JUVILER, president of the *Hamilton Radio Corporation,* announced recently that the company name has been changed to *Olympic Radio & Televisions, Inc.*

The company produces the *Olympic*

"tru-base" radios for both the domestic and export market and therefore felt it advisable to change the name of the corporation to coincide with the name of its products.

The two acre, block square, Brewster Building at 3101-19 38th Ave., Long Island City, New York, has been leased by *Olympic*. It is estimated that this new location will bring about a fourfold increase in the company's capacity to produce radio sets.

* * *

JOHN W. STRICKLAND, formerly sales manager of *Globe Wireless, Ltd.,* Radiotype Division, has been named sales promotion manager of *Press Wireless Manufacturing Corporation.*

During the war, Mr. Strickland, as Major in the Army Airways Communications System, had charge of extensive installations of radar and various types of telecommunications and participated in the design and installation of communications systems for the postwar expansion program of the Air Transport Command in eighty European cities.

Prior to the war, Mr. Strickland was sales manager for the *American Network.*

* * *

FRANK WHITAKER has been appointed director of materials and purchasing at *Sonora Radio & Television Corporation.*

Mr. Whitaker came to *Sonora* from *Stewart-Warner Corp.,* where he was co-ordinator of the electrical division, in charge of expediting, materials, warehousing, and shipping records.

* * *

THOMAS B. ALDRICH succeeds R. C. Powell as general sales and advertising manager of the *Presto Recording Corporation.* Mr. Aldrich has been with the company for the past ten years in the capacity of factory sales engineer in the New York Metropolitan Area.

In 1942 he was granted leave of absence to enlist in the Army. He spent two years in the European Theater as Captain in the 9th Air Force and in the Fall of 1944 resumed his activities with *Presto.*

* * *

JAMES S. KNOWLSON, Chairman of the board and president of *Stewart-Warner Corporation,* was recently awarded the Medal of Merit, highest award the U. S. Armed Services can confer on a civilian. The award was made for services performed while Mr. Knowlson was a "dollar-a-year" man serving in various capacities.

* * *

ARTHUR E. AKEROYD has been made New England district manager for *Solar Manufacturing Corporation.* He will also serve as New England district manager, with headquarters in

Boston, for *Solar Capacitor Sales Corp., Solar* subsidiary distributing the company's products to electrical and radio jobbers.

Mr. Akeroyd joins *Solar* after 14 years with the *Raytheon Manufacturing Company,* where he was manager of distributor sales.

* * *

BERNARD BENSON was recently appointed purchasing agent in Detroit for the *Utah Radio Products Division* of *International Detrola Corporation.*

Mr. Benson was formerly assistant purchasing agent of *Utah* before that company was acquired by *Detrola.*

* * *

NORMAN H. LAWTON has been elected to vice president in charge of sales for the two *Franklin* companies; the *A. W. Franklin Mfg. Corp.,* manufacturers of radio sockets, plugs, switches and assemblies and the *Franklin Airloop Corp.,* manufacturers of the new Airloop antennas. Both companies are in New York.

* * *

ARROW SALES, INC., has begun business in their own new, large building at 59 West Hubbard Street in Chicago where they will stock all types of radio parts, equipment and supplies.

Rudy Weiss has dissolved *Arrow Radio Company* and become president of the *Arrow Sales, Inc.* Ralph Sackley, former sales manager for the war assets of *Belmont Radio Corp.,* is secretary-treasurer of the firm.

* * *

HOWARD J. SILBAR is assuming the duties of Jean H. DuBuque as coordinator of advertising and public relations for *Lear, Incorporated.* Mr. DuBuque left Lear to become new Director of Aviation for the City of Dallas, Texas.

For five years before entering the service in 1942, Mr. Silbar worked in the advertising and public relations department of *Burroughs Adding Machine Company* in Detroit. Prior to that he was correspondent from Michigan for several national business papers.

* * *

LYNN BRENDEL has been promoted to the post of general service manager of the *Hallicrafters Company* of Chicago. Mr. Brendel will be responsible for the servicing of all *Hallicrafter* equipment and the operation of the company's six service centers throughout the country.

Mr. Brendel was previously associated with *United Motors Service* as a sales and service engineer, and later with the *Bendix Radio Corporation* in Detroit as a sales and research engineer, from which post he moved to the position of sales engineer in the com-

pany's War Assets Administration surplus disposal agency. During the war he served as a radio engineer for the Chicago Signal Corps depot.

* * *

EMERSON RADIO AND PHONOGRAPH CORPORATION, New York City, has announced the acquisition of 100% of the authorized and issued capital stock of *Plastimold Corp.,* Attleboro, Mass.

The *Plastimold Corporation,* for many years manufacturers of plastic radio cabinets in addition to fabricating a variety of molded plastic products, will serve as a wholly owned subsidiary of *Emerson Radio.* The corporation will continue with the present operating personnel and will maintain the same policies. —30—

Selenium Rectifiers

(*Continued from page* 45)

side, denoted by a "+" sign, is equivalent to the cathode while the negative side functions as the plate. Soldering the stack into the set in this manner constitutes the entire replacement operation unless the filament of the tube was linked to other parts of the circuit, in which case a resistor is used to replace the rectifier tube filament.

Installation of the miniature #403D2625 selenium rectifier can be made right in the customer's home as indicated in Figs. 1-6. The set shown is a typical three powered portable using a 117Z6 rectifier. As is evident from the schematic of the power supply (Fig. 7) the filament of this tube is not interlocked with any other component in the set. Therefore it is only necessary to insert the stack into the circuit along the lines outlined in the previous paragraph. Solder the positive side to the cathode terminal on the tube socket, the negative side to the plate terminal, and the installation is over.

Only four tools are required to perform the entire 7 minute operation,—a soldering iron, screw driver, socket wrench, and a pair of long nose pliers. First the chassis is withdrawn from the cabinet and the tube is removed from the socket (Fig. 2). Extension leads are then soldered on the rectifier stack. It is recommended that the positive lead be covered with red wire so as to distinguish it from the negative lead, which is usually made yellow or black (Fig. 3).

At this point it should be noted that, whenever possible, the stack should be installed underneath the chassis. However, in this case, as is the case with many portables, though the stack is only 1¼" x 1¼" x 1⅛", it did not fit underneath the chassis and was inserted from above in the space that was formerly occupied by the tube. In this latter case some type of protective covering must be provided.

Fig. 4 shows the leads which were drawn through center of the tube socket and soldered to the appropriate pins, the red lead to the cathode terminal and the yellow one to the plate terminal. The set is then turned on and if the rectifier has been installed correctly, it should start operating immediately, (Fig. 5). Finally a protective covering, which is supplied with the rectifier, is placed around the stack and tightened to the chassis via a screw and nut (Fig. 6). The chassis is then put back in cabinet and the job is done.

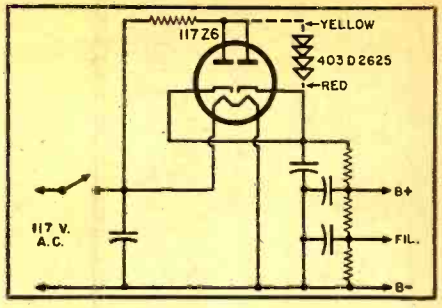


Fig. 7. Schematic diagram shows method of substituting a selenium rectifier for a conventional 117Z6 tube.

After insulation of the rectifier, check filament voltage. If this is too high for normal tube operation, insert a 27 ohm resistor in the line just before the rectifier to bring the operating voltage of the filament back to normal.

Three operational improvements have been achieved with the installation of this rectifier. In the first place, since rectification is now immediate, the set operates as soon as it is turned

on, in contrast to the filament warm-up period previously required. Secondly, in view of the low internal impedance and high efficiency of the stack, the ambient temperature of the set is reduced by approximately 35° F. which results in increased battery life. Finally, the long life of the selenium rectifier means that power supply troubles are reduced to a minimum.

Federal has developed replacement sheets covering every possible power supply used in home receivers, which give specific, easy-to-follow instructions, on what steps are necessary to install this rectifier. These sheets are available to all servicemen and can be obtained by writing to *Federal Telephone and Radio Corporation,* 200 Mt. Pleasant Ave., Newark, N. J.

—30—

Television Receivers

(*Continued from page* 53)

screen area with the width control full advanced.

3. *Vertical Deflection.* A failure in the vertical deflection circuit is indicated when only a thin horizontal line appears on the fluorescent screen or when it is impossible to cover the screen area with the height control full advanced.

4. *R.F. Section.* A failure in the r.f. section of the receiver is indicated when the scanning raster is normal but there is no sound or picture signal. This could also be an antenna defect.

5. *Sound Channel.* A sound channel failure is indicated when there is no sound but a normal picture.

6. *Picture I.F. Channel.* A picture i.f. channel failure is generally indicated by a normal sound but no picture and no locking-in of the scanning raster. Locking-in of the scanning raster causes the dimensions of the entire raster to decrease slightly when the contrast control is advanced to the point where the sync pulses lock-in the sweep oscillators.

7. *Video Amplifier.* A failure in the video amplifier is indicated by a normal sound and a locked-in scanning raster but no picture or just a trace of one with the contrast control full advanced.

8. *Synchronizing Circuits.* A failure in the synchronizing circuits is indicated by what seems to be a strong signal (abundance of blacks and whites on the picture tube screen) but general instability and inability to maintain a stationary image.

Bench-Checking Receiver

For bench-checking the receiver, a good antenna system should be available as well as a means for grounding the chassis. Proper grounding is necessary to protect the serviceman in case of a high voltage leak between primary and secondary windings of the high-voltage transformer. The antenna system should be trouble-free so the serviceman can be certain any defect is a fault of the receiver and not the antenna system.

Inasmuch as tube failure is the most frequent trouble, the tubes of the defective section should be checked first. In fact, checking all tubes throughout the receiver is a good first step. If the defective part cannot be located by a careful mechanical inspection of the defective section, voltage measurements should be made. However, before making any tests with the receiver turned on, disconnect the high-voltage transformer. In some receivers this means unsoldering a high-voltage lead as prescribed by the manufacturer, while in others it is only necessary to remove the primary fuse from the high-voltage transformer primary. So far as defects in the high-voltage circuits are concerned, they can all be located by resistance measurements or mechanical inspection with the equipment turned off.

Inasmuch as the number of types of television receivers which will reach the market this year will be limited, it would be of great benefit to the serviceman if he would find out as much as he could about a representative model of each line and draw up a trouble chart. The trouble chart presented herewith does not cover all, or even a large percentage, of the troubles that could occur. Its value lies in the fact that it evolves a procedure and develops an understanding of the techniques which can be employed to localize trouble. The trouble chart, Table 1, lists common faults found in most types of television receivers. A typical picture channel, General Electric HM-171, was published on page 52 of the June, 1946 issue.

—30—

Table 1. This is a continuation of the table appearing on page 53.

VIDEO AMPLIFIER	
DEFECT	CHECK
1. No picture on screen. Scanning raster locked-in. Sound normal.	a. Video amplifier tubes. b. Voltage check video amplifier.
2. Loss of definition as indicated by blurring of lines on test pattern. The r.f. and i.f. response patterns are normal.	a. Substitute video amplifier tubes. b. Voltage check video amplifier. Check component parts (coupling capacitors and peaking coils).
3. Weak picture with light range reversed — whites are black; blacks, white.	a. One stage inoperative. Check plate circuits for open. Check tubes.
4. Hum (heavy black bars).	a. Voltage and resistance check for shorted plate load resistor, and open or partially shorted bypass capacitor.

200 Watt Transmitter

(*Continued from page* 43)

Tune the plate circuit of the second 6L6GA and the plate circuit of the 809s to 20 meters in the same manner as outlined previously.

For 40 and 80 meter operation the 809s may be excited directly from the v.f.o. output. The coils used in the second doubler plate circuit and the plate circuit of the 809s should tune to the same frequency as that of the v.f.o. output. An open phone jack may be inserted in each of the 6L6GA cathode current jacks or the 400 volt power supply may be turned off; the doubler circuits are not required when the 809s are excited directly from the v.f.o.

If crystal control operation is desired, place the crystal in the 5-prong coil socket as shown in Fig. 1. Turn the plate circuit of the first 6L6GA for minimum plate current and then detune the circuit slightly on the *high-frequency* side of resonance. This improves the stability of the crystal oscillator. It must be remembered that no frequency doubling takes place in the first 6L6GA circuit when using crystal control; the plate circuit is tuned to the same frequency as that of the crystal. The second 6L6GA, however, is a doubler. For operation on 80 meters, it will be necessary to use a 160 meter crystal; for operation on 40 meters, an 80 meter crystal must be used. When using 40 and 20 meter crystals for 20 and 10 meter operation respectively, it is necessary to be very careful to make certain that doubler is tuned to *two* times the crystal frequency and not to some other harmonic. Use the wavemeter as outlined before, for checking.

The approximate dial settings and coil combinations for the four amateur bands are given in the accompanying tables. Table 3 is for v.f.o. operation. Table 2 is for crystal control operation. In making up the coil combinations for the v.f.o. table it is assumed that the v.f.o. unit will supply at least *10 watts output power* on the 80 and 40 meter amateur bands.

Rear view of completed transmitter. An external power supply is required.

Almost any good antenna can be used with this transmitter. The author used a pair of half-waves in-phase with 33 foot feeders on the 10 meter band. Stations on the West Coast of the U.S.A. and Europe were contacted from a location in central Pennsylvania. The ends of the 33 foot feeders were connected to the final tank link coil terminals, no coupling device whatever being used. The antenna was about 38 feet above ground.

-30-

Aircraft Radio

(*Continued from page 27*)

which replaces the military transmitter. (This is a fifty watt transmitter and receiver unit). This group can be seen to the left of the center of the control panel. See illustration Fig. 5, shown on page 27.

3. Tuning and audio controls for a single military range receiver having a frequency range of 195 to 550 kilocycles. These controls were removed from the military control box, and can be seen to the right of the center (Fig. 5).

4. "Audio On-Off" switches (one for each of the receivers, ADF, range receiver and communications receiver) are provided for each of the pilots. These are located along the lower edge of the control panel at each end of the panel.

5. Two hybrid transformers which provide dual audio outputs from the ADF and range receiver. (The communications receiver unit already has dual audio channels).

6. Two auto-transformers to provide impedance matching from high to low impedance as required with some models of military receivers.

It can be seeen that all controls are ahead of the pilots' line of vision and complete separation of the audio facilities have been provided. Reasonable cleanness has been gained, too. The remote crank for a trailing wire antenna reel is within easy reach of both pilots. Space for this control was made by relocating the ADF control box to the left of its original position. The military transmitter control was also removed. A comparison with the original cockpit layout can be made by referring to Fig. 2.

An "Unmodified" Cockpit Layout

In contrast to the modified installation as just illustrated compare the foregoing with the new control panel shown in Fig. 7. This is an engineered unit starting with a completely new set of radio gear. Nothing makeshift has been required. A single unit takes the place of the several controls required in the modification. The entire radio system was treated as a unit and engineered from that standpoint. The advantages gained are obvious, but a few should be pointed out such as; a very clean cockpit with all radio controls ahead of the pilots' line of vision; ease of installation; complete

use of all facilities offered by the particular units involved; saving in weight and over-all cost. The control panel illustrated provides the following:

1. Complete selection of audio outputs by either pilot with no mutual interference.

2. Audio level controls and marker receiver sensitivity control within easy reach of either pilot.

3. Individual range-voice filter selector switches for each pilot. Only the ADF or range receiver output can be filtered at one time, not both at the same time, with each filter selector switch.

4. Tuning control, tuning meter, band selector and function selector switches for an ADF having frequency range of 200 to 1750 kilocycles. All ADF controls are *red.*

5. Tuning control, band selector, function selector and AVC-MVC-CW switches for a range receiver having a frequency range of 150 to 1100 kilocycles and 2.0 to 10.00 megacycles. This receiver has provision for the addition of an antistatic loop antenna. Facilities for two crystal lock-in points within the frequency range are also a part of this receiver.

6. Channel selector, transmit-interphone switches, and indicator light for a ten channel crystal controlled communications unit. The channel selector switch automatically operates an antenna changeover relay on those channels on which a trailing wire is used if this type antenna is included.

7. Microphone and headset jacks located for convenient routing of the microphone and headset cords. These do away with the need for any external jack boxes.

An easily installed mounting base is used. Four captive screws are used to secure the panel to the mounting base. Mechanical tuning shafts are well routed from the controls back to the receivers. "On-Off" switches are combined with the receiver function switches, marker receiver "Hi-Lo" sensitivity switch and the communications unit channel selector switch.

Installation Problems

The radio system controlled by this panel approaches in completeness those carried by commercial airlines. And now that an outline of the problems to be answered has been made let us get into the problems confronting the engineer from the actual installation standpoint.

Transmitter Fixed Antennas

In low and high frequency transmitter work the problem of antennas will likely remain as one of the greatest stumbling blocks to good transmitter efficiency. Due to the small physical sizes of the medium weight aircraft in use a single, straight wire of even thirty feet in length is difficult to obtain without many compromises.

For example, on one of the most widely used aircraft the distance from one vertical fin to a mast located at a

point above the cockpit is approximately twenty-two feet. Twenty-two feet is less than one-third of a quarter wavelength for 3105 kilocycles. The angle between the legs of a "V" formed by an antenna running from each vertical fin to the mast above the cockpit is small. "Folding," and effective shortening of the forty-four foot antenna obtained in this way, results. It is desirable, too, to be able to use one fin-to-mast antenna for a range receiver without having to employ an antenna changeover relay. If the communications antenna is used for a range receiver such a relay is needed.

Unless the lead-in is made at some angle greater than sixty degrees to the straight portion of the antenna the total electrical length is effectively shortened. In this particular case a well spaced lead-in back through the fuselage to a point just ahead of the horizontal stabilizer can be installed to allow the lead-in to depart from the fuselage at close to a ninety degree angle (reducing capacity) and feed the overhead portion of the communications antenna at close to a ninety degree angle. Even though the lead-in is longer and inside the fuselage, an over-all improvement in effectiveness of the antenna can be obtained as compared with an antenna whose lead-in within the fuselage is short, but which departs from the fuselage and feeds the overhead portion of the antenna at comparatively sharp angles. Further improvement in the characteristics may be obtained by carrying the overhead portion of the communications antenna over the nose of the aircraft. A short mast, erected as far forward on the nose as possible, is used to anchor the forward end of the communications antenna. That is, of course, if the pilot's objection is not too great! By finishing such a mast in dull black the reflection becomes nil, and actual obstruction to vision is not nearly as much as would be thought.

The writer's experience has shown that an antenna such as just described "loads" almost like a standard communications antenna on a *Douglas* DC-3, but of course, the radiation is not nearly as good with equal power. In practice a fifty watt transmitter working into an antenna with a nose mast gave coverage of at least 75 miles on the congested itinerant frequency channel, 3105 kilocycles. "Clear channels" such as used by commercial operators extend this range by several times. (See Fig. 3.)

On most of the smaller, single engined craft it is often necessary to depart from a single wire and revert to the "clothes line" system of stringing wires from wingtips to tail, etc. With high speed aircraft (over 180 miles per hour) many serious disadvantages present themselves. It is entirely possible that mechanical resonance between the aircraft structure and the antenna might occur. Vibration of the antenna wire in the windstream could then cause antenna

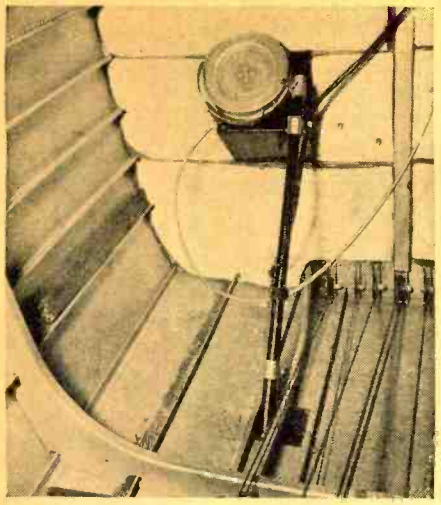


Fig. 6. Trailing-wire antenna reel.

breakage, or structural failure. It is obvious that a wire across the windstream will be more susceptible to icing than one running lengthwise to the windstream and the ice load and shape will affect the mechanical resonance point of the antenna. Angles of greater than 20° between the antenna wire and windstream should not be exceeded where the airspeed is 180 miles per hour or over. Drag (wind resistance) increases rapidly, too, as the angle increases.

The "spider web" type antenna system will certainly make possible transmitter loading, yet the radiation resistance is usually rather low. It is also possible that cancellation occurs to some degree.

The inconvenience to the loading of passengers who must thread their way through a maze of wires has to be considered. In addition, greater difficulties and hazards in hangaring an aircraft having such a web of wires hanging from it are encountered. If damage is not done to another craft the antenna in question is often pulled loose, stretched or otherwise made to require some maintenance.

Loading Units: Unless the transmitter itself has sufficient provision for loading built into it some form of external loading unit will be required. A very effective loading coil can be constructed with little cost. Loading coils should be built of the lowest loss materials available and spaced as far away from any structure as possible. A major disadvantage of external loading is that only one frequency can be readily taken care of without resorting to a more or less complex unit.

Antenna Icing, Precipitation and "Ground" Effects: No completely successful simple method of combating ice and rain on antennas has been developed. Precipitation of any kind seriously changes the antenna resistance and reduces radiation, usually because of detuning. Wherever possible final tuning adjustments should be made in flight in a clear sky to prevent the effects of ground capacity and precipitation. The detuning ex-

perienced with the aircraft on the ground is not serious since contacts with the control tower can still be made. Final tuning adjustments to transmitter should never be made in rain or snow. Detuning due to precipitation of any kind becomes more serious in its over-all effect when the antenna resistance is small since any change resulting from this source is a greater percentage of the total. If transmitter tuning must be done in a hangar extreme care in prevention of fires must be taken. It is definitely not a good practice. Nor can the adjustments be considered final. An external primary power source should be used whenever possible in order to save the low capacity aircraft batteries carried in the ship.

Trailing Wire Antennas: Trailing wire antennas are very often the only answer to a highly efficient transmitter system. Unfortunately they are not only inconvenient to the crew, causing additional work for them, but present actual danger to those on the ground in case the antenna weight is lost while in flight or when the antenna is not reeled when landing (forgetfulness on the pilot's part is not always to blame!). A solid weight of any kind is unstable aerodynamically and will oscillate especially as it is being reeled in. Damage to the aircraft structure results if the weight strikes the ship. Unless the fairlead is properly located the wire may foul some part of the landing gear, controls, pitot masts, etc. A piece of one-inch open link chain weighing approximately a pound, although not good in appearance (see Fig. 6), will not whip or oscillate. A string of lead beads on a section of flexible cable is perfectly stable at all speeds. Neither of these require a swivel to prevent twisting of the antenna wire as do any of the drag cup or windsock type antenna "Drags." Rubber balls and windsocks are very popular with small aircraft, but a strong swivel must be used even at the lower speeds if it is to last very long.

The use of v.h.f. will make possible small, light and simple mast type antennas. The lead-in problem and routing will be much simplified, too.

Antenna Changeover Relays: When a transmitter antenna is used for a receiver antenna, a changeover switch must often be provided. The changeover relay employed must be positive and not subject to vibration. Self cleaning contacts are of primary importance and a cover of some kind should be used for protection from dirt and damage. Intermittent and noisy receiver operation is often traced to this source. Where high r.f. voltages must be handled, as is the case with a short antenna, a vacuum relay may be required, and although they are more expensive their reliability and trouble-free characteristics make them a good investment. Most transmitters have built-in changeover relays, but the type of relay and its usage should be considered nevertheless.

Receiver Antennas: Balanced "T"

antennas or balanced "V" antennas with a vertical lead-in are preferred for receivers working on the 200 to 400 kilocycle band due to more symmetrical "cone-of-silence" characteristics over the radio range stations (nondirective reception). It is not always possible to attain this due to mechanical mounting problems, etc., and fortunately, when a 75 megacycle marker receiver is used the importance of the cone-of-silence indication is of less importance. In addition better signal pickup is obtained with the same length of antenna used as an "L" type rather than a "T" or "V" type antenna. A "T" or "V" antenna should have at least eight feet on each leg for satisfactory service and be as well spaced from the fuselage as possible. An "L" type approximately ten or twelve feet long will prove adequate for most range receivers. The distortion of the cone-of-silence due to directivity, is not often so serious as to make it useless in case the marker receiver is not used.

Whip antennas have excellent characteristics, but there are two major objections to their use. The first is their small size (approximately 5½ to 6 feet) which is not great enough for adequate signal pickup under all conditions. The second is breakage. An "L" antenna for long distance work and a whip for close in radio range work has been used with very good results. However, an antenna changeover relay is required. Where possible the range receiver antenna should be located on the belly of the aircraft in order to reduce to a minimum blanketing of the signal by the aircraft and allow direct path reception. Small ground clearances and hazards to ground crews will not always make belly mounting practical.

The ADF sense antenna will work most satisfactorily if it meets the requirements as outlined above and at the same time passes directly over and in line with the loop antenna. Minor departures from such installation have been made in many cases which work perfectly. Automatic compass action is difficult to predict and ADF bearing reversals may occur where extreme unbalance of loop sense antenna location exists. An "L" antenna approximately ten feet in length passing over the loop housing with four inches or more clearance will produce very good results.

Proper operation of the marker receiver is dependent to a large degree upon the placement of the marker antenna with respect to all surrounding objects including other antennas, landing gear, etc. The antenna should be horizontal in flying position of the aircraft and the external lead-in short and vertical. A half wavelength or approximately 76 inches is used. The position of the tap must be determined by the spacing between the antenna and the aircraft structure. A fifty ohm coaxial line is used for a lead-in inside the fuselage. The coaxial cable shielding must be grounded directly at the point of entry of the external

lead-in. Where the antenna has approximately nine inches separation from the fuselage the tap is usually five to six inches off center to produce the correct impedance matching. Adjacent antennas and obstructions may cause severe distortion of the marker beacon patterns (due to marker antenna directivity produced) to the extent that the marker station cannot be located accurately. Audio signal will appear some time before the visual light signal. The visual light signal should be visible for a period of approximately 20 to 25 seconds when passing over a station at 3000 to 4000 feet at a speed of 120 miles per hour. Sensitivity adjustments and antenna characteristics will determine the time element and in any case the symmetry must be very good. Flight tests are the only means of determining accurately the over-all performance. Only high quality insulators should be used on the marker antenna to reduce leakage and maintain the antenna characteristics as nearly as possible to the original adjustments. A balanced "T" range receiver antenna may sometimes also be used as marker receiver antenna by employing a coupling transformer. Such a system may limit the size of the "T" antenna to a degree where the range receiver is not as effective as is desired. Careful flight testing and adjustment is needed. A half-wave dipole with the coaxial cable making connection at the center of the antenna has been tried with some success, yet the mechanical difficulties and maintenance required is almost prohibitive.

Loop Antennas: A preferred location for an antistatic loop is on the belly and free of obstructions. Difficulty of mounting, antenna cable length and chances of mechanical damage sometimes dictate placement on the top-side. Practical results have proven that loop antennas mounted on top give fully satisfactory results operationally. If two loops are to be mounted adjacent to each other approximately two feet of space should be allowed between them to prevent interaction or coupling. This objection is not so serious where one is a fixed position loop.

In every case where a loop antenna is to be used to take bearings on a station, calibration correction must be determined beforehand. Only in a very few instances on wood constructed aircraft has calibration correction been so small as to be negligible. On the other hand plus and minus errors of up to 20 degrees are common even where the loop antenna is unobstructed and is placed symmetrically on the aircraft. Instructions for calibration determination can be found in the manuals accompanying this type of equipment, and although involved, is not particularly difficult.

Location of Radio Gear: Placement of the radio units poses several requirements, each of which must be met. Four of the major considerations are as follows:

1. Available space. Standardization of unit size and multiples of this size have been followed in the designs of the past few years in transport type equipment as shown in Fig. 4. Most radio rack designs will accommodate them, however this does not hold in all cases. A few aircraft are encountered in which radio racks have not been installed and which require complete structures to be added. Modification of existing racks, or addition of structure, must be approved by the Civil Aeronautics Authority.

2. Structural strength. Often too little attention is paid to this phase. Radio racks already installed have maximum load limits assigned. Where modification is necessary, or new structure, careful structural strength investigation should be made. A weight penalty results when the structure is heavier than needed and danger of structural failure is present if too light. The radio rack itself is seldom part of the primary airframe, but the tie-points are carefully chosen and reinforced in order to properly distribute the load throughout the primary airframe structure. Aircraft manufacturers go to great lengths to obtain adequate strength with light weight. The airframes are normally designed to withstand loads as high as six or more "G." Any changes or additions must be capable of withstanding similar loads and yet not cause excess stresses to appear throughout the adjacent airframe. Civil Air Regulations Bulletin No. 18 covers accepted practices and approved methods of making repairs, materials used, rivet sizes, etc.

3. Location as regards antenna lead-ins; electrical cable routing; mechanical shaft routing; accessibility for maintenance. In most cases considerable compromise must be made in this category. Locating a unit in a compartment with a fuel tank, even a well ventilated compartment, is highly dangerous since gasoline fumes are

Fig. 7. Bendix MS-117 control panel mounted in a Beechcraft Model 18.

almost always present after fueling and normal arcing of dynamotor brushes can cause them to explode. Such installations have been made in exceptional cases but only where the fuel tank compartment was perfectly sealed off from the radio or baggage compartment in which the radio was located.

4. Weight and balance. This requirement becomes more critical as the weight of the radio equipment increases in comparison with the total gross weight of the aircraft since the percentage of change in c.g. (center of gravity) location is increased and is, therefore, more pronounced. This is a straight-forward problem in mechanics.

Each aircraft has an individual operations record which includes the empty weight of the craft, c.g. location and total empty weight moment (weight in pounds multiplied by moment arm in inches giving moment in inch-pounds).

The c.g. must lie within certain designated limits, fore and aft, (lateral c.g. is not computed) in order for the aircraft to be licensed. In computing empty c.g. expendable load such as fuel cannot be considered. However, fuel, oil, deicing fluid, baggage, passengers and their locations must all be considered in the most unfavorable, extreme positions in computing loaded weight. The c.g. must not exceed either the forward or rearward limit under any condition of loading. In some cases a "placard" is attached to the aircraft designating the allowable load, and its position. Such limitation is very undesirable for the operator and should not result from the addition of radio equipment if at all possible. In many cases a "loading schedule" is used. Greater flexibility is obtained, but computation of load and its placement must be made prior to a flight. Before an installation is begun careful investigation should be made of the effect on c.g. location and the limitations that may be placed on loading the aircraft. As was mentioned previously this becomes more critical as the weight of the aircraft decreases.

The "reference" or "datum" line of the aircraft is usually the nose of the ship in twin-engined craft; and the leading edge of the wing in single-engined craft. Location of "items" are taken from this point which gives the "arm." The weight of the item is then multiplied by the arm, resulting in the "moment." An *algebraic* summation of the moments is added to the original moment shown in the operations record. The total weight is added to the listed empty weight. The new c.g. can then be obtained by dividing the new moment (inch-pounds) by the new empty weight (pounds). The result is the new c.g. location (in inches) from the reference or datum line. All items *removed* or *added* are handled in this manner and must be listed on the operations record permanently. While anyone can make the computations they must be certified, and

signed for, by a licensed aircraft mechanic.

In every case a licensed mechanic must supervise and approve all work done on the aircraft and sign for its airworthiness, etc., in the aircraft's logbook and operations record.

The quality of mechanical and electrical work done in aircraft is traditionally high as compared to some other fields. It is the soundest investment an aircraft owner can make—good work and maintenance. High standards should be expected and demanded. A well made radio installation having good electrical connections, well supported cables, etc., will continue to give trouble-free, reliable service and require little, if any, maintenance. A poorly made installation cannot be relied upon and can eventually cost more than the original cost of the best.

—30—

Treasure Finder

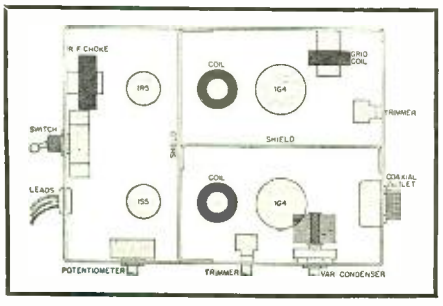
(*Continued from page 37*)

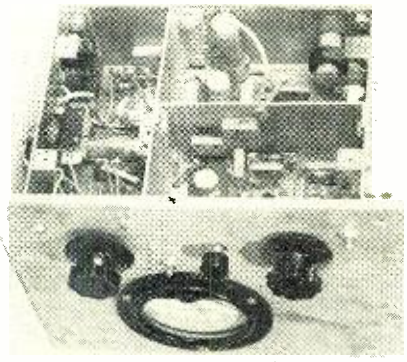
chassis is necessary, and this should now be screwed on. Metal shields should also be provided for the four tubes. Another very useful, and almost essential, addition is a two or three foot length of metal braid attached to the chassis. This is held in one hand while operating and prevents annoying body capacity between the chassis and the operator.

The loop is wound "spider-web" fashion on a circular piece of ⅛ inch phenolic, or other insulated material. Over-all diameter is 14 inches and the diameter of the inside turn is 4 inches. About 250 turns of 26 gauge d.s.c. wire are required—that is, 125 turns on each side of the former. The 250 turns are counted at the cross-over points, or slots, which incidentally, may be any odd number between 7 and 15. A photograph of an experimental loop is shown on page 36.

After mounting a couple of solder lugs in the center, connect a suitable length of low-capacity coaxial cable (5 feet of RG62U was used by the writer) and test with the complete unit. If everything proves to be satisfactory soak the loop in hot wax, mount two other circular pieces of phenolic top and bottom as a cover, and fill the edges with plastic wood or other similar compound. Finally coat the whole loop unit with shellac for

Fig. 2. Chassis layout.





Bottom view of locator with panel in place.

waterproofing purposes, and mount it on a long bamboo pole. A wooden dowel and supports for angle adjustment, as shown, are additional refinements.

It should be borne in mind that the ultimate frequency is set by the plate inductance of the fixed oscillator. This has no variable trimmer, and therefore all other tuned circuits are resonated with this one.

The added capacity of shielded leads, such as the loop antenna cable, must be watched carefully, and it will be noted that in the original schematic the writer has deleted the fixed shunt capacitor in the grid circuit of the variable oscillator in order to balance up the loading of the antenna cable.

The complete set is mounted in a wooden (or aluminum) box with meter on the top panel. The chassis is screwed to this panel and the batteries lie in the bottom of the box. Ninety volts of light-duty "B" batteries and 1½ volts "A" battery are required. At the expense of a heavier "A" battery drain, the 1G4 oscillators may be replaced by the more powerful 3A5 miniature tube (with two halves in parallel) if desired.

A strap is attached to the two sides of the box, and then slung over one shoulder. Holding the loop a few inches from the ground, the operator moves very slowly along until the meter needle dips towards zero. He then calls his wife with her pick and shovel, and the fun begins.

—30—

"These radios are all right. I just cussed out the Sarge and he can't do a thing about it!"

International Short-Wave

(*Continued from page 44*)

Some new models, now in production, are expected to have both meters and megacycles on the dials. The economic situation in Sweden has been good and therefore the high prices haven't mattered a great deal."

Short-wave listening has received widespread publicity in Sweden. Short-wave stations are often introduced by the Swedish Radio, while the radio publications, *"Roster i Radio"* and *"Kortvags-Lyssnaren,"* frequently feature illustrated, lengthy articles from the short-wave stations, along with instructive material. In addition, the leading newspapers—*"Dagens Nyheter," "Stockholm Tidningen"* and *"Aftonbladet"*—are introducing actual radio stations abroad to their readers. Current short-wave station lists are published regularly by *"Roster i Radio," "Kortvags-Lyssnaren,"* and by the manufacturer of *Radiola,* one of the leading receivers in Sweden.

"This kind of publicity is of great importance," comments Mr. Skoog. "And it seems likely that no other country goes so far in publicity on DXing."

A group of short-wave enthusiasts banded together early in 1944 under the name, *Sveriges Radioklubb* (The Radio Club of Sweden). Shortly, the membership reached 1500 members scattered all over the country. Meetings were arranged in Stockholm, attended by hundreds of visitors. Small affiliated local clubs were also founded in several rural cities and towns. While the parent organization has not been active for some time, many of the small local clubs are going on with their activities. Swedish short-wave fans also hold memberships in clubs in other lands, particularly the *Universal Radio DX Club* in the United States.

Broadcasts in the Swedish language from abroad form another good reason for the keen interest of short-wave listeners in Sweden. For the benefit of Swedish-speaking readers, Mr. Skoog lists some of these transmissions in Swedish (in GMT; add one hour for Swedish Time):

New York—NBC broadcasts *daily* programs at 1730-1745 over WGEA/WGEO, 15.330, and WBOS, 15.210.

London—*Daily* programs in Swedish are radiated by the BBC at 1830 on 307 meters and on short-wave frequencies of 7.150, 9.675, and 11.800.

Moscow—*Radio Centre* broadcasts two daily 30-minute programs in Swedish—at 1915-1945 and 2015-2045, respectively, on 6.100, 7.165, 9.720, and 9.780.

Paris—The *daily* program for Sweden is heard at 1945-2000 on 463 meters and on the short-wave frequency of 9.560.

Quito—With more listeners in Sweden than in any other part of the world, HCJB now transmits three regular weekly programs in Swedish—Sundays, Tuesdays, Thursdays at 2130-2200 on 9.958, 12.455, and 15.100.

Brazzaville — From French Equatorial Africa, *Radio Brazzaville* beams a 15-minute program to Sweden every fourth Wednesday (November 6, December 4, January 1 and 29 (and so on), between 2030-2045, on frequencies of 9.440 and 11.970. This program was inaugurated because of the tremendous

mail response from listeners in Sweden. It was difficult to arrange this service inasmuch as there was not a Swedish-speaking announcer on the station's staff, and the station finally called upon the good will of local Swedish missionaries. Since the time of these missionaries is quite limited, it has not been possible to broadcast more than a 15-minute session in Swedish every fourth week.

Radiotjanst

The verification card now being sent out by the Swedish Radio lists this information:

"Sveriges Radio" is the announcing call used in the Swedish radio programs. As an interval signal, an old melody from Dalarna Province is employed. The Swedish Broadcasting Corporation, *Radiotjanst*, is a semi-state institution and commenced its activities in January, 1925. In January, 1946, receiver licenses numbered 1,840,000 (the entire population of Sweden is 6,600,000). At present, Sweden has the largest number of licenses in relation to population of any country in Europe. The Swedish Radio broadcasts a common program over 33 stations, generally on Sundays and holidays from 7-22 GMT (2 a.m.-5 p.m. EST) and other days from 6.15 to 7.15 and from 11 to 22 GMT (1:15-2:15 a.m. and 6 a.m.-5 p.m. EST). There are also two 12 kw. short-wave transmitters in Motala, through which special programs for listeners abroad are broadcast daily at 1-2 and 15-16 GMT (8-9 p.m. and 10-11 a.m. EST). Calls listed on the card are SDT-2, 15.665; SBT, 15.155; SBP, 11.705; SDB-2, 10.780; SBU, 9.535; SDT, 9.4425; SBO, 6.065; and SDB, 5.7325. (At the present time, SBT, 15.155, is the one best heard in the United States, especially at 10-10:55 a.m. *daily* in the North American beam.)

A letter just in from Y. Samsioe, an official of *Radiotjanst*, informs us that the Swedish short-wave services are now in the process of being completely reorganized. "As you have possibly heard," he explains, "the Government has granted us a rather large sum of money for extending out shortwave services through stronger transmitters and so on. This, however, will take some years to accomplish and during that time we shall have to go on with our old transmitters. Nevertheless, from about the beginning of November of this year, we are going to increase our transmissions by 50 per cent—and, above all, to introduce special programs for short-wave listeners all over the world.

"As you certainly understand, we have had enormous difficulties to overcome and our short-wave service has suffered by them, but now the situation has brightened considerably and we are trying to get in contact with short-wave listeners in every corner of the world.

"We promise to answer all listeners' reports promptly and to give information about Sweden and the Swedish Radio. We want the Swedish Radio to attain a high regard and good will in your country and all over the world. I feel that no effort should be spared when the establishment of lasting and useful short-wave contacts is concerned. Sweden has made up her mind to become a first-rate short-wave country."

Describing the operations of *Radiotjanst*, Mr. Samsioe pointed out that the cost of the entire broadcasting service in Sweden is defrayed out of license revenues. Commercial advertising is not practiced by the Swedish Radio. "The Swedish Radio has expanded rapidly during the two decades of its existence, and, as in other countries, it performs an important service in promoting popular enlightenment and in the distribution of news, as well as being a vehicle for high-quality entertainment," he continued. "In 1939, this country was able to record the highest number of licenses per 1000 inhabitants in Europe, surpassing in that respect her competitors, Denmark and Great Britain. Sweden still holds that position. The license fee amounts to 10 kronor a year. The Telegraph Commissioners assume responsibility for the technical arrangements, while the program activities are carried out by the Corporation, *Radiotjanst*, in which the Press and the leading firms of the radio industry are partners."

The principles formulated by the Swedish Government for drawing up the programs require that the transmissions be varied and entertaining; moreover, they should be of a high intellectual, cultural, and artistic standard and should be characterized by reliability, objectivity, and impartiality. Popular education and popular enlightenment should be promoted, and efforts should be made to establish and maintain as intimate cooperation as is possible with the musical and popular educational organizations which are supported by public funds. Expressions of opinion on political subjects of topical interest may be broadcast, provided it is open to different trends of opinion to expound their views.

Programs of *Radiotjanst* have undergone considerable expansion during the last few years. The transmission period at present amounts to about 4000 hours per year—an average of 11 hours a day. The organization preparing the programs has been extended and improved. The international exchange of programs—particularly between the Northern Countries—has been on a large scale since the end of the war.

Sven-Bertil Norberg, Secretary of the Foreign Relations Department. His voice is often heard from Stockholm during point-to-point short-wave contacts.

Musical programs take up nearly half of the broadcasting time. By special agreement, *Radiotjanst* has the regular use, for orchestral music, of the largest symphony orchestra in Sweden. *Radiotjanst* has an arrangement with the Royal Opera whereby transmissions from the theatre may be made on an unlimited basis. Programs include both light entertainment music and music of a classical nature. With a view of promoting more interest in music, special programs are arranged, often in an entertaining form with musical competitions.

In its talks programs, *Radiotjanst* seeks to meet the many requirements and demands as expressed in various trends of taste and different classes of society by dividing the broadcasts into groups and subjects. Topical events are commented on in special talks and interviews as well as in regular surveys (foreign policy, new legislation, Parliamentary news, new books, and the like). There are also agricultural talks, talks for housewives, and lectures on academic subjects. Approximately 170,000 pupils in about 4000 schools listen to the School Radio Broadcasts, and to meet the needs of adult education, there are popular educational lectures on Sunday mornings, series of talks especially intended for "groups of listeners," as well as language courses and talks in foreign languages. Light is thrown on questions of the day through discussions between representatives of various shades of opinion. From its own publishing department, *Radiotjanst* issues textbooks for language courses, lecture series, school-radio handbooks, and books of other sorts.

By means of readings from works representative of various fields of literature, the radio aims—apart from giving mere diversion—to promote the people's cultural development. A large number of newly-published books are presented to listeners in this way.

One item appreciated widely is the programs concerned with religious education. The Sunday services and the devotional broadcasts are apportioned as between the State Church and the Free Church communities in consultation with the most important trends of ecclesiastical opinion.

Many of the programs are taken up with reports from the Swedish provinces and industries, as well as with interviews with typical and original representatives of different occupational and population groups. Since it is frequently possible to record these program items, a valuable and interesting body of material regarding the Swedish people's mode of living and way of talking is being preserved for the benefit of future research and for posterity.

The Swedish Radio's news service is highly developed. News is broadcast three times daily direct from the Newspapers' Telegram Bureau. Weather reports from the State Meteorological-Hydrographical Institute are heard four times a day. The Radio also al-

lots time for broadcasting notices, at the request of the police, concerning missing persons.

Under the title, *"The Day's Echo,"* a special 15-minute program presents comments on the news of the day. Topical Swedish reports from all over the world form a striking feature of this session. Since the end of the war, the Swedish Radio has sent its own news reporters to various countries of Europe. There is a special section devoted to picking up foreign broadcasts, and where also important speeches and reports are recorded. These recordings will no doubt prove of great value for research when events and speeches that have made world history have been recorded and catalogued.

The Radio-Theatre is a most popular form of dramatic art in Sweden. As a rule, at least one major and several minor theatrical performances are given each week. The Royal Dramatic Theatre in Stockholm and the Municipal Theatre at Gothenburg have undertaken by contract that their artists collaborate with the Radio-Theatre in providing a certain number of performances each year. Some of the Radio-Theatre's performances are adapted for study circles.

A wide provincial organization—comprising program managers and radio agents in most of the major towns and at practically all of the local broadcasting stations—guarantees that the Swedish provinces contribute to an all-round National Program. Program managers at the larger stations are moreover allowed to broadcast local programs of a specifically provincial character or of special local interest.

For the benefit of Swedes living abroad, *Radiotjanst* broadcasts about 13 hours per week a specially-compiled program on short-wave. These broadcasts include music, reports from industries, news and short comments on the Riksdag (Parliament), cultural progress, economics and trade, and so on. In addition to these short-wave programs—intended mainly for Swedes living in North America—there is broadcast once a week the *"Swedish Chronicle"* for the benefit of Swedes living abroad on the Continent of Europe, as well as foreign-language broadcasts each weekday evening.

Further, lists of the names of foreigners evacuated to Sweden during the final phases of the war are read in special short-wave broadcasts. Regular radio programs have also been arranged (including entertainment and news) in about ten different languages for the benefit of refugees in Sweden.

The Technical Side

Considerable activity has been going on in the technical field, too. The number of studios has increased. This year, the Corporation has at its disposal 13 studios in Stockholm, ranging in size from rooms with a floor space of a few square yards to large concert

halls. Power lines have been reconstructed in order to improve the quality of broadcast transmissions, while the broadcasting stations have modernized or redesigned their equipment altogether. Apparatus for steel-band recording, wax-recording blanks, magnetophones, and lacquer-recording blanks, as well as other up-to-date equipment, is now available in quantity for broadcasting in Sweden. Some of this equipment is installed in the five reporting cars belonging to *Radiotjanst*, one of them being equipped with a frequency-modulated ultra-short-wave transmitter for use in reporting work.

During 1946, work was started on the construction of a Broadcasting House in Stockholm. It will be completely modern, will contain 15 major studios, three of them concert halls with accommodations for audiences of 1000, 500, and 250, respectively. The aggregate size of the Broadcasting House will be 134,000 cubic meters. The actual building—which is expected to be completed in 1949—will cost 14,600,000 kronor; the technical equipment, 3,900,000 kronor; acoustics, 982,000 kronor; and the building site, 7,700,000 kronor.

In January, 1945, a Government Commission appointed to investigate the present and future requirements of the Swedish Radio, presented its report, which contains comprehensive recommendations for three simultaneous programs; this would be made possible by establishing over the entire country a high-frequency wired wireless network over telephone lines—a technical method that is best suited to a country with Sweden's geographical and demographical conditions. The Commission had previously recommended the erection of two new short-wave transmitters of 100 kw. each, and the above-mentioned Broadcasting House.

Arne Skoog, Swedish DX-er who will act as master of ceremonies for the November 24th broadcast dedicated to Radio News readers and ISW listeners.

Regarding the position of the Swedish Radio in the community, the Commission made this observation: The independence of those in charge of broadcasting—their relative exemption from control, both formally and actually, by authorities and official bodies—is a primary interest. The broadcasting Corporation, representing a semi-State-owned monopoly, should, as far as possible, be ensured the enjoyment of all the advantages of a private publicity undertaking without its self-evident loyalty to the State being disregarded on that account.

From this outline, it is clear that the already highly-developed Swedish Radio will continue to expand and progress.

Radio Publications

Among the popular radio publications in Sweden are these:

"Roster i Radio" (Voices in Radio)—This is the official Swedish program-paper, owned by the Swedish Radio Corporation, Radiotjanst; address, *"Roster i Radio,"* Jakobsgatan 7, Stockholm 16. Current paid circulation is 120,000. Published weekly, 40 pages. Contains Swedish Radio programs in detail with illustrations, articles, and a special column for short-wave listeners. Two or three times a year, it carries a comprehensive short-wave station list compiled by Arne Skoog.

"Popular Radio"—A monthly illustrated magazine, primarily for radio engineers, servicemen, and amateurs. Circulation is 9,000, 24 pages. Con-

TIME (EST)	WAVE-LENGTH	FRE-QUENCIES	PROGRAMS
		Weekdays	
8-9 p.m.	25.63	11,705 kc.	Special programs for listeners abroad.
8-9 p.m.	31.46	9,535 kc.	Special programs for listeners abroad.
10-11 a.m.	19.80	15,155 kc.	Special programs for U.S.A.
12:30-12:55 p.m.	27.83	10,780 kc.	Bulletins in German, Swedish and English.
12:30-12:55 p.m.	19.80	15,155 kc.	Bulletins in German, Swedish and English.
		Sundays	
8-9 p.m.	25.63	11,705 kc.	Special programs for listeners abroad.
8-9 p.m.	31.46	9,535 kc.	Special programs for listeners abroad.
10-11 a.m.	25.63	11,705 kc.	Special program for U.S.A.
10-11 a.m.	19.80	15,155 kc.	Special program for U.S.A.
4:30-5 p.m.	27.83	10,780 kc.	Special programs for listeners abroad.
4:30-5 p.m.	31.46	9,535 kc.	Special programs for listeners abroad.

Swedish Short-Wave Schedules.

tains technical articles, construction plans, diagrams, and the like. Address, Popular Radio, Postfack 3221, Stockholm 3.

"Kortvags-Lyssnaren" (The Short-Wave Listener)—This was formerly *"DX-Radio."* Is an illustrated monthly. In each issue there is published one-third of a complete short-wave station list, with a time-on-the-air diagram. Foreign broadcasters are introduced to Swedish readers through attractively illustrated articles, and there are also columns for information concerning veries received, for the latest DX loggings, and so forth. Address, *"Kortvags-Lyssnaren,"* Stockholm 29.

"QTC"—This is a new house organ for S.S.A. (Sveriges Sandare Amatorer, or Swedish Sending Amateur-Association). Is just getting started and will be issued monthly for distribution *only* to members of S.S.A. free-of-charge. Address, Editor Ingenjor Hans Eliaeson, SM5WL, Jarnmalmsvagen 2, Traneberg, or S.S.A., Stockholm 8.

Facts About Sweden

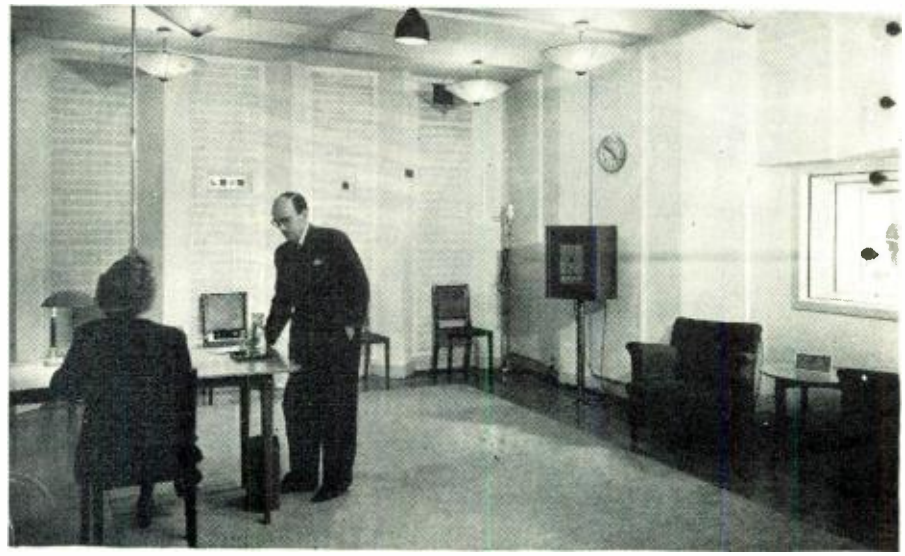
Sweden occupies the eastern and largest part of the Scandinavian peninsula in northeastern Europe. The Government is a constitutional monarchy. The Riksdag (Parliament) has two Chambers—the first of 150 members, the second of 230 members. All persons—men and women—over 21 years of age are entitled to vote.

The King of Sweden is Gustav V, who succeeded on the death of his father, Oscar II. A Social Democratic Government rules the country; there is a Prime Minister.

Lakes and rivers are more numerous in Sweden than in any other European country except Finland. The Government's hydro-electric plant, Porjus, in Lapland many miles north of the Arctic Circle, the center of a vast iron mining section, has a capacity of 150,000 horsepower. The water power resources of the country are approximately 30,000,000,000 k.w.h.

Although of broken, mountainous topography, Sweden contains much productive land, well-watered, on which the Swedish people have attained high efficiency in agriculture. Half the people are on farms which number about 420,000, of which 120,000 are under five acres, and 270,800 are between five and 50 acres. Many trees, particularly in Lapland, are 120-160 years old. Of the vast forest area (about 58,000,000 acres), 45 per-cent is owned by farmers, 4 per-cent by large landed proprietors, 27 per-cent by companies having sawmills, pulp

"Dagens Dikt" is a daily noontime program featuring the reading of the "poem of the day." Here the program is being recorded in Studio Nine.



mills, and so on, and about 24 percent by the State. In forestry, lumbering, sawmills, and pulp mills, 265,000 men and women are regularly employed and 400,000 more obtain some part of their living therefrom. Fabrication of rayon and other textiles made of pulp has increased, and it has even been possible to produce cattle fodder from woodpulp.

About 10,000 people are engaged in the mining industry, which is most extensive north of the Arctic Circle. Swedish steel is of especial value in tool making. The iron and mechanical industry employs about 175,000; textiles, 80,000; and the paper industry, 60,000.

The population is very homogeneous, being entirely of the Scandinavian branch of the Aryan family, except about 20,000 Finns and 6500 Lapps. Most of the people are Lutheran Protestant, which is the State religion, but complete freedom of worship exists. Education is compulsory.

The Army has been enlarged with special attention paid to mechanization. Service is compulsory between the ages of 20 to 47. The Air Force has been increased to 16 wings. Sweden adopted a five-year defense plan in 1942 with annual cost estimated at 755,000,000 kronor. The Navy (1945) consists of four cruisers, seven coast defense craft, 21 destroyers, six torpedo-boats, 42 minesweepers, 28 submarines, 19 motor torpedo-boats, two minelayers and small craft. The personnel is approximately 10,000. The Swedish merchant marine numbered 2107 vessels of more than 20 tons (1944).

Sweden comprises 173,347 square miles and the 1944 population was listed at 6,522,827, now is approximately 6,600,000. Stockholm is the capital city.

Best Bets in Sweden

We are indebted to Sven Lindhe, Carl-Eric Petersson, and Lars-Olof Forsstrom for this list of "best bets" for Swedish listeners, given in Swedish time (Swedish time is 1 hour *ahead* of GMT, 6 hours *ahead* of EST):

Radio Andorra, 5.990/5, can be heard well around 1900-0000. OTC2, 9.745 (varying), Leopoldville, Belgian Congo, is best around 0115-0200. PCJ, 15.220, Hilversum, the Netherlands, heard well in Happy Station Programs, Sundays and Wednesdays, 1630-1800. FZI, 11.970, *Radio Brazzaville*, French Equatorial Africa, good to 0200.

CXA19, 11.835, Montevideo, Uruguay. HCJB, 12.455, Quito, Ecuador, 2200-0200. PRL7, 9.720, Rio de Janeiro, Brazil, at 2100-0300. ZYC8, 9.610, Rio de Janeiro, Brazil. ZYB8, 6.095, Sao Paulo, Brazil. LRX1, 6.120, Buenos Aires, Argentina. LRY, 9.455, *Radio Belgrano*, Buenos Aires, Argentina, 0000-0200. LRS, 9.315, *Radio Splendid*, Buenos Aires, Argentina, 2300-0000. LRX, 9.660, Buenos Aires, Argentina, 0000-0100.

CNR, 9.082, *Radio Maroc*, Rabat, French Morocco. TAQ, 15.195, Ankara,

Turkey, around 1200; TAP, 9.465, Ankara 1700-2145. CSW6, 11.035, Lisbon, Portugal, 2200-0300.

CKNC, 17.820, and CKLX, 15.090, Montreal, Quebec, Canada, 1800-2300.

In addition to the above, practically all the U.S. and the BBC stations are heard at good level in Sweden.

* * *

The Ilse

Through the efforts of Arne Skoog, Sweden, and Bill Howe, short-wave editor of the *Universal Radio DX Club* in the United States, the *International League of Shortwave Editors* came into being at the end of 1945. They organized an exchange of information, with members in various parts of the world. Members in addition to Messrs. Skoog and Howe include Rex Gillett, DX Editor of *"Radio Call,"* South Australia; Arthur Cushen, a leading short-wave authority and contributor to radio publications, New Zealand; and Sr. Carlos Ramirez, short-wave editor of *"Radio Guia,"* Havana, Cuba. Mr. Skoog is chairman.

* * *

Polskie Radio

From W. Pawlak, Chief, Foreign Liaison, *Polskie Radio,* Warsawa al. Stalina 31, comes this information:

"We have only one short-wave station, Warsaw III, situated at Raszyn, near Warsaw, using 7.5 kw. and scheduled, 9.5268, 9-10 a.m., and 6.1149, 1:55 p.m.-12 midnight." (*Note:* I believe schedule for the 6.1149 frequency is an error, for the mimeographed detailed schedules in *English* enclosed with Mr. Pawlak's letter, list the radiation as 1655-0300 Central European Time, or 9:55 a.m.-8 p.m. EST.) Details of schedules given were (converted to EST):

9:55 a.m.-1 p.m.—Transmission of the General Program. 1-1:10 p.m.—Interruption. 1:10-1:20 p.m.—Program for Yugoslavia. 1:20-1:30 p.m.—Interruption. 1:30-3 p.m.—Transmission of the General Program. 3-3:20 p.m.—News in *English.* 3:20-3:40 p.m.—News in Russian. 3:40-4 p.m.—News in French. 4-4:15 p.m. (Monday)—The UNRRA Mission in Poland (Bulletin); (Tuesday, Thursday, Saturday, Sunday)—News in Yiddish. 4-5 p.m. (Wednesday, Friday)—Transmission of the General Program. 4:15-5 p.m. (Tuesday, Thursday, Saturday, Sunday)—Transmission of the General Program. 5-8 p.m.—Press news by the Polish Press Agency PAP (at dictation speed).

Warsaw I operates on 395.8 meters (758 kcs.).

Mr. Pawlak continued, "We usually relay the General Program in Polish and as special broadcasts we give only news in *English,* French, Russian, Serbo-Croate, Yiddish. You will probably understand that in the actual conditions, it is impossible to give identification in *English* during broadcasts in other languages. *We send verifications and answer all questions put to us by listeners. An IRC is required, but even so, we always answer."* *Polskie Radio* issues publica-

tions in *English,* Mr. Pawlak concluded. (Several nice photos of the installation at Raszyn, 17 km. from Warsaw, were forwarded; we hope to use them soon in ISW.)

* * *

More Sunspot Activity

Renewed disturbance of ionosphere conditions, due to sunspot activity, played havoc with international short-wave reception the last week in July. Reports from all parts of the U. S. and Canada indicate that the severe magnetic storm all but blotted out s.w. reception for about four days. WWV, Bureau of Standards station in Washington, D.C., was inaudible much of the time, even at short distances.

As pointed out to me by Clyde P. Brockett, Department of Chemical Engineering, University of Toronto, "it is interesting to note that the BBC doesn't miss a trick. As usual, at the beginning of this period of disturbance, they announced the probability of poor radio reception 'for some time' because of 'disturbed ionosphere conditions.'" Mr. Brockett comments that "this is the sort of thing I should like to see radio stations do more of, especially since there must be plenty of reliable information these days in various quarters on disturbances of this nature from continuously-recording instruments."

* * *

The Anti-Franco Radio

Carl Beck, New York, reports an "anti-Franco, anti-Phalangist Radio," 14.900, signing off at 5:33 p.m.; Spanish *only.*

* * *

Club Notes

Australia—From H. J. Clark, secretary, V.R.I. Wireless Club (V.K.3RI), Victorian Railways Institute, Flinders Street Station Building, Melbourne, C1, Victoria, comes this data:

"The Victorian Railways Institute Wireless Club was formed in July, 1926, by railwaymen in Victoria who were interested in the amateur side of radio broadcasting. A transmitting license was granted to the Club in November of that year under the call-sign, V.K.3RI, the letters 'R.I.' being applied for by the Club as designating 'Railways Institute.' Broadcasting began on the 200-meter band immediately, and regular transmissions were made on week nights and on Saturday afternoons and Sunday mornings and afternoons, the programs being publicized at that time in the local weekly radio magazine, *'Listener In.'* Subsequently, the commercial broadcasting stations opened up the 200-meter band for commercial broadcasting, and in common with other amateurs, our Club was restricted in its hours on the air, and the only regular transmissions then carried on were on Sunday afternoons and at night, with irregular transmissions at other times. Concurrent with these restrictions, however, tranmisssions were conducted on the 20-, 40-, and 80-meter bands and later on 56 megs. (5-meter band). When the war commenced, all amateur broadcasting in Australia ceased and

up until May 28 of this year we have only had the 6-meter and 10-meter bands restored—although we are hoping to have all other bands restored in the near future.

"Originally composed solely of railwaymen, the Club altered its Constitution in 1930 to admit non-railwaymen as 'associate' members in the proportion of one associate member to every two railwaymen.

"Annual subscription to the club is 5/- and in order to raise funds for our activities, dances are held during the year—and for these we have a very good social committee.

"Although the club did at one stage conduct classes in radio for tuition, no classes are held at present for class tuition, but individual tuition is given to new members desirous of same from the other members who are qualified to teach. The Club is affiliated with the Wireless Institute of Australia, which is the governing body for amateurs in Australia, and is also a member of the American Radio Relay League.

"Present officers are: President, T. Ramsey; vice-presidents, W. Brennan and H. McBain; secretary, H. Clark; assistant secretary, R. Duncan; and treasurer, W. I. May. These officeholders are elected at the annual meeting held in July each year and are eligible for reelection. A Management Committee of 8 members is also chosen at the annual session. Officers of the Club are ex-officio members of that committee. The Club, of course, is an affiliate of the Victorian Railways Institute and operates under the Constitution of that Institute."

* * *

All-Continent Tips Given

DXers in the Eastern United States who are anxious to verify *all-continents,* will be pleased to learn that this is possible at this time in about 2 hours of *evening* listening and by sending out correct reception reports. I suggest:

Africa—OTC-2, 9.738 (varying), 8:10 p.m. when *English* news is given from Leopoldville; address, The Belgian National Broadcasting Service, Leopoldville, Belgian Congo (Africa).

Asia—*All-India Radio,* 15.160 or 15.190, Delhi, 9:30 p.m. when *English* news is given with frequent announcements; address, All-India Radio, Delhi, India.

Australia—Tune *Radio Australia* on VLC9, 17.840, or VLA9, 21.60, at 8 p.m. when *English* news is featured; address, Radio Australia, Melbourne.

Europe—Here you can have your choice: Paris on 9.550 is excellent at 9 p.m. in *English* news period; Bern, 9.539, Switzerland, is also at fine level during its entire North American nightbeam, 8:30-10 p.m.; address for Paris is Radio Nationale Francais, Paris; for Switzerland, The Swiss Broadcasting Corporation, Berne.

North America—Tune to 25-, 19-, or 16-meter band at 8 p.m. when the West Coast transmitters are coming through "full tilt!" *English* is used

and announcements are frequent. Address of the United Network transmitters is Fairmont Hotel, San Francisco, California.

South America—Tune the old standby, HCJB, 12.455 or 9.958, Quito, Ecuador, at any time between 8-10 p.m., usually has *English* program around 9 p.m.; address is simply, HCJB, Quito, Ecuador.

Morning *"best bets"* for *all-continents* include:

Africa—OTC5, 17.770, Leopoldville, Belgian Congo, *English* news at 8:30 and 11:30 a.m.; address given above.

Asia—*Radio SEAC,* 15.12, Colombo, Ceylon, best around 6-8 a.m.; *English* news at 6 and 7:30 a.m.; address, 191 Turret Road, Colombo, Ceylon.

Europe—London in the 25-, 19-, and 16-meter bands is "all over the place." Now verifies. Send 10 cents in unused postage stamps with your report to Bryan Hayes, Local BBC Representative, 8 Althorpe Crescent, New Bradwell, Bletchley, Bucks, England. Another European regularly beamed to North America is SBT, 15.155, Stockholm, Sweden, 10-11, a.m., usually with *English* news around 10:05 a.m.; some days has not been audible here lately, but reception from this quarter should improve as autumn advances. Sends out verie card now for first time. Address, Swedish Radio, or Radiotjanst, Stockholm, Sweden (Sverige).

North America—CKNC, 17.820, Sackville, N.B. (studios in Montreal, Quebec), usually heard well all morning; address, International Service, CBC, Montreal, Quebec, Canada.

South America—HCJB, 12.455 or 9.958, Quito, Ecuador, is your "best bet" here, too, mornings. Heard around 6-8 a.m. with fine level; address given above.

* * *

Verifications

So much interest is being shown in s.w. verifications these days, I am devoting some space to it each month.

Grady Ferguson, North Carolina, has received verification by airmail letter on NIGF, 9.065 and 18.530, Atom Bomb Expedition: "NIGF, the Army Communications Ship, 'Spindle Eye,' is the successor to the old 'Apache.' The call, WVLC, is now held by the 'Spindle Eye' but has been temporarily set aside for this operation. We are modulating dually, an RCA 7.5 kw. high-frequency voice transmitter, and 96C Wilcox 2.5 kw. Thanks for your interesting report of our signal. The 'Spindle Eye' is taking up a new position for test 'Baker' and will act as a relay to NICO and NCLG, *U.S.S. Mt. McKinley* and *Appalachian,* respectively." Ferguson reports he heard NIGF, 8.530, with this relay from 6:15 p.m. to their going off the air at 10:08 p.m., July 24, with only fair signal at beginning but improvement until it was good, with swings up to R6 toward the last. He did not give address for verification, but I will have the address by the time you read this; in case you're still interested, drop me a line.

Address for verification from JODK, 2.510, Seoul, Korea, is: Radio Department, Bureau of Public Information, Headquarters USAMGIK, A.P.O. No. 235, c/o Postmaster, San Francisco, California; letter verification received in New Zealand was signed by James W. Browitt, assistant director. (Cushen)

Verification from the British Forces Network which operates from Hamburg, Germany, on 7.290, is Maj. J. F. Bassett, RA, No. 2 Field Broadcasting Unit, British Forces Network, British Army of the Rhine.

Mail address for KU5Q, Guam, is Box 10, Com-Marianas, c/o Postmaster, San Francisco, California. A Texas correspondent, Buddy Giles, reports KU5Q is now using a form letter for verification.

Address of the new DTYC, 5.3025, Munich, Germany, is A.P.O. No. 170; has asked for reports; tests, 8-8:30 a.m.

Verifications are being sent out promptly by PCJ, Holland; reports are requested and will be acknowledged over the air in Eddie Startz's "Happy Station" programs. Address is PCJ, Postbus 150, Hilversum, Holland (The Netherlands).

The *Sharq-el-Adna* station (6.135, 6.710, 6.790) verifies from Jaffa, Palestine, with nice verification card.

Address of HP5H, 6.122, Panama, is Apartado 1045, Panama City, Republic of Panama.

OAX4H, 6.365, Lima, Peru, "Radio Mundial," verifies from Apartado 1098.

Address of ZEA, 7.600, is G.P.O., Box 792, Salisbury, Southern Rhodesia.

Reports to *Radio Belgrad* should be addressed to Kneza Milosa 16/V, Belgrade, Yugoslavia.

The Klofta short-wave station in Norway answers reports from Klofta Kortboljerkringkaster, Oslo, Norway (Norge).

Although DXers in the U.S. (including myself) have been unable to get a verification from *Radio Eirrean,* Dublin, this reply has recently come to K. G. Frick, Sweden: "It is desired to thank you for your communication relative to reception of the Irish Short-Wave Br. Station on May 6th, 1946, and to confirm your reception reports. The Irish Short-Wave Br. Station, 1.5 kw., transmits daily 12:40-1 p.m. on 16.82 meters (17.84), and from 4:10 to 5:30 p.m. on 31.27 meters (9.595). We shall be glad at all times to receive reception reports from you." (Reports of mine addressed merely Radio Eirrean, Dublin, Eire, have not been returned, so it is presumed that address is sufficient. I did receive a reply to one letter, however, stating that their station would not be on the air for some time yet, but they did not verify my reception of reported 17.84. It is assumed they referred to a *new* station probably now under construction.)

Reception reports for *Radio Noumea* should be addressed in care of Le Chef de Cabinet du Gouverneur, Directeur du Service de l'Information, Noumea, New Caledonia (Nouvelle-Caledonie).

Bern, Switzerland, is now verifying with a nice card, not with a letter as formerly. (Legge, VRC) Merely address The Swiss Broadcasting Corporation, Berne, Switzerland.

Reports for verification by *All-India Radio* in Bombay, Calcutta, Madras, or Delhi, should be addressed to All-India Radio, Delhi, India.

"I have received a letter verification from *Radio Rangoon,* Burma. They seemed surprised to get a report of such excellent reception strength in Canada. They use a Marconi 7.5 kw. xmtr, with a Franklin Master Oscillator. The aerial is a center-fed dipole. Have also heard from Calcutta; they use a Phillips 10 kw. transmitter; the Calcutta engineer stated that the Delhi transmitters 'go as high as 100 kw.'" (Bromley)

Miss Eileen Reis, Program Director, "The Voice of America in North Africa," Algiers, reports: "Letter verifications are sent when correct reception reports are received, and an International Reply Coupon is appreciated. Reports should specify the frequency of the station heard, the time in GMT, the date, and as much program information as possible *(particularly the language in which the program is presented)* over as long a period of time as possible." (NOTE: These comments are good standard

practice for sending reports asking verification by *any* station.)

For newcomers, address of *Radio Milan* is repeated this month: Radio Italiana, Via Arsenale 21, Torino, Italy.

"Recently I received a nice verie postcard from HI2T, Monsenor Nouel, Dominican Republic; report was sent May 9 by regular mail and the card was received July 17; it is yellow and white, signed by a 'director.' Address is simply La Voz del Yuna, Monsenor Nouel, Dominican Republic; frequency was listed as 6.480. I also have received a nice card from *Radio Andorra*. My veries now total 50, not too bad for only 6 months of DXing." (Gauvreau)

COBC, 9.365, Havana, Cuba, heard nightly to 11 p.m., verifies with a letter and a tiny verie the size and shape of a U.S. airmail stamp, with perforation, *et al.* Address is Apartado 132. (Moss)

* * *

Acknowledgments

AUSTRALIA—Gillett, *Radio Call*, Radio Australia, DXSA, Addis. CALIFORNIA—Balbi, Dilg, Curtiss, McCarthy (at sea); Norton, URDXC; West Dyke, Gould. CAMEROUN—Le Chef Du Service Radioelectrique. COLORADO—Woolley. CONNECTICUT—Georges. CZECHOSLOVAKIA—Halas. DENMARK—Friis. DISTRICT OF COLUMBIA—*West Indian Radio Newspaper*. EGYPT—Cairo Calling, *Forces' Radio Times*. ENGLAND — Hayes, BSWL, Harrison; Bear, International Short Wave Club. FLORIDA — Rowland. HOLLAND—Koelmans; Startz, PCJ. INDIA—All India Radio, *Indian Listener*. INDIANA—Hart, Green; Jacobs, Grand National SWL Club; Brimelow. ITALY—Radio Italiana. KANSAS—Seckler. KOREA — Ware. LOUISIANA — Smith, Miller, Brennecke, Crandall. MARYLAND — Weyrich. MASSACHUSETTS — Harris, Simonian, Kernan, French. MISSOURI—Kierski, International Round Table. NEW JERSEY — Wooley, Williams, De Brier, *Newark News Radio Club*. NEW YORK — Legge, Australian News & Information Bureau, BBC, Wohl, Beck, Taylor, Yates, Bill Duggan. NEW ZEALAND—Cushen, Watson, Milne. NORTH CAROLINA—Ferguson. OHIO—Sutton; The Crosley Corporation. ONTARIO — Bromley, MacKay, Brook. PENNSYLVANIA—Cooley, Callahan, Jones, Gonder, Black; Hankins, VRC. QUEBEC—CBC; Gauvreau. ROUMANIA—Theodor. SOUTH AFRICA — Laubscher. SWEDEN — Skoog, Radiotjanst, Ekblom, Skogslund, Bergstrom, Narosky, Carl-Eric Petersson, Frick, A. B. Standard Radiofabrik, Ulvsunda, Edberg, Svensson, Erik Petersson, Sten Andersson, Lindberg, Gillbert Andersson, and others. TEXAS—Thompson, Giles. VIRGINIA — Howe, URDXC; Norris, Mayo. WEST VIRGINIA—Rupert, Reese.

—30—

Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

MELLON REPRINT

Mellon Institute of Industrial Research is currently offering a 32-page reprint entitled "From the Research Laboratory to the Armed Forces."

Although the reprint covers several diverse fields there is one article which should be of interest to the readers of RADIO NEWS, i.e. "Research Improves Resistors for Radio and Radar" by Edward E. Marbaker.

Copies of this reprint are being distributed free of charge upon request to *Mellon Institute of Industrial Research,* University of Pittsburgh, Pittsburgh 13, Pa.

C-D CATALOGUE

A new and revised catalogue which contains a listing of all electrolytic, paper and mica capacitors, in addition to capacitor test instruments and interference filters manufactured by the company, has been issued by *Cornell-Dubilier Electric Corporation.*

This 24-page catalogue, No. 195A, gives design and engineering information, dimensional sketches, physical properties and installation instructions for the capacitors described in the text.

A copy of this catalogue may be obtained from local jobbers or direct from *Cornell-Dubilier Electric Corporation,* South Plainfield, New Jersey.

MALLORY CATALOGUE

The new 37-page catalogue issued by *P. R. Mallory & Co., Inc.* contains listings of hundreds of the company's products which are of particular interest to the radio serviceman.

Included in the listing are such items as dry electrolytic condensers, paper dielectrics, tone controls, vitreous enamel fixed and variable resistors, switches, jacks and plugs, vibrators, rectifiers, battery chargers, power supplies and miscellaneous hardware items.

Known as Catalogue No. 467, this publication will be furnished upon request to *P. R. Mallory & Co., Inc.,* Indianapolis 6, Indiana.

TUBE SELECTION BOOKLET

Of interest to broadcast engineers and industrial designers is the new 8-page booklet, ETX-10, prepared by the Tube Division of *General Electric Company's* Electronics Department.

Included in the booklet are characteristics, ratings, prices and warranties of *G.E.* transmitting and industrial electron tubes.

Tube types are arranged alphabetically in thirteen sections and listed numerically by type number. Description and rating publication numbers are included in the chart of key information concerning each tube type.

Copies of booklet ETX-10 are available at *G.E.* tube distributors or on request to the Tube Division, Electronic Department, *General Electric Company,* Schenectady, New York.

PARTS BULLETIN

An 8-page supplement to the company's complete catalogue is now available according to *Concord Radio Corporation.*

This supplement features new merchandise which is currently available for shipment, and includes standard and hard-to-find radio and electronic parts.

A copy of the new bulletin may be obtained by writing *Concord Radio Corporation,* 901 West Jackson Boulevard, Chicago 7, Illinois.

WATERPROOF CONNECTORS

Bulletin No. W-146, covering the new type "W" waterproof connectors, has just been released by *Cannon Electric Development Company.*

Designed specifically for sub-marine geophysical explorations, these connectors are also suitable for use in swamps, lakes, rivers, docks, with underground cable, or in any outdoor application where moisture conditions make a sealed fitting necessary.

Engineering and mechanical specifications for the Type "W" connectors are given in this bulletin which will be forwarded by *Cannon Electric Development Company,* 3209 Humboldt Street, Los Angeles 31, California to those requesting it.

AMPLIFIER DATA

A data sheet covering the *Pan American Electric Company's* Monitor Amplifier is now available, according to a recent announcement by the company.

Covering the PAB-1500 Monitor Amplifier, the data sheet lists applications in broadcast and recording work, electrical and mechanical characteristics, and a schematic diagram of the unit.

A copy of this data sheet will be furnished upon request to *Pan American Electric Company, Inc.,* 132 Front Street, New York 5, New York.

ELECTRO-VOICE CATALOGUE

Electro-Voice, Inc. has recently issued a complete new catalogue and selections guide which is currently available upon request.

This illustrated catalogue gives complete data and information on the

company's line of cardioid, dynamic, crystal, velocity, differential and carbon microphones. One of the features of the catalogue is the selection chart which makes it easy to select the correct microphone for specific applications.

A copy of the catalogue may be secured from any authorized *Electro-Voice* distributor or by writing the company, *Electro-Voice, Inc.*, 1239 South Bend Avenue, South Bend 24, Indiana.

COLOR CODE GUIDE

Allied Radio Corporation has recently released their new RMA-JAN Color Code Guide for radio and electronic type resistors.

This pocket-sized guide is easy to operate, consisting of three rotary discs which are equipped with code colors and corresponding resistance values. Upon setting the color value, the correct numerical value appears at corresponding windows at the bottom of the guide. The guide also includes data covering resistance tolerance and a complete listing of RMA-JAN 10% resistor stock values.

These guides are available at a nominal charge of ten cents. Make your request direct to *Allied Radio Corporation*, 833 West Jackson Blvd., Chicago 7, Illinois.

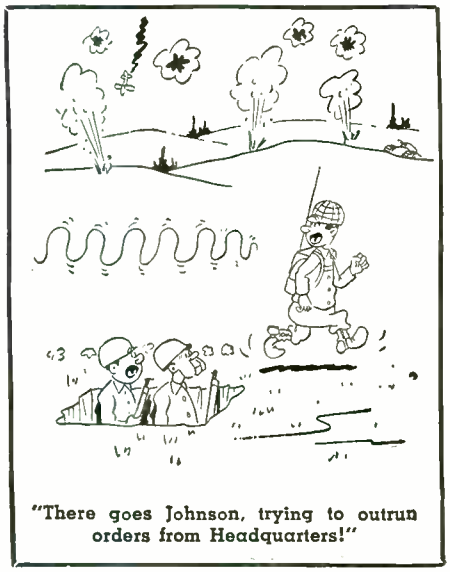
NATIONAL SCHOOLS CATALOGUE

A fully illustrated, 34 page catalogue entitled "Your Future in Radio, Television and Electronics" is currently being offered to prospective students by *National Schools* of Los Angeles.

Included in the catalogue is a resumé of the courses offered by the school, biographies of the faculty and pictures of the equipment and training facilities which are available to students.

A copy of this booklet may be obtained from R. B. Murray, Mail Sales Advertising, *National Schools*, 4000 South Figueroa Street, Los Angeles 37, California.

-30-



"There goes Johnson, trying to outrun orders from Headquarters!"

What's New in Radio

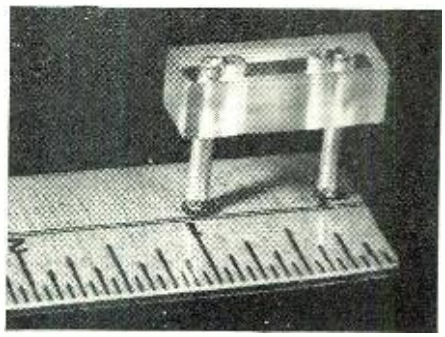
(*Continued from page* 124)

without change on the new FM band.

Insulation is polystyrene for low losses. The transformer is 1⅜" square and stands 3⅛" above the chassis. The units are available for immediate delivery. Additional information may be secured by writing *National Company, Inc.*, Malden, Massachusetts.

CRYSTAL HOLDER ADAPTER

A new service is offered to radio amateurs in the use of the new Crystal Holder Adapter announced recently by *Carl E. Mosley*, Overland 14, Mo.



It provides a convenient, low cost means by which a new type crystal holder with a pin spacing of ½ inch can be used in existing sockets which have a spacing of ¾ inch such as in the usual 5 or 6 prong tube sockets or any of the special ¾ inch crystal sockets.

These adapters are being distributed through radio suppliers who stock amateur parts. Additional information will be furnished upon request by writing *Carl E. Mosley*, 2125 Lackland Road, Overland 14, Missouri.

TELEVISION CAPACITORS

A new line of hermetically-sealed, high-voltage capacitors, especially designed for use in rectified r.f. type power supplies for television receivers and other cathode-ray tube applications have been announced by *Solar Manufacturing Corporation* of New York.

These capacitors are available in voltage ratings up to 30,000 volts, d.c. and in capacitances up to 500 $\mu\mu$fd.

The units are housed in solder-sealed glass bushings with a choice of either ferrule terminals for mounting in standard fuse clips, or screw terminals for more rigid means of support and connection. The ferrule terminal types have been designated the *Solar* Type

QTMF and the screw terminals Type QTMH.

Especially selected low power-factor paper is mineral oil impregnated under extra high vacuum in making these capacitors in order to assure satisfactory performance under high operating temperatures, according to the manufacturer.

Additional details of these high-voltage capacitors will be furnished by *Solar Manufacturing Corporation*, 285 Madison Avenue, New York 17, New York.

R.F. PROBE

Manufacture of a new r.f. probe for functional testing of high-frequency power circuits is under way at the Boonton, New Jersey plant of *Radio Frequency Laboratories, Inc.*

In operation, when the probe tip is subjected to an r.f. field, a proportionate r.f. current is capacitively induced, rectified and indicated on a *Weston* 506 meter.

Among the uses for this probe are the quick detection of standing waves, shielding power leaks, r.f. choke efficiency, and circuit tracing for r.f. in all radio-frequency equipment and associated components.

The unit may also be used for checking AM, FM and television transmitters up to 1500 mc., electronic heating and soldering equipment, antennas and transmission lines, diathermy apparatus and other r.f. units.

Additional data will be supplied by *Radio Frequency Laboratories, Inc.*, Boonton, New Jersey, upon request.

THREE-ELECTRODE TUBE

The Tube Division of *General Electric Company* has recently introduced a new three-electrode transmitting tube, Type GL-5C24 which was designed and tested for service as class A and class AB1 audio-frequency amplifier and modulator.

The tube is particularly adapted for high power AM transmitter applications where very low distortion levels are required.

Typical operation as a class A amplifier and modulator include: a d.c. plate voltage rating of 1500 volts; peak a.f. grid voltage of 150 volts; power output of 55 watts. At maximum ratings of 1750 volts, the plate input is 250 watts. The mu of the tube is 8.

When used as a class AB1 amplifier and modulator the d.c. plate voltage is 1750 volts. The maximum signal plate input is 300 watts.

Further technical information on

the GL-5C24 is available from Tube Division, Electronic Department, *General Electric Company*, Schenectady, N. Y.

FARM RADIO

The *Echophone Division* of *Hallicrafters Company* of Chicago has recently placed on the market its Model EC-600, four-tube, battery-operated home receiver for use in farm homes,

summer cottages and other locations where power line service is not available.

This receiver covers the entire broadcast band from 535 to 1750 kc. and is designed to operate from a single battery unit which provides 1000 hours service under normal use.

The speaker and audio system feature a powerful 6½ inch PM speaker, driven by a beam-power amplifier.

The unit is housed in a walnut veneer cabinet with oriental walnut banding and harmonizing center panel of richly textured grille cloth. A beveled slide rule dial is made up with large numbers for easy and accurate tuning.

Details of this Model EC-600 will be furnished by *Hallicrafters Company*, 2611 South Indiana Avenue, Chicago, Illinois.

TELEVISO V.T.V.M.

A direct reading instrument featuring a full-scale sensitivity of .5 volt for use at radio and audio frequencies has been introduced by *Televiso Products Company* of Chicago.

This new vacuum tube voltmeter, the Series 200A, provides accurate readings as low as 100.000 microvolts,

according to the manufacturer. Several new features in both circuit and housing design have been incorporated in this unit, including a rear storage compartment which contains a source of calibration voltage equal to 5 r.m.s. volts ± 2%; precision wire-wound re-

sistors; copper lined cabinet which prevents extraneous r.f. fields from affecting operation accuracy; and unique mechanical construction.

Full details on the Series 200A will be furnished by *Televiso Products Company,* 7466 Irving Park Road, Chicago 34, Illinois.

—30—

Subscription-Lease Plan

(*Continued from page* 56)

graphically demonstrated by their mobile workshop technique. The company also uses publication advertising, elaborate and richly colored literature and catalogues which during the course of years have been sent to every citizen of Switzerland.

A lottery idea which would probably be illegal in the United States was also used to supplement their sales promotion. In the Steiner lottery plan, the customer writes the address of a possible prospect on his premium card. Should the contract be closed with the prospect, the subscriber receives ten francs. He also has the right to check four numbers from the numbers 1-20 on his registration card. Every month, four numbers are drawn by lot and if the subscriber has picked the winning number, he receives an additional ten francs, two winning numbers, 25 francs; three winning numbers, 100 francs; four winning numbers, 500 francs. During the course of three years the company states they have paid out 500,000 francs but against this have earned a supplementary turnover of more than 10 million francs.

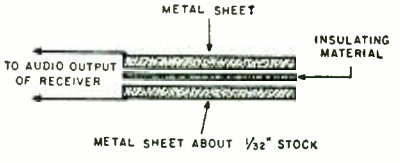
This alert and aggressive Swiss organization is extending its plan for the future with broad vision to include television and magnetic recording, but is clinging to the subscription idea as the main foundation of its business operation.

—30—

EMERGENCY EARPHONES

THE UNIT described and illustrated here may be used as a substitute earphone on the reception of c.w. signals, according to F. Harris of Chicago, Illinois, who designed it.

The earphone consists of two sheets of metal such as copper or aluminum separated by a sheet of insulating material, varnished or high grade writing



paper may be used. An audio signal of approximately 1000 cycles will excite this condenser earphone sufficiently to give good output on c.w. signals.

The area of the metal sheets need not be very great, according to Mr. Harris, two pieces, 4 x 4 inches, will serve nicely.

—30—

Metal Analyzer

(*Continued from page* 29)

Chemical Company. "Such a determination," the company continues, "is made by the well-known method of plotting the log of the relative intensities against composition, using known standards in plotting the original or calibration curve. This method is used in the usual spectrographic technique. In analyzing magnesium alloys, there are several good magnesium spectrum lines, each of which is stronger than the lines of any of the constituents. One or more of these spectrum lines is, therefore, used as the internal control or the reference line. The intensity of such a line is equal to the original charge in a condenser multiplied by a constant.

"It is unnecessary (as well as impractical) to completely discharge the condensers, or to determine their original charge. It is suitable to time the discharge of all condensers down to a given low voltage, such as 1.0 volts, supplied by a standard cell. This discharge is made through a resistance unit such that the *RC* constant of the circuit is about 5 seconds, which means that a condenser loses 63 per-cent of its initial charge in 5 seconds or, for the current involved in our method, a condenser is discharged in an easily measurable period of about 10 seconds. A range of *RC*, 3 to 6, is suitable as long as exactly similar *RC* constants are used for all condensers.

"It is very simple and effective to start the discharge of all condensers at the same instant and record on a multi-point recorder the time required to discharge each condenser down to the given standard voltage. By measuring the *difference* between the time required to discharge each condenser and the time required to discharge the reference condenser (that one charged by the magnesium spectrum line used for internal control), and by then comparing these differences with similar differences in time produced from alloys of known composition, the composition of an unknown sample may be read directly with calibrated scales.

"Various magnesium base alloys are made by melting together suitable amounts of various alloying elements. The final composition of such alloys must fall within rather narrow limits. The alloying metals of chief interest are aluminum calcium, manganese, zinc, iron. Others may be of interest in certain circumstances and provision may be made for the simultaneous determination of such metals in place of, or in addition to, those mentioned above.

"A spark source and facilities for preparing electrodes are provided, as for any spectrographic method, with special attention given to the need for speed in completing the analysis.

"A special monochromator is provided having a fixed exit slit for one or more lines of predetermined wavelength from each of the metals magnesium, aluminum, manganese, zinc, iron and/or any others. Behind each of these slits is mounted an electron multiplier tube, such as the *RCA* No. 931A, previously described. The output of each tube is wired to a condenser such as previously described which, in turn, is connected in series through a switch with a resistance. Between the terminals of the condenser is placed an electronic timing circuit so arranged that a signal is given at the instant at which the condenser voltage drops to exactly 1.0 volts, for example.

"In practice, a sample of molten metal is ladled from the pot in which it has been alloyed. The sample is poured into a mold in which a portion of it freezes in a shape approximating the shape of the electrodes used as the source of energy. As soon as the metal has solidified, it is removed from the mold and dressed down to standard size as a pair of electrodes. The electrodes are clamped in position and the power is turned on. After a suitable pre-arcing period, in which the arc can establish itself between the electrodes, the shutter over the monochromator is opened for a time exposure of several seconds.

"During this exposure, the energy in each of the predetermined lines is picked up by a multiplier electronic tube, which amplifies the energy and charges a condenser. After the exposure, the power source is cut off and the electrodes removed. The switches which discharge the condensers are all closed at the same instant and a signal indicating the starting of this discharge is sent to a multi-point recorder in which the record paper is moving at a carefully controlled and constant rate past the row of marking pens, one of which is connected to each condenser circuit. The discharge of the reference condenser takes place in about 10 seconds, a longer period of time than is required for the discharge of any of the other condensers. During these 10 seconds, all the other condensers discharge to the common level of 1 volt in varying times.

"The time of complete discharge to this voltage is indicated on the recorder paper. The distances between these indications and the mark showing discharge of the reference condenser are compared with similar distances derived from alloys of known compositions to indicate the unknown composition. When the discharge characteristics of known compositions are determined a transparent plate may be prepared in which various percentages of each component are scribed along lines corresponding to the lines of the several components scribed on the recorder. In this way, the master plate (which may be somewhat different for each type of magnesium alloy) can be placed directly over the record as soon as the reference condenser is discharged and the marks representing the discharge of each condenser will fall under a scale marking calibrated

to read directly the percentage of the unknown component which was responsible for this particular discharge."

The only unit of this new spectrometer yet built, the one in the magnesium alloying plant of *The Dow Chemical Company* at Midland, is the electronic "sentinel" on guard in scientifically controlling the composition of fresh metal, as 15,000 pounds of it are being poured into the furnace every five minutes. However, one instrument company is planning to manufacture at least one hundred of these spectrometers annually. A high school graduate can operate the device, which, in the final analysis, means that electronics is "reading" the ultimate mixture of various metals before melting them into ingots or castings. No longer is it necessary for a human operator to hold a pot molten for thirty minutes.

—30—

Sound Conditioning

(Continued from page 31)

In this respect a suitable size would be approximately 8′ wide, 8′ long and 8′ high, inside measurements. Observation windows should be constructed of double panes of glass set in felt or soft rubber.

To overcome sound transmission special attention should be paid to wall construction. As a general rule, weight, thickness, density and rigidity determine the "sound proofness" of any wall. Where weight and extreme thickness is impractical special techniques have been worked out to make use of various combinations of free air spaces between independent walls. Sound absorbing materials are used extensively in these combinations.

A few partitions and their average transmission losses are shown in Fig. 2.

All cracks or openings which may exist around doors should be sealed by providing felt or rubber gaskets on the door stops at the head and jambs, and installing a special metal-bound, felt strip threshold-closer, as illustrated in Fig. 3.

Efficient sound insulation in windows is required when windows are used for observation. These should be constructed with double panes of heavy glass with each pane isolated completely from the frame by gaskets of felt or rubber around all four edges. It is advisable to have the panes of slightly different thickness, to avoid resonance effects. Details of this construction are clearly illustrated in Fig. 3.

In the case of machine vibration the simplest method of reducing this type of sound transmission is to provide a resilient mounting for the machine which will tend to cushion and absorb the vibration rather than transmit it directly to the building structure. Rubber, cork, or spring mountings are designed to carry any load limit. Pads

of cork, rubber or fiberboard and other compliant materials may also be used.

Not to be overlooked in the process of construction is the ventilating system. The air ducts should be about 6" x 12" in size and should be about 20' long. In case of fan or air noises conducted by the ducts it will be necessary to line the duct with an absorbent material. This will prevent the duct from acting as a speaking tube in transmitting the sound into the room. This is also true of ducts leading to adjacent rooms.

If the best reception is to be enjoyed from radios and record transcriptions, sound conditioning is an absolute must.

Broadcasting companies spend thousands of dollars on program arrangement, engineering, studios, and the consequent heightened standards of broadcast quality in order to transmit the finest possible productions.

The radio industry is incorporating many developments obtained from wartime research, into models now coming off production lines. A dealer should be in a position to take advantage of these by presenting his merchandise in the most skillful manner possible.

Acoustical treatment is now, more than ever, being included in construction specifications. Leading acoustical products manufacturers have franchised distributors thoroughly experienced in all phases of sound conditioning.

The benefit of their experience is available without obligation. A little time spent with a sound conditioning engineer will yield an excellent return to the serviceman-dealer.

—30—

Classified

Rate 20c per word. Minimum. 10 words

RADIO ENGINEERING

RADIO Engineering Broadcasting, Aviation and Police Radio, Servicing, Marine Operating and Electronics taught thoroughly. Expenses low. Write for catalog. Valparaiso Technical Institute. Dept. N. Valparaiso, Ind.

FOR SALE

SELENIUM Rectifiers, full wave. 5 ampere, $1.85; 1 ampere, $2.50. Half wave 5 amperes, $4.50; 2.2 amperes, $2.25; 1.5 ampere, $1.85. Bulletin. Bursma Radio, Route 5, Grand Rapids, Mich.

RADIO tubes, parts, wholesale. Bulletin, 3c. Henshaw, 3313 Delavan, Kansas City, Kansas.

LOWEST Prices. Radio Tubes, parts. Bargain lists 3c. Potter, 1314 McGee, Kansas City 6, Mo.

WIRELESS phono-osc. transmits voice, recordings up to 500 ft. without wires; Kit with tubes, $5.75, Kit wired with tubes, $6.95. Constant Electric, 112 Cornelia St., Brooklyn 21, N. Y.

SELL—National communication receiver, 100 ASP, McElroy Recorder RRD, $9.00. C. Horn, 325 E. 163 St., New York 56, N. Y.

5SDG SELSYNS, $1.75: RCA 2050 Thyratrons, 75c: Luminous Paint Kit, $2.50: C-1 Autopilot Amplifier, as is, with 6 plate relays and 7 tubes, $5.75, less tubes, $3.75; "principles of Radio Engineering," Glasgow (McGraw-Hill), $2.50: SCR-522, new and complete, $97.50: AN/APN-1 Radio Altimeter, new and complete, $95.00: also APT-5A, SCR211, BC406, BC375, BC348, BC224, SCR-274, SCR284A, new and used. Free Descriptive List. Engineering Associates, Far Hills Branch Box 26, Dayton, Ohio

SPECIAL BUYS—Pan Oscillo Receiver 3" oscilloscope, panoramic adapter, synchroscope, receiver (when used with converter). Ideal General and Television service work, laboratory. 110v 60 cycle. New original cartons originally $1750, your cost $97.50. Send 60c for 80 page technical manual. BC 406 15 tube superheterodyne 205mc receiver 110V 60 cycle. Easily converted 2-10 meters or FM. Instructions furnished. Clearance price $21.45. New meters W. E. Output—4 to +6DB—3" $3.95. Frequency 48-62 cycles 3" $2.95. Triplett 2" 0-150ma pair $6.35. 5G Selsyn generators, perfect antenna direction indicator. 110V 60 cycle $12.00 pair. Transmitting tubes new G. E. 814 $11.45 pair. RCA8012. UHF to 500mc $8.95 pair. Eimac 304th $17.90 pair. Convert BC 312 to 110V 60 cycle exact replacement army power pack, new, $14.85. Signal Generators Measurements Corporation Type 65 B-75kc-30mc. Slightly Used but perfect $475.00. High Power Modulators. Two 500 audio units in one channel rack 110V 60 cycle less eleven tubes new $325.00. Westchester Electronic Products, 29 Milburn Street, Bronxville, New York.

HICKOK TUBE Tester Model 530 Excellent Condition—Best offer takes. Kurth's Sound Equipment, Citizens Bank Building, Hutchinson, Minnesota.

CLOUGH Brengle Signal Generator. Just Factory Calibrated Model OCX. Best offer takes. Kurth's Sound Equipment, Citizens Bank Building, Hutchinson, Minnesota.

PR-16 Communications Receiver with Jensen baffle and 12" speaker. F. Knapp, 6508 Montgomery Rd., Cincinnati, Ohio.

DIAGRAM, Case Histories for Every Receiver, 35c. Lopes, 780 E. 214, New York, N. Y.

SELSYN Transmitters and Repeaters. Diameter, 4"; weight, 10 lbs. Write to J. A. Weber, 150 Maple, Hershey, Pa.

6' NEON Radio Service sign. Details, Best Vibrator Co., Box 5802, Cleveland 1, Ohio.

400 CYCLE Dynamotors. 28VDC input, 115VAC output, 485VA. Shaft extension, black crackle, $12.50. Amplidyne Motorgenerators 28VDC to 60VDC 530W, $10.50. Generators, 30VDC 300 Amperes, $22.50. New. Postpaid. Free list Aircraft, Electrical, Radio Parts. Ereco, 1006 Hewitt, Everett, Wash.

HRO NOISE limiters, 2 tubes, variable control, easily installed. Drill one hole only. Complete with instructions, $15.95. Radio Electronic Sales, 46 Chandler St., Worcester 2, Mass.

VOICOIL stops that rub. $1.25 bottle. Pat. pending. Rounds out warped coil cores. Trial size 25c. Restore that radio speaker cone for $1.00 with "New Tone" harmonic solution. Stops cracking, rattles, blasting. Gives ear-ease, simulates 5th dimension, FM and out of doors reception. Lasts for years. Tested and approved by American Research Laboratories. Pat. pending. Trial size 25c. Radio Research Products, W. Malloy, Mgr., 1528 E. 64th St., Chicago, Ill.

PRESELECTORS, 10 to 20 meters, self contained power supplies, $19.95; 2 meter superregen receivers, $22.50; write for details. Constant Electric, 112 Cornelia St., Brooklyn 21, N.Y.

INDUSTRIAL Instruments. Model RN-I Wheatstone Bridge, $90.00. Model DR-52 Resistance Decade, $100.00. Model 652 Jackson Audio Oscillator, $90.00. Model 546 Supreme Oscilloscope, $70.00. AC Variable Voltage Adjuster with Voltmeter, $25.00. 20 New Panel Meters, all ranges. For radio service and amateurs' parts. Send for complete list. L. Dye, 150 Sunset Ave., Dayton, Ohio.

HAMMARLUND HQ 129X Vomax VTVM, BC221 frequency meter, TBY7 & power supply. S. Mayo, 372 E. 16th St., Brooklyn 26, N. Y.

WANTED

SURPLUS Radio Supplies, Tubes, Manuals, Test Equipment. Give complete information, prices, quantity. Bursma, R.R. 5, Grand Rapids 4, Mich.

WANTED—Rider Manuals I, II, III. A. R. Villedanne, R.F.D. No. 1, Claremont, N. H.

WANTED—Dual speed transcription phonomotor with turntable, for sixteen-inch recordings, 110 volts AC. C. C. Bonsell, 20 Race Road, Fairfield, Ohio.

WANTED—Springfield 1903 Service rifle in perfect condition, high serial number (as issued) and other rifles. Exchange for high grade semi-professional recorder, amplifier, mikes, etc. Value over $300.00. Write giving full particulars. Box 437, % Radio News.

WANTED—Army Tech. School Radio Workbooks. Chris Carey, Fair Haven, Vermont.

CORRESPONDENCE COURSES

CORRESPONDENCE Courses and self-instruction books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete information and 100-page illustrated bargain catalog FREE! Write Nelson Company, Dept. 2-59, Chicago 5.

For the Record

(*Continued from page 8*)

The signal picked up and used most effectively was a reflection from a nearby building.

The reproductions were excellent. The image appearing at the rate of 20 frames per second, scanned 525 lines per frame for each of the basic colors—red, yellow and blue—was pleasant to observe and in the short program, seemed to develop no eye-strain.

But, here again at *CBS* we were shown laboratory models operated by top flight engineers. The receivers, although housed in attractive cabinets, were all carefully built by expert workmen.

This brings up a question. Shall we scrap black and white television now and concentrate all of our planning and research on color television?

Black and white television is today a reality. Most of the technical problems of production have been solved and we are assured of a large volume of quality home receivers at prices within reach of the average purse, once labor and material difficulties have been successfully resolved.

But color television is still in the laboratory. Those of us who have sweated through the laborious process of making engineers' successes in the laboratory commercially successful and production line assembly usable, dependable products in the hands of the layman, can see months and perhaps years of work ahead to make color television commercially feasible.

It is the opinion of your editor that the future of television can best be insured by proceeding rapidly with the techniques already learned and make black and white television a reality to the bulk of the country as soon as possible. Television in color will be a natural development and it will fall quickly into its place in the radio pattern when adjustments have been effected that will make those laboratory successes commercially possible.

THE new series of articles on Recording—scheduled for this issue—has been delayed due to last-minute revisions. We'll try to start the series in our next issue. . . . . O. R.

ERRATUM

The formula for calculating the length of a quarter-wave matching transformer shown on page 66 of the September, 1946 issue of Radio News should have been $246/f\sqrt{D}$. All lengths specified in the various formulas in the article are in feet.

Photo Credits

Pages	Credit
25, 26	Beech Aircraft Corp.
27 (left)	Dallas Aero Service
27 (right), 137, 141	Bendix Radio Division
28, 29	Dow Chemical Company
30	The Celotex Corporation
35	Arthur Haug, Staff Photographer
39	Collins Radio Co.
45	Federal Telephone & Radio Corp.
49	Walter Steinhard, Staff Photographer
54	Steiner Company, Bern, Switzerland
146	Foto Soren, Sweden
150	Foto Daniels, Sweden

INDEX OF ADVERTISERS

November 1946

Abell Distributing Co., The
Brodix Advertising Agency 84
Adson Radio Co.
Bass & Weber Company, Inc. 90
Air King Radio
Henry A. Loudon Advertising 91
Alliance Manufacturing Company
Foster & Davies, Inc. 75
Allied Radio Corporation
George Brodsky, Advertising 9,88
Almo Radio Company
E. L. Brown, Advertising 152
Alsam Products
Sander Rodkin Advertising Agency 154
American Phenolic Corporation
Burton Browne Advertising 21
American Photocopy Equipment Co.
Arthur Meyerhoff Advertising 134
American Radio Institute
Sternfield-Godley, Inc. 150
American Sales Company 148
American Television Institute
Turner Advertising Agency 85
American Television & Radio Co.
Firestone-Goodman Advertising Agency .. 161
Amperex Electronic Corp.
Frank H. Kaufman 104
Arrow Sales Inc. 135
Astatic Corp.
Wearstler Advertising, Inc. 139
Atlas Condenser Products Co., Inc.
Bereman-Jarret Advertising 86
Atlas Electronics Company
Bass & Weber Company, Inc. 142
Atlas Sound Corporation
Burke & Wayburn, Inc. 124
Audak Co.
Hart Lehman Advertising 8
Audel, Publishers
Granf & Wadsworth Co. 157

Baker-Phillips Company
Foulke Agency 151
Baltimore Technical Institute 160
Banks Mfg. Co. 148
Barclay Electronics 136
Beard, George F. 162
Bell Telephone Laboratories
N. W. Ayer & Son 24
Bigg Radio Store 92
Bliley Electric Company
Hardy Advertising Agency 99
Bliss Electrical School
N. W. Ayer & Son 148
Brooks, Geo. & Associates 144
Bud Radio, Inc.
Allied Advertising Agency 90
Buffalo Radio Supply
International Advertising Agency 95
Burlington Instrument Company
Weston-Barnett, Inc. 161
Burnell Company
Mitchell Advertsing Agency 80
Burstien-Applebee Company
Frank R. Whalen Advertising 70

California Radio & Electronics Co.
Bass & Weber Company, Inc. 11
Candler System Co.
Rand-Ries, Inc. 152
Cannon Electric Development Co.
Dana Jones Company 133
Capitol Radio Engineering Institute
Henry J. Kaufman Advertising 71
Centralab
Gustav Marx, Advertising 115
Chicago Industrial Instrument Co. 160
Chicago Wheel & Mfg. Co.
Weston-Barnett, Inc. 152
Chief Electronics 154
Clark Radio Equipment Corp.
Turner Advertising Agency 90
Clark Reiss Distributors
Bass & Weber Company, Inc. 138
Clarkson Publishing Co.
Smith, Benson & McClure, Inc. 160
Clarkston Corporation
Stellar, Miller & Ebberts 134
Cleveland Institute of Radio Electronics
Kenneth H. Kolpien 62,68,143
Clippard Instrument Laboratory
Savage & Talley, Inc. 164
Collins Audio Products Co.
Collins Radio Company
McCann-Erickson, Inc. 22
Communications Equipment Company
Borough Advertising Agency 69
Concord Radio Corporation
E. H. Brown, Advertising 56
Constant Electric Company 144
Coyne Electrical School
Phil Gordon Agency 59,162
Coyne Electrical School
McJunkin Advertising Agency 142
Crab ree's Wholesale Radio 134
Croname, Inc. 109

D. & H. Distributing Co.
Business Service Agency 100
DeForest's Training, Inc.
MacDonald-Cook Company 15
Dow Radio 142
Drake Electric Work, Inc.
William Hoffman & Associates 104
Dymac, Inc.
Harold Warner Company 156

Editors & Engineers 10, 136
Electronic Designs, Inc.
Bass & Weber Company, Inc. 165
Electronic Equipment Distributors 118
Electronic Institutes, Inc. 162
Electronic Instrument Company
Purnies & Associates 162
Electronic Manufacturing Co.
Business Service Company 157
Electronics Measurements
Purnies & Associates 138
Electronic Supply Corp.
Regent Advertising Agency 152
Electro-Motive Mfg. Co., Inc.
Cory Snow, Inc. 158
Erie Supply Company 162
Esse Radio Company
George S. Diener Company 20
Evans, Victory J. & Company
Emery Advertising Co., Inc. 162

Fada Radio & Electric Company, Inc.
Sternfield-Godley, Inc. 6
Fahnestock Electric Company, Inc. 131
Federated Purchaser, Inc.
Altomari Advertising Agency 167
Feiler Engineering Co.
George Brodsky Advertising 98
Flanagan Radio Corporation
Stewart-Jordan Corp. 93
Foht Radio Company 154
Frank Wally, Ltd.
Dundes & Frank, Inc. 150

General Cement Mfg. Co.
Turner Advertising Agency 102
General Industries Co., The
Fuller & Smith & Ross, Inc. 94
General Test Equipment Co.
Suzanne B. Hayman, Advertising 154
Greenlee Tool Company
Howard H. Monk & Associates 112
Greenwich Sales Co.
Bass & Weber Company, Inc. 130
Groban Supply Company
A. L. Addison Advertising 144
Grossman Radio & Electric Co.
Arnold Cohan Corporation 125
Guardian Electric
Kennedy & Company ..... *SECOND COVER*

Hall, R. C. & L. F., Inc. 74
Halldorson Company, The
Sander Rodkin Advertising Agency 80
Hallicrafter Company, The
Burton Browne Advertising 5
Hammarlund Mfg. Co., Inc., The
Roeding & Arnold, Inc. 101
Harrison Radio Corporation
Altomari Advertising Agency 60
Harvey Radio Company, Inc.
Shappe-Wilkes, Inc. 96
Henry Radio
Burton Browne Advertising 78
Hexacon Electric Co.
George Homer Martin 74
Hoodwin, Chas. Co. 156
Hopp Press, Inc
Gallard Advertising Agency 164
Hytron Radio & Electric Corp.
Henry A. Loudon Advertising 67

Illinois Condenser Company
Sander Rodkin Advertising Agency 148
Instructograph Company
Turner Advertising Agency 140
International Resistance Corp.
John Falkner Arndt & Co. 79

J. F. D. Mfg. Company
Bergman-Jarrett Company 153
Jensen Radio Manufacturing Co.
Burton Browne Advertising 89
Johnson, E. F. Company
David, Inc. 103
Joseph, Irving Associates 128

Kelvin Electronics
Sternfield-Godley, Inc. 150
Kenyon Transformer Corp.
Jasper, Lynch & Fishel, Inc. 113
Kurz-Kasch, Inc.
Kircher, Helton & Collett 107
Kwikheat
West-Marquis, Inc. 129

Lake Radio Sales Company
Sander Rodkin Advertising Agency 64
Legri S Company
Cromwell Advertising Agency, Inc. 154
Leotone Radio Co.
Altomari Advertising Agency 82
Liberty Sales Co., Inc.
Sternfield-Godley, Inc. 121
Lifetime Sound Equipment
Miller Agency Co. 112
Lincoln Engineering School
Buchanan Thomas Advertising Agency ... 140
Mac's Radio Supply 167
Maguire Industries, Inc.
City Advertising Agency 119
Mallory, P. R. & Co., Inc.
Aitkin-Kynett Co. ..... *THIRD COVER*
Maritime Switchboard 116
Martin, Don Scool of Radio Arts 156
Massey's Radio Supply 148
Melville Radio Institute
Seidel Advertising Agency 102
Metropoltan Electronic & Instrument Co.
Bass & Weber Company, Inc. 66,141
Mid-American
E. H. Brown, Advertising 105
Miles Reproducer Co., Inc.
Altomari Advertising Agency 148
Millen, James Mfg. Co., Inc.
James Millen, Inc. 12
Milo Radio Electronics Corp.
Burke & Wayburn, Inc. 112
Murray Hill Books, Inc.
Harry P. Bridge Advertising 76,77
McGee Radio Company
Edgar Walter Fischer 155
McGraw-Hill Book Co., Inc. 136
McMurdo Silver Company
Edward Owen Company 16

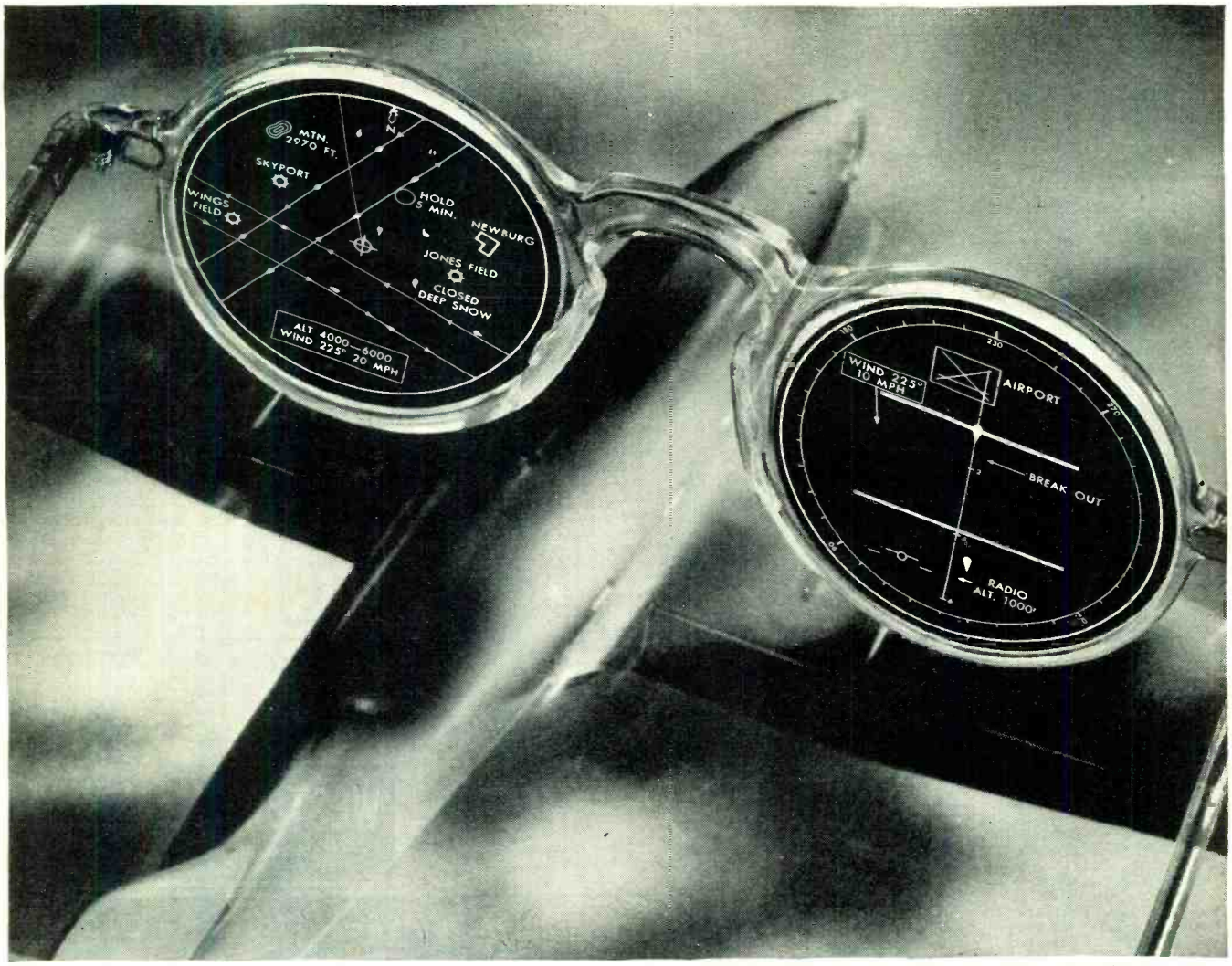
N. J. Industrial Agency 116
National Acoustic Products
Paul Basinger Studio 163
National Company, Inc.
Graydon Smith Advertising 55
National Radio Distributors
Burke & Wayburn, Inc. 166
National Radio Institute
Van Sant, Dugdale & Company 3
National Radio Service 144
National Schools
Stodel Advertising Agency 65
National Schools
Mayers Company, Advertising 23
National Union Radio Corp.
Hutchins Advertising Agency 61
Newark Electric Company
Charles Brunelle Company 117
Newark Surplus Materials Co.
William N. Scheer 140
Newcomb Audio Products Co.
Stevens-Hall Advertising 159
New York Technical Institute of New Jersey
Schwab & Beatty, Inc. 72,73
Niagara Radio Supply
Burke & Wayburn, Inc. 106

O & B Laboratories 144
Ohmeyer Engineering Labs. 108
Olson Radio Warehouse
Jessop Advertising Agency 169
Oxford Radio Corp.
Signet Company 62

Pa-Kette Radio Company
Arrow Advertising Agency 154
Petersen Radio Company
Bozell & Jacobs 130
Potter Radio Company 130

RCA Institutes, Inc. 134
R. L. Electronics Corp.
R. S. Wittenberg Advertising 106
Radio City Products
Reiss Advertising Agency 18
Radio Corporation of America
J. Walter Thompson Advertising 170
Radio Dealer Supply
H. J. Gold Advertising 148
Radio Development Labs
Altomari Advertising Agency 118
Radio Distributing Co. 162
Radio Electric Service Co.
David Zibman Advertising 156
Radio Equipment Distributors
Ross, Gardner & White Advertising 134
Radio-Experts 152
Radio Ham Shack
J. R. Kupsick Advertising Agency, Inc. .. 145
Radio Kits
Hamburger Advertising Agency 142
Radio Maintenance Magazine
Shappe-Wilkes, Inc. 63
Radio Parts Company
Sidney S. Lovitt Advertising 159
Radio Press 156
Radio Products Sales Company
Barton A. Stebbins 151
Radio Supply & Engineering Co.
Karl G. Behr Advertising 58
Radio & Television Supply
Thomas H. Stevenson 162
Radio & Television Supply Co. 60,143
Radionic Equipment Co.
Bass & Weber Company, Inc. 149
Radio Wire Television, Inc.
Reiss Advertising Agency 81
Radolek Co.
Turner Advertising Agency 157
Reed Manufacturing Co.
Borg Advertising Agency 108,148
Rider, John F., Publishers
Lansford F. King, Advertising 123
Risco Sales
Diener & Dorskind 162

Robson-Burgess Co.
Pfeiffer Advertising Agency 98
Rowe Industries
Miller Agency Co. 158
S/C Labs
Gallard Advertising Agency 147
Sams, Howard Company, Inc.
Aitkin-Kynett Company 57
Sauereisen Cements Co.
McCarty Co. 140
Scenic Radio & Electronics Co.
Bass & Weber Company, Inc. 116
Seman, Paul
A. N. Baker Advertising Agency 114
Sheffield Radio & Appliances Co.
Sander Rodkin Advertising Agency 132
Shure Appliances
Paul Basinger Studio 156
Sigmon's Radio Supply
Advertising, Inc. 140
Slate & Co.
Bass & Weber Company, Inc. 146
Sound Products Company
Bass & Weber Company, Inc. 118
Sprague Products
Harry P. Bridge Advertising 97
Sprayberry Academy of Radio
Harry P. Bridge Advertising 7
Standard Parts
Bass & Weber Company, Inc. 104
Standard Radio & Electronic Products
Mount Printing Company 137
Stanton Supply Company 160
Star Measurements Company
Altomari Advertising Agency 154
Stark's
A. L. Addison, Advertising 161
Starter Batteries, Inc. 160
Sterling Electronics Company 160
Stevens Walden, Inc.
Howard Wesson Co. 14
Sun Radio & Electronics Co.
Bass & Weber Company, Inc. 167
Sun Radio of Washington, D. C.
Kal-Ehrlich & Merrick 17
Superior Instrument Corp.
Bass & Weber Company, Inc. 87
Supreme Publications
Henry H. Teplitz Advertising 13
Surplus Radio, Inc.
Bass & Weber Company, Inc. 110
Sylvania Electric Products, Inc.
Newell-Emmett Company ..... *FOURTH COVER*
T A B
Bass & Weber Company, Inc. 122
Taybern Equipment Co.
Bass & Weber Company, Inc. 102
Telectron Company, The 118
Terminal Radio Corporation
Regent Advertising Agency 127
Terry Jay 144,160
Transvision, Inc.
H. J. Gold Advertising 120
Triplett Electrical Instrument Co.
Western Advertising Agency 19
Tri-State College
Clem J. Steigmeyer Advertising 160
Trutone Products Co.
Terrill Belknap Marsch 152
Turner Company, The
W. D. Lyon Company 111
Ungar Electric Tools, Inc.
Walter C. Davison 86
Union Radio Corp.
Sander Rodkin Advertising Agency 165
United Screw & Bolt Corp.
Fred Mellis Advertising 83
United Transformer Corp.
Shapp-Wilkes, Inc. 92
University Loudspeakers, Inc.
George Homer Martin 153
Valparaiso Technical Institute
Smith, Benson & McClure, Inc. 144
Valpey Crystals
Cory Snow, Inc. 166
Variety Electronics Company
Bass & Weber Company, Inc. 126
Vasco 162
Vaughan Cabinet Company 130
Warner Electric Company
Mason Warner Company 136
Warren Distributors 108
Waterproof Electric Company 138
Weber Radio Labs.
Bass & Weber Company, Inc. 106
Webster-Chicago Corporation
William Hoffman & Associates 132
Weller Manufacturing Co.
Beaumont, Heller & Sperling, Inc. 68
Wells Sales, Inc.
Turner Advertising Agency 147
Western Radio Communications Institute .. 156
Western Sound & Elec. Labs., Inc.
Morrison Advertising Agency 169
World Radio Laboratories, Inc.
Pfeiffer Advertising Agency 163
Workshop Associates
Larcom Randall 140
YMCA Trade & Technical Schools
Cecil & Presbrey, Inc. 130



Teleran pictures—air traffic control by radar plus television.

Teleran—"radio eyes" for blind flying!

It's a television "information please" between airplane and airport—with the pilot's questions given split-second answers on a television screen mounted in the cockpit.

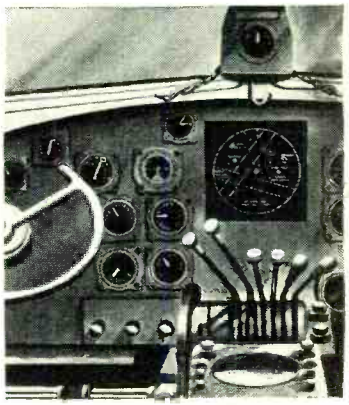
Teleran (a contraction of *TELE*vision—*R*adar *A*ir *N*avigation) collects all of the necessary information on the ground by radar, and then instantly transmits a television picture of the assembled data to the pilot aloft in the airplane.

On his receiver the pilot sees a picture showing the position of his airplane and the position of all other aircraft near his altitude, superimposed upon a terrain map complete with route markings, weather conditions and unmistakable visual instructions. The complex problem of air traffic control is well handled by Teleran.

Teleran—another achievement of RCA—is being developed with Army Air Forces co-operation by RCA Laboratories and RCA Victor, endless sources of history-making developments in radio and electronics. They are also your assurance that *any* product bearing the RCA or RCA Victor monogram, is one of the finest instruments of its kind science has yet achieved.

• • •

Radio Corporation of America, RCA Building, Radio City, New York 20 . . . Listen to The RCA Victor Show, Sundays, 2:00 P. M., Eastern Standard Time, over the NBC Network.

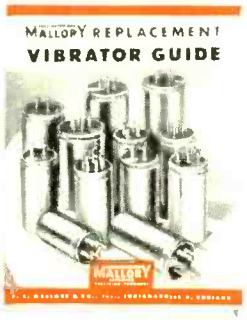


Instrument Panel of the Future. The Teleran indicator, mounted in a cockpit, simplifies the pilot's job by showing his position relative to the airport and to other planes in the vicinity. It promises to become one of the most useful developments in the history of aviation.

RCA **RADIO CORPORATION of AMERICA**

PRINTED IN U. S. A.

You'll find a Mallory Vibrator in 8 auto radios out of 10



WANT A COPY? *A complete list of replacements for all pre-war auto radios. Valuable service information too! Ask your Mallory distributor.*

YES, Mallory Vibrators are the most widely preferred and the most widely *used* of all vibrators made today. There must be good reasons why this year, as for many years past, 80% of all automobile radios have been equipped with Mallory Vibrators. There *are* good reasons.

Mallory is the largest producer of vibrators in the business. It has the most extensive manufacturing "know-how"—the most active staff of research experts. Every Mallory Vibrator that reaches the market is checked and double-checked against tough specifications.

These are some of the reasons why Mallory manufactures 80% of all vibrators used in original equipment. They are the same reasons why Mallory Vibrators are your best bet for replacements, too. See your Mallory distributor. He has a complete line of 6, 12 and 32 volt Mallory Vibrators.

P.R. MALLORY & CO. Inc.

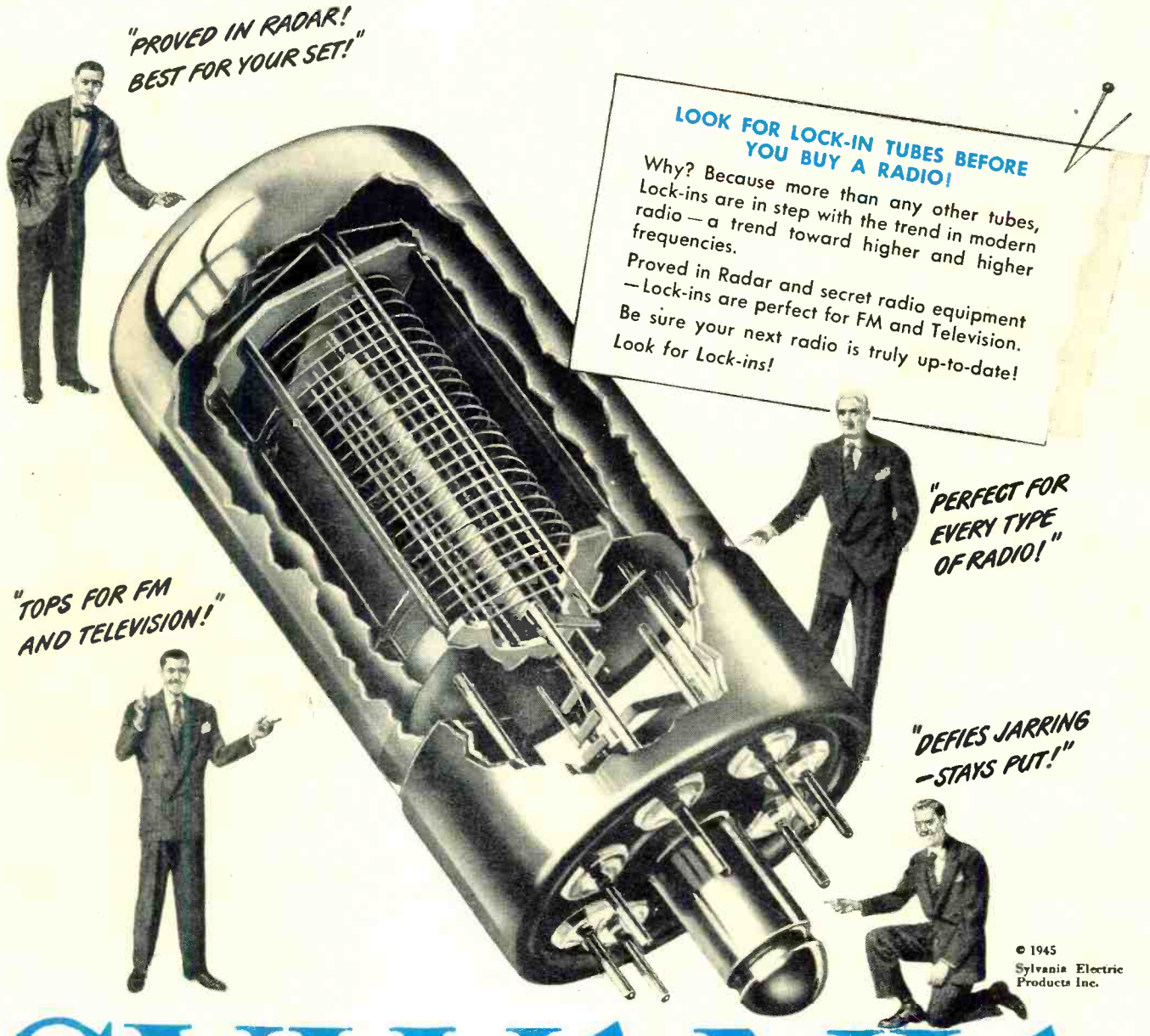
MALLORY

VIBRATORS . . . VIBRAPACKS* . . . CAPACITORS . . . VOLUME CONTROLS . . . SWITCHES . . . RESISTORS . . FILTERS . . . RECTIFIERS . . . POWER SUPPLIES. ALSO MALLORY TROPICAL* DRY BATTERIES, ORIGINALLY DEVELOPED BY MALLORY FOR THE U. S. ARMY.
*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

YOUR NEXT RADIO NEEDS "LOCK-IN!"



SYLVANIA ELECTRIC

Executive Offices: 500 Fifth Ave., New York 18, N. Y.

Makers of Radio Tubes; Fluorescent Lamps, Fixtures, Wiring Devices; Electric Light Bulbs; Electronic Devices