

FEBRUARY
1947
35c

RADIO NEWS



"WAVEMETERS COVERING AMATEUR FREQUEN

"TESTING"

RN-56-J41366-47
LAURENCE THORSON
DALLAS WIS

RADIO SERVICE TECHNICIANS

use the **BLILEY CCO..**

for

instant channel selection

and frequency accuracy



Ask your Bliley
Distributor for
Bulletin 32

SUPPLIED COMPLETE WITH 7 CRYSTALS,
TUBES AND CONCENTRIC OUTPUT CABLE.

The Bliley CCO (crystal controlled oscillator) is the only test instrument available to radio service technicians that features —

DIRECT CRYSTAL CONTROL

— with instant channel selection of the five most commonly used intermediate frequencies—175 kc, 262 kc, 370 kc, 455 kc, and 465 kc.

— at 200 kc for r-f alignment.

— at 1000 kc for short wave alignment.

Finger tip adjustment is provided by a three position modulation selector and a five step attenuator, with vernier output from 0 to 15 volts. An external socket accommodates extra crystals that may be needed for special requirements.

There is nothing complicated about the Bliley CCO. Simply connect it to the receiver to be tested and select the frequency desired. The crystals are instantly on frequency as soon as the oscillator is energized. It will save you hours of time, eliminate guess work and increase your prestige as a radio service technician.

The CCO is a “techniquality” product of the same engineering skill and craftsmanship that have kept Bliley Crystals foremost in dependability in the frequency control field for over 15 years.

Bliley
CRYSTAL CONTROLLED OSCILLATOR

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA

I WILL SEND YOU
BOTH FREE

NEW 64 PAGE BOOK

64-page illustrated book describes many fascinating jobs Radio, Television, Electronics offer, shows big kits of Radio parts I send you, tells how I give you practical experience building real Radio circuits at home in spare time, how you make extra money fixing Radios while still learning; contains letters from many men I trained, telling what they are doing, earning. FREE. Mail Coupon below!

SAMPLE RADIO LESSON

I will also send you my Lesson, "Getting Acquainted With Receiver Servicing," FREE, to show you how practical it is to learn Radio at home in spare time. It's a valuable Lesson. Study it—keep it—use it—without obligation! Tells how "Superhet" Circuits work, gives hints on Receiver Servicing, Locating Defects, Repair of Loudspeaker, I.F. Transformer, etc. 31 illustrations. Mail Coupon below!



SEE FOR YOURSELF HOW I TRAIN YOU AT HOME TO BE A RADIO TECHNICIAN

Do you want a good-pay job in Radio—or your own money-making Radio Shop? Mail Coupon for a FREE Sample Lesson and my FREE 64-page book, "How to Be a Success in RADIO—Television, Electronics." See how N.R.I. gives you practical Radio experience at home—building, testing, repairing Radios with BIG KITS OF PARTS I send!

Many Beginners Soon Make Good 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-grasp, illustrated lessons—PRACTICE what you learn 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 and Electronics become available to the public! Send for free books now!

Find Out What N.R.I. Can Do for You

Mail Coupon for Sample Lesson and my 64-page book. 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. 7BR National Radio Institute, Pioneer Home Study Radio School, Washington 9, D. C.** Our 33rd Year of Training Men for Success in Radio.

VETERANS

You can get this training right in your own home under G. I. Bill. Mail coupon.

I TRAINED THESE MEN

Averages Better Than \$3,000 A Year

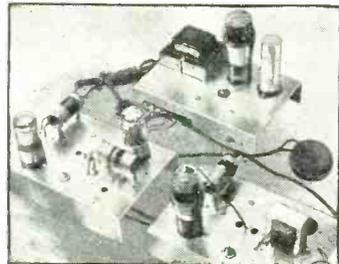
"I now have a shop and am doing fine. I average better than \$3,000 per year, and certainly give NRI much of the credit."—RAYMOND F. DAVIS, Ashburn, Georgia.



Made \$612 In 12 Mos. Spare Time

"Soon after I finished my experimental kits lessons I tackled my first Radio service job. The neighbors were very cooperative. I soon had all the repair jobs I could handle in spare time. I have made \$612 in the past 12 months in spare time."—J. W. CLARE, Wilmington, North Carolina.

Build Radio Circuits Like These With Kits I Send



Good for Both FREE

MR. J. E. SMITH, President, Dept. 7BR National Radio Institute, Washington 9, D. C.
 Mail me FREE, without obligation, Sample Lesson and 64-page book about how to win success in Radio—and Television, Electronics. (No salesman will call. Please write plainly.)

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City State

(Please include Post Office zone number)

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THE COVER: Final assembly and testing of wavemeters to be used in conjunction with the proper adjustment and operation of ham transmitters. The Bud Radio, Inc. plant at Cleveland is the scene of this operation.

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RADIO NEWS

Reg. U. S. Pat. Off.

First in radio

Average Paid Circulation over 130,000

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hallicrafters PRESENTS THE

SX-42

Another first!
Greatest contin-
uous frequency
coverage of any
communications
receiver — from
540 kc to 110 Mc

This is the long-awaited Hallicrafters SX-42, a truly great communications receiver. The tremendous frequency range of the SX-42, *greater than ever before available in a receiver of this type*, is made possible by the development of a new "split-stator" tuning system and the use of dual intermediate frequency transformers. Packed with advance features that every ham and every other radio enthusiast desires, the SX-42 clearly lives up to the Hallicrafters ideal of "the radio man's radio."

From now on watch Hallicrafters — the name that's remembered by the veteran, preferred by the radio amateur. See your distributor for demonstration of the SX-42 and for colorful literature describing this great set in complete technical detail.



Because of the precise and thorough engineering that must be done on the SX-42 and because the parts supply has not been continuous, top production peaks have not yet been reached. In the immediate future deliveries will necessarily run behind the demand, but the SX-42 is definitely worth waiting for.



hallicrafters RADIO

THE HALLCRAFTERS CO., MANUFACTURERS OF RADIO
AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

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BUILDERS OF *Skyfone* AVIATION RADIOTELEPHONE

SALES CHAMPIONS



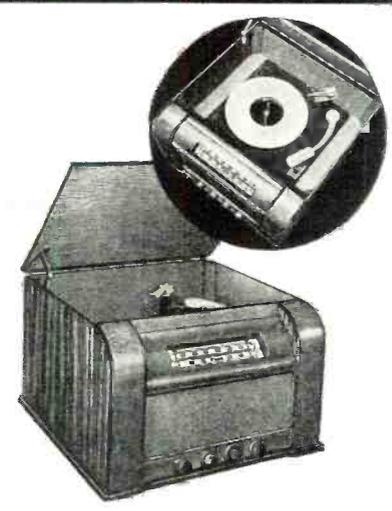
The Radio of
TO-MORROW ... TO-DAY!

by **FADA**



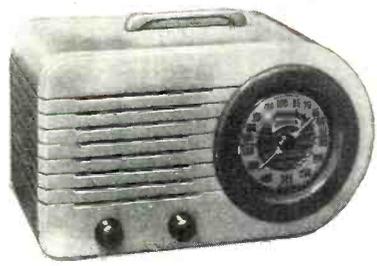
MODEL P82

Tri-power portable Superheterodyne with Hi-Gain tuned RF stage in rich two-tone simulated leather covered wood cabinet. 5 tubes plus rectifier tube.



MODEL 602

New Superheterodyne AC Table Model Radio Phonograph Combination with Automatic Record Changer in a Cabinet of Beautiful Mahogany Veneers.



MODEL 1000

AC-DC Superheterodyne in beautiful gem-like "Fada-Lucent" cabinets. Five Tubes plus Rectifier Tube.



FADA 5-tubes — plus-rectifier-tube models are equipped with the new FADA "Sensitive-Tone" ... assuring greater sensitivity and clearer reception.



MODEL 633

New Portable Electric Phonograph in smart Deluxe two-tone luggage case. Plays 10 or 12 inch records with the lid closed. Incorporates advanced engineering developments.

YOU CAN ALWAYS DEPEND ON

FADA

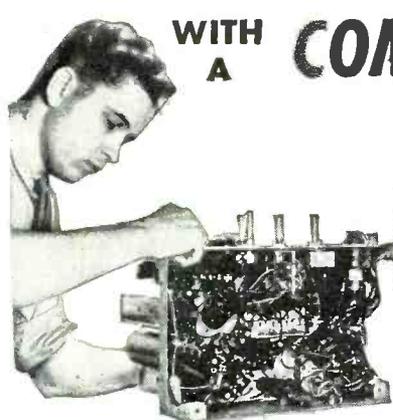
Radio

Famous Since Broadcasting Began!

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.

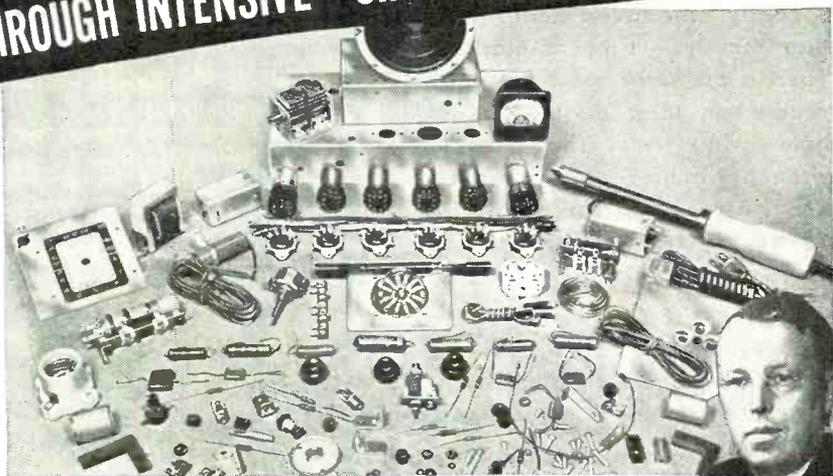


I give you a fine, moving-coil type Meter Instrument on Jewel Bearings—with parts for a complete Analyzer Circuit Continuity Tester. You learn how to check and correct Receiver defects with professional accuracy and speed.

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 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.

SPRAYBERRY ACADEMY OF RADIO

F. L. Sprayberry, President, Room 2527 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)

MAIL COUPON TODAY!



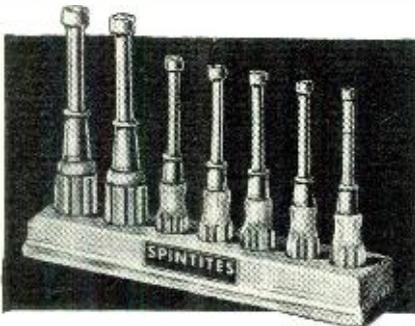
PARTNERS IN TIME!

Today, time saved means more than minutes—it means markets. There's no surer way to speed production than by the use of time-saving tools. That Spintite wrenches achieve this, is proved by their acceptance on the assembly lines of the radio industry.

A few simple twists of the screwdriver type Spintite speed parts into place with a minimum of waste motion.

Ranging in size from 3/16" to 5/8". Spintites are available to fit square, hex, or knurled nuts.

When time is of the essence, there's no substitute for Spintites.



T-73 Set, has 7 sizes of hex heads. Shock-proof handles, and cold forged sockets assure safety and strength.



STEVENS • WALDEN
INCORPORATED
Worcester • Massachusetts

8

For the RECORD.

BY THE EDITOR

THE recent survey among our readers has now been completed. From the results we have been able to determine individual preferences for editorial material. The response was most gratifying. In fact, there were several thousand returns on these questionnaires, filled out very completely and containing many concrete and worthwhile ideas for articles, new developments, servicing instructions and amateur gear. So enthusiastic was the response that we have undertaken a compilation of the suggestions and were able to select many outstanding requests for early publication.

While it is impossible to completely satisfy each and every reader every month, we do strive for an editorial balance which will fulfill the needs of the majority. The tremendous growth of RADIO NEWS confirms our belief in maintaining a well-balanced format.

Many of you made the suggestion that every article published should be completed on one or two pages without having to dig into the back of the book for what we call "runback." Unfortunately, this is not mechanically workable in most cases. If each ad were a full page, this could be done. At any rate, we are attempting to streamline our constructional articles so that whenever possible they will be completed without any runback. This, of course, will make it far easier for the reader to follow the text and to immediately refer to the accompanying diagrams.

Hundreds of our salesman-dealers are becoming more and more concerned with the future sales of radios, television sets, parts and accessories. Accordingly, we are now preparing a new series of articles which will present, in simplified form, the basic formulas that have been successfully worked out in selling that type of merchandise.

We have also found that thousands of readers are vitally interested in simplified "how to make it" articles. A new department therefore will be set up to cover this interest and the staff will build and describe such units for those who are intrigued with simple gadgets and electronic equipment.

An ever-growing interest is being shown by the amateur for u.h.f. transmitter design and technique. For the most part, these "hams" have had previous experience on the 160 meter band. They are interested primarily in local rag chews and are not too much concerned with a DX contact.

New and unique applications for the miniature tubes have been requested by our readers. At this writing, many

types are not available but when they are we'll print plenty of articles on ultra-compact receiving and transmitting equipment making use of these "tiny bottles."

Other helpful suggestions were made—too numerous to mention. I should like to express my thanks to all of you for your fine cooperation in helping to design your radio magazine along the lines that will be of the greatest interest and assistance to you. We are planning to send such questionnaires periodically in order to keep pace with your interests. With twice the circulation of any other radio publication, the task of satisfying everyone becomes a real problem. This is particularly true when we consider that radio to us is no longer a mere entertainment media. Our profession and hobby has branched out into a very large electronic group. Accordingly, there are those who have found their niche in some highly specialized branch of radio-electronics who require an entirely different type of material than those of us who have remained in one particular branch of radio for some time.

The Citizens' Radiocommunication band is a good example of what to expect in the way of new services and developments. Since keen interest has already been shown in this service, many radio men have already begun to lay the ground work for future sales and service of two-way units. Let's not overlook the ever-growing interest in television. You can sell, in advance, by telling your customers about TV. Make it known that you will be able to supply them with sets and to install and maintain them when television programs are available in your town.

Yes, we are indeed in a new era of radio. The annual Radio Parts and Electronic Equipment Shows, Inc. is fully cognizant of the desirability of showing the myriad of new products to the radio serviceman, the amateur and even the public at large. A special Open House Day has been inaugurated in connection with the Show to be held in Chicago next May which will enable many radio-minded men and women to get a preview of things to come. We think it is a splendid idea and will do much to gain prestige for the serviceman and amateur. We'll see many of you there in person and we want you to make yourselves known.

We will again publish the RADIO NEWS DAILY at the Show this year as a service to the radio industry. Be sure to get your complimentary copy.

..... O.R.

RADIO NEWS

PUTTING ELECTRONICS TO WORK
with
Government Owned Surplus



To help you incorporate the many advantages of electronics in your business, the War Assets Administration is making available its enormous inventory of tubes and equipment now.

Qualified distributors all over the country have been appointed by WAA to represent it. In every field where electronic application has proved its worth, these distributors maintain inventories and have the technical "know-how" to service your needs.

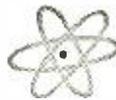
Get in touch with your nearest distributor and see how government-owned war surplus can help you—electronically. Or—if it is more convenient—write to

ELECTRONICS DIVISION
OFFICE OF AIRCRAFT DISPOSAL

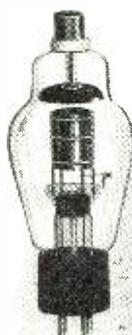
WAR ASSETS ADMINISTRATION

425 Second St., N.W.

Washington 25, D. C.



Millions and millions of electronic tubes are at your disposal. Pictured are some of the types which are available to you.



RECTIFYING
(NO. 866A)

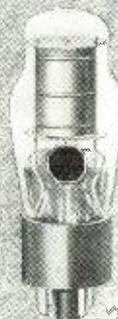


CATHODE RAY
(NO. 3BP1)



TRANSMITTING
(NO. 815)

VOLTAGE REGULATOR
(NO. VR150)



RECEIVING
(NO. 6SK7)

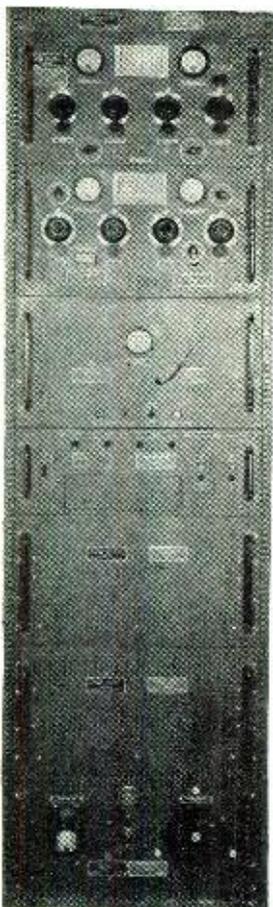


RECEIVING
(NO. 6L6)

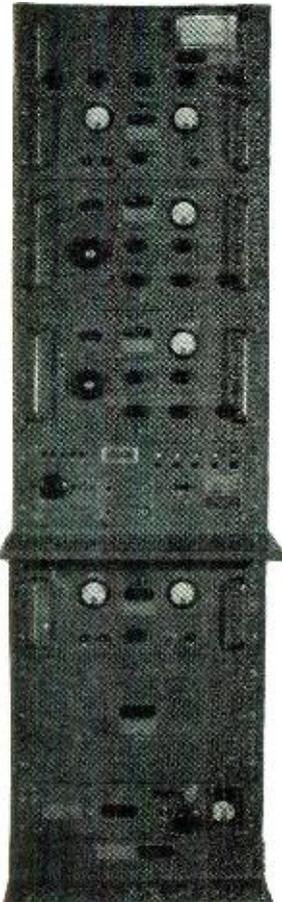
tubes! tubes! tubes!

"NO ELECTRONIC DEVICE IS BETTER THAN ITS TUBE"

880



Transmitter



Receiver

MODERN COMMUNICATION and PRODUCTION

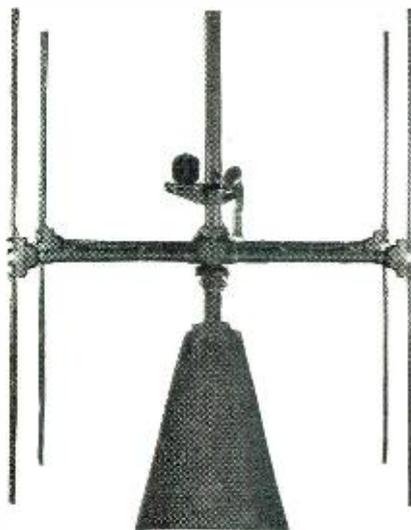
depend on

Electronics

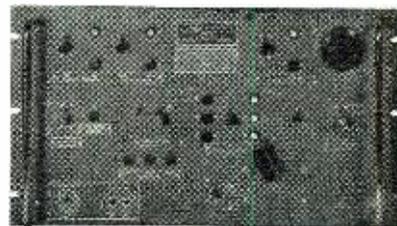
Today—virtually all methods of high-speed communication use electronic tubes. In the industrial field, heating, welding and various methods of control are being done better and faster because of electronics. From big broadcasting stations to tiny hearing aids—from induction heating to voltage regulation—the science of electronics is playing a major role in industry.



Microphone



Matching Stub and Antennae



Control Unit



Headset

these Authorized Distributors will serve you:

Listed here are the names and locations of WAA appointed distributors. Not all of them will have complete stocks but it will pay you to consult them on your electronic problems.

Automatic Radio Mfg. Co., Inc.
120 Brookline Avenue
Boston 15, Massachusetts

Communication Measurements Laboratory
120 Greenwich Street
New York 6, New York

Tobe Deutschmann Corporation
Canton, Massachusetts

Electronic Corporation of America
353 West 48th Street
New York 19, New York

Electro-Voice, Inc.
Buchanan, Michigan

Emerson Radio & Phonograph Corporation
123 Duane Street
New York 7, New York

Essex Wire Corporation
1601 Wall Street
Ft. Wayne 6, Indiana

General Electric Company
Building 267-1 River Road
Schenectady 5, New York

Hammarlund Mfg. Company, Inc.
460 West 34th Street
New York 1, New York

Hoffman Radio Corporation
3741 South Hill Street
Los Angeles 7, California

Hytron Radio & Electronics Corporation
76 LaFayette Street
Salem, Massachusetts

E. F. Johnson Company
206 Second Avenue S. W.
Waseca, Minnesota

Newark Electric Co., Inc.
242 West 55th Street
New York 19, N. Y.

Majestic Radio & Television Corporation
125 West Ohio Street
Chicago 10, Illinois

Raytheon Manufacturing Company
60 East 42nd Street
New York 17, New York

Smith-Meeker Engineering Company
125 Barclay Street
New York 7, New York

Sylvania Electric Products, Inc.
Emporium, Pennsylvania

Technical Apparatus Company
165 Washington Street
Boston 8, Massachusetts

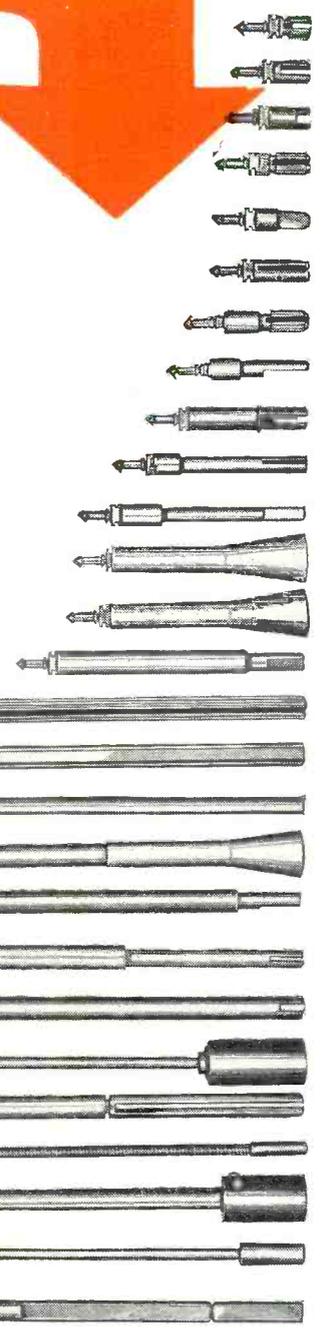
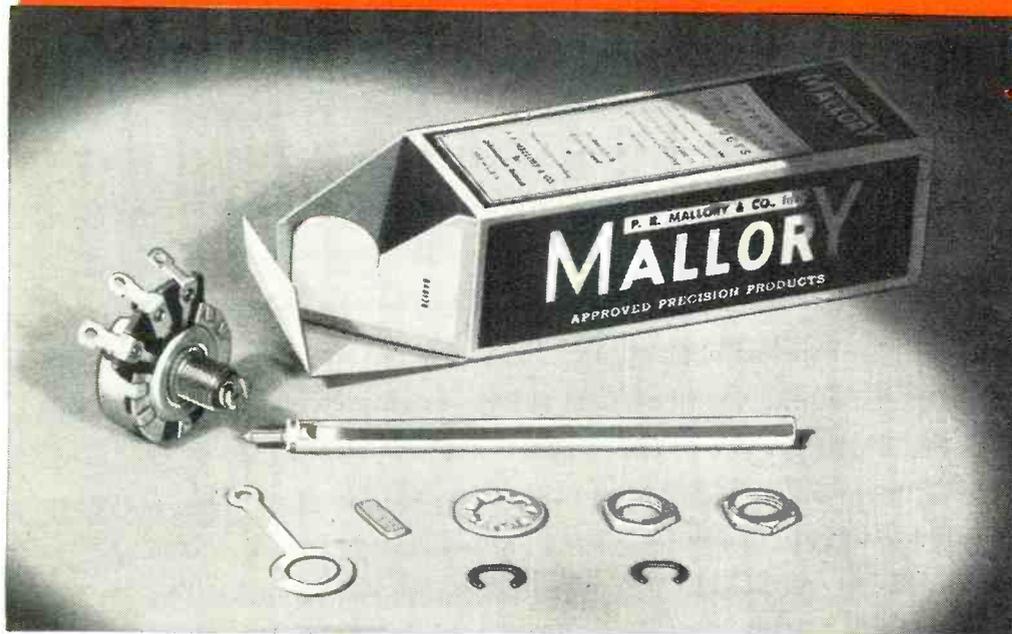
Tung-Sol Lamp Works, Inc.
95 Eighth Avenue
Newark 4, New Jersey

American Condenser Co.
4410 Ravenswood Avenue
Chicago 11, Illinois

WAR ASSETS ADMINISTRATION

A UNITED STATES GOVERNMENT AGENCY
FOR THE DISPOSAL OF SURPLUS PROPERTY

Mallory Offers 12 Clutch Type Controls for Use in Auto Receivers



MALLORY offers the widest range of resistance values in clutch type controls to fit every need. Four different values are available in the Universal Midget line (100M ohms, 250M ohms, 500M ohms, 1 megohm), and eight values in popular combinations of overall and tap resistances in our Tapped Midget line.

Add these to the Plug-In Shafts you see at the right, and you can replace original controls in any auto set you name—not merely replace them but *duplicate them mechanically and electrically*. Get the complete story from your Mallory distributor.

You Expect More . . .
and Get More . . .
from Mallory

**INSIST ON
MALLORY—THE
COMPLETE
CONTROL
LINE**

NO WOBBLE—this ring prevents it!



All Mallory Plug-In Shafts are made with a small ring as shown above. That's why they can't wobble or work loose—why they fit as securely as a fixed shaft.

P. R. MALLORY & CO. Inc.
MALLORY

VIBRATORS . . . VIBRAPACKS* . . . CAPACITORS
. . . VOLUME CONTROLS . . . SWITCHES . . . RESISTORS
FILTERS . . . RECTIFIERS . . . POWER SUPPLIES.

*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SUPERIOR IS AT YOUR SERVICE

with a COMPLETE LINE of TEST INSTRUMENTS



IMMEDIATE SHIPMENT

Please place your order with your regular radio parts jobber. If your jobber does not handle our line kindly write for a list of jobbers in your state who do distribute our instruments or send your order directly to us.



Now you can SEE and HEAR

The signal with the new CA-12 SIGNAL TRACER

Always ready for instant use it takes less than five seconds to begin using this versatile unit. No maze of special cables—the Model CA-12 uses only one connecting cable. No line cord—the CA-12 operates on self-contained batteries. No tuning controls of any kind are used in this model.



FEATURES:

- Comparative intensity of the signal is read directly on the meter—Quality of the signal is heard in the speaker.
- Simple to operate—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.
- Built-in high gain amplifier—Alnico V. speaker.
- Completely portable—weight 8 pounds—measures 5 1/2" x 6 1/2" x 9".

The Model CA-12 comes complete with Detector Probe, test leads, self-contained batteries and instructions. Comes housed in heavy gauge crystalline cabinet with beautiful two tone etched front panel. **NET PRICE \$3485**



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.
 - Tests shorts and leakages up to 3 Megohms in all tubes.
 - Tests both plates in rectifiers.
 - New type line voltage adjuster.
 - Tests individual sections such as diodes, triodes, pentodes, etc. in multi-purpose tubes.
 - Noise-Test—detects microphonic tubes or noise due to faulty elements and loose internal connections.
 - Uses a 4 1/4" square rugged meter.
 - Works on 90 to 125 volts 60 cycles A.C.
- EXTRA SERVICE**—May be used as an extremely sensitive condenser Leakage Checker. A relaxation type oscillator incorporated in this model will detect leakages even when the frequency is one per minute. **\$3950**

The New Model 600 SET TESTER

A NEW COMBINATION TUBE TESTER AND MULTI-METER. A complete testing laboratory all in one unit. Test tubes. Reads A.C. Volts, D.C. Volts, D.C. Currents, Resistances and Decibels.

TUBE TESTER SPECIFICATIONS:

- Speedy operation—assured by newly designed rotary selector switch.
- Tests all tubes up to 117 Volts.
- Tests shorts and leakages up to 3 Megohms in all tubes.
- Tests leakages and shorts of any one element against all elements in all tubes.
- Tests both plates in rectifiers.
- Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
- New type line voltage adjuster.



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 Volts.
D.C. CURRENT: 0 to 1.5/15/150 Ma., 0 to 1.5 Amperes.
D.C. CURRENT: 0 to 1.5/15/150 Ma., 0 to 1.5 Amperes.
RESISTANCE: 0 to 2,000/20,000/200,000 Ohms, 0 to 20 Megohms.
DECIBELS: (Based on zero decibels equals .006 Watts into a 500-Ohm line.) —10 to +18 D.B., +10 to +38 D.B., +30 to +58 D.B. **\$6250**

The New Model 670 SUPER METER

A Combination VOLT-OHM MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS.

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 13,000 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 5 1/2" x 7 1/2" x 3" **NET \$2840**

The New Model 650 SIGNAL GENERATOR

Ranges: 100 Kilocycles to 35 Megacycles on Fundamentals; 25 Megacycles to 105 Megacycles on Harmonics.

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- Complete with coaxial cable, leads and instructions. **\$4875**



The New Model 400 ELECTRONIC MULTI-METER

A combination vacuum-tube voltmeter and volt-ohm milliammeter plus capacity, inductance, reactance, and decibel measurements.

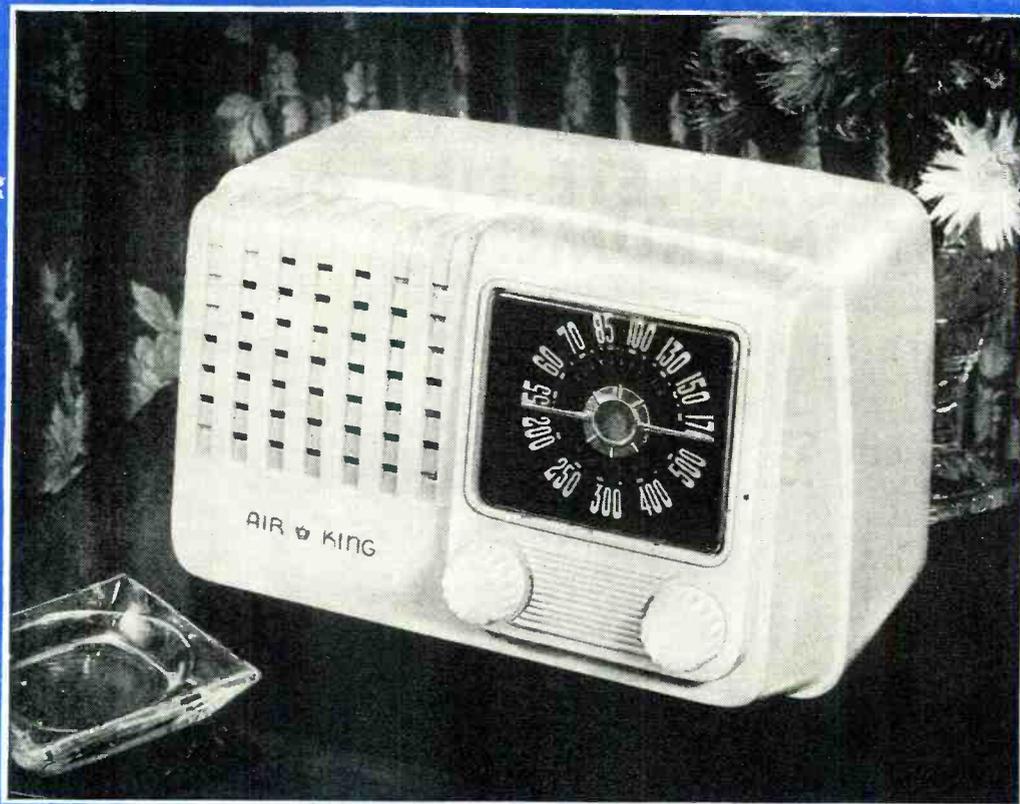
SPECIFICATIONS:

D.C. V.T.V.M. VOLTS: (At 11 Megohms Input Resistance.) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.
D.C. VOLTS: (At 1,000 Ohms Per Volt.) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.
A.C. VOLTS: (At 1,000 Ohms Per Volt.) 0 to 3/15/30/75/150/300/750/1500/3000 Volts.
D.C. CURRENT: 0 to 3/15/30/75/150/300/750 Ma., 0 to 3/15 Amperes.
RESISTANCE: 0 to 1,000/10,000/100,000 Ohms; 0 to 1/10/1,000 Megohms.
CAPACITY: (In MFD.) .0005—2, .05—20, 5—200.
REACTANCE: 10 to 5M (Ohms), 100—50M (Ohms), .01—5 (Megohms).
INDUCTANCE: (In Henries.) .035-14, 35-140, 35-14,000.
DECIBELS: —10 to +18, +10 to +38, +30 to +58. **NET \$5250**



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MODEL 4706

The Regent

Post war is a term that can be applied, honestly and proudly, to this 1947 Air King model. Beauty and good taste mark the design and finish of the cabinet. Appealing lines, artistic proportions, and the contrasting dial all contribute to the Regent's visual appeal. When you first see the Regent, you like it instinctively. When you hear it you know your first impression was right.

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will appreciate these keen-value features*

Precision, die-cut antenna for maximum signal . . . Modern illuminated, white-on-black airplane tuning dial gives maximum readability, and forms artistic design element of the set . . . Loud-speaker of Alnico No. 5 alloy gives exceptional

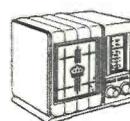
volume without tone distortion . . . Beam Power Pentode Audio System brings new tone and definition to familiar programs. The Regent is a 6 tube Superheterodyne (including rectifier). Operates on AC or DC, and is available in Ivory (illustrated above) and Walnut Plastic Cabinets.



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February, 1947



This new Rider Book, soon to be announced, will be of lasting usefulness to everyone interested in any phase of radio.

Bob Henry says:

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18

Spot Radio News

* Presenting latest information on the Radio Industry.

By FRED HAMLIN

Washington Editor, RADIO NEWS

TO OUR READERS

A sufficient supply of the glue ordinarily used in binding the January, 1947, issue of Radio News was not available at the time the magazine was being printed and therefore a substitute material was used on some of the copies. In some cases this substitute adhesive used for binding failed to do a good job of holding the magazine together.

Any reader having such a copy may return it to us for replacement. We regret the inconvenience resulting and assure you that it was in no way due to carelessness.

FM, LIKE WE SAID last time, is getting organized on a national basis from headquarters in Washington and with the enthusiastic blessing of no less than the Federal Communications Commission. First steps toward activating a group of FM station executives was taken at the National Association of Broadcasters convention in Chicago in the early winter, and a complete organization, with program, was drawn up at the first all-FM convention, held in Washington early in January.

PUBLICIZING AND PROMOTING

FM nationally is the first order of business in the new outfit, which bears the name "Frequency Modulation Association," with headquarters at 810 International Building, Washington 4, D. C. Scores of FM station heads have already joined under the leadership of the Washington-led group which spark-plugged the FMA. These included Roy Hofheinz, Leonard Asch, Wayne Coy, W. R. David, Everett L. Dillard, Gordon Gray, F. A. Gunther, Ira A. Hirschmann, E. J. Hodel, C. M. Jansky, Jr., R. F. Kohn, and Stanley Ray.

FCC ENTHUSIASM FOR FM and an FM station organization was summed up by chairman Charles R. Denny. Denny recently told FMA: "An organization such as yours, concentrating on the building of FM, can perform one of the most valuable services in the history of broadcasting. Those of us close to radio are excited over this revolutionary improvement, but to the vast majority of listeners, FM is still just another alphabetical combination. It is highly gratifying to know that your group has embarked on a crusade to carry the story of FM to every radio listener in the land." That the crusade will have financing was indicated early in the FMA's career. "Our dollars will be spent for FM promotion," said its steering committee. An all-out national publicity campaign may be expected during the spring, summer, and fall as a result.

IF YOU HAVE ANY FURTHER

DOUBT about FCC's attitude toward FM, listen to Commissioner Ewell K. Jett: "FM," he declared recently, "is now established on a sound, permanent postwar basis. In all, we at the FCC expect some two thousand of these FM stations in the next few years—nearly twice as many as the present number of standard stations." He sounds a note of warning to the general public, however: "FM receiver production is troubled by the same shortages that afflict so many other industries. But FM sets are coming on the market in increasing numbers. The latest estimate is that at least five million will be produced next year." Mr. Jett's advice to the prospective buyer of a new radio: "If I were buying one today, I would certainly not buy one that did not include FM."

SPEAKING OF PRODUCTION,

every indication at year-end was that it will continue generally good, despite supply and labor difficulties. Latest complete figures—for October—showed shipments that month at a new all-time peak. Domestic radio sets, including phonograph and record players, increased 20 per-cent to 1,800,000 units over September, according to the Civilian Production Administration.

COLOR TELEVISION—

whether it will come into its own tomorrow or years hence—may develop into the jackpot radio question of the year. It was brought up with fanfare before the FCC in December largely at the urging of the Columbia Broadcasting System. While RCA and NBC, both working in the color field, favor taking more time to perfect their methods. Frank Stanton, president of CBS, went so far as to declare that Columbia could start colortelecasting within a few weeks, if FCC permits are forthcoming. "Substantial, regular" programs were predicted "within a year." . . . Reason for the FCC hearings was the Columbia request for FCC to set standards for

RADIO NEWS

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Radio is expanding with far-reaching improvements in reception. No one knows yet how great the Television market will be. Electronics will touch almost every walk of life—in industry and in the home.

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National Shop Method Home Training wins good jobs, independence and security. Take the word of National men who have established records in their favorite Radio, Television, or other branches of Electronics.



Clifford Hannah, Portage La Prairie, Manitoba, Canada, writes: "My training has brought results as I'm in line for another raise thanks to National's encouragement and thorough training."



Joseph Michel, Jr., Granite City, Illinois, writes: "I am enthused with National training. I am now earning \$225 a month as a radio operator and technician and \$20 a week more in my shop at home."



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From O. K. Irey, Washington, D. C., comes this endorsement: "I believe National offers the best course to be had... Keep up the good work."



Here's a statement from R. R. Wright, Blackfoot, Idaho: "Due to my training at National I was selected to be had instruct in the laboratory work of Navy and Marines."

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SPOT RADIO NEWS

color television commercial broadcasts "immediately" on 480 to 920 megacycles, bands now classed as experimental. Opening these bands would give color opportunity to develop into national networks, another prediction that Stanton felt Columbia could make good in the near future. He added that CBS had spent approximately two million dollars in experimenting during the last two years. . . . What the ultimate decision would be, nobody was willing to predict as this went to press. A good bet; some kind of television with color in the commercial field by 1948.

FOREIGN RADIO ACTIVITIES

will come into the electronics news again in April, with a number of interesting developments promised. Occasion will be the International Meeting of the Marine Radio Aids to Navigation groups from interested nations. The meeting will last two weeks, convening first in New York City, followed by a gathering at New London, Conn., where marine radio aids will be demonstrated to the 250 U. S. and foreign delegates expected to attend. Three ships will be used in the demonstrations, one from the Coast Guard, one from the U. S. Maritime Commission, one from the Coast and Geodetic Survey. What will be demonstrated has not been crystallized, but you can count on seeing radar, sonar, loran, and advanced types of ship-to-shore radio in action. . . . Also on the international docket for the immediate future are the international radio conference, scheduled for May, place yet undecided, but probably San Francisco; the international plenipotentiary conference in July, and, following, a meeting of high frequency experts, scheduled tentatively for August or September. No locations have been chosen for the last two. . . . The May meeting will be to revise the regulations of the 1939 Cairo conference, while the plenipotentiary gathering will amend and change the 1932 rulings of the Madrid convention. Participating nations at all three meetings will approximate the membership of the United Nations.

SHORAN WILL BE ONE OF THE

THINGS to watch with interest at the New London, Conn., meeting, although it is just the opposite of an aerial device. Kept under blankets by the Navy and Army during the war and still obscured by military red-tape, it is the pet of the Coast and Geodetic Survey, which uses it for mapping the ocean bottom. Geodetic has four sets, costing \$50,000, and wish they could get more. It operates on a one-way echo principle, a hydrophone (waterproof microphone) sending a sound to a land-based receiver. Underwater sound has been found to travel best at 4200 feet, and hydrophones are set at that level if possible, with cables carrying the sounds to shore from the hydrophone base. . . .

RADIO NEWS



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Ralph Waldo Emerson said, "Know Thyself"—and never was there a time when the professional radioman needed to heed that advice more than today. I've watched radiomen come and go for over a generation—and the ones who are on "top" today are the ones I'd have picked 10 years ago. They were always getting ready for the "job ahead." It's truer today than ever before! Profit by the experiences of others—prepare *today* for your opportunities *tomorrow*.

E. N. Reiff
President of CREI

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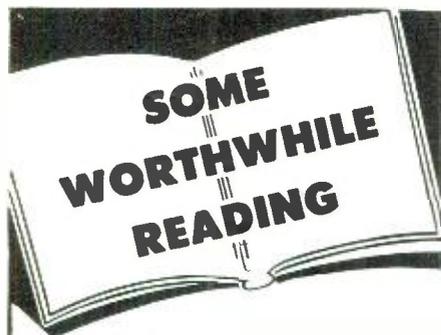
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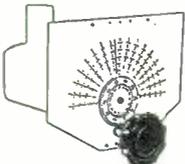
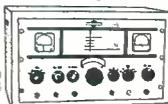
The Model 30K-1 Transmitter, complete with the 310A-1 Exciter and all tubes, is a complete transmitter ready to operate. Input is 500 watts on cw, 375 watts on phone. Operating controls in Exciter unit.



\$1250

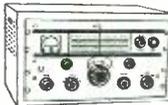
32V-1 150-watt transmitter (120 watts on phone) complete with tubes. Uses the highly stabilized and accurate Collins VFO. \$475

70E-8 VFO. It is new, versatile and extremely accurate. Overall accuracy and stability are within 0.015%. Can be used for all bands up to 2/3 meter with doublers. Complete with calibrated dial. You can build a good band-switching exciter unit with the 70E-8 that will make multi-band operation a pleasure.



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Navy is using it in its Pacific-air-sea rescue project, by triangulating messages picked up by the phones. A plane in trouble or lost may drop a bomb that explodes at the 4200-foot level, and the phone pickups, when graphed on a map, give the plane's exact location in a few seconds. Hydrophones are being strategically located so that rescue ships may reach distressed planes in three or four hours after a bomb call for help has been dropped. Shoran is accurate within twenty-five feet, Coast and Geodetic scientists report.

RETURNING HOME, the recent coal strike pointed the way toward a radio revolution which might have resulted in all the school kids of the nation staging a strike of their own. With schools closing, Justin Miller, president of the National Association of Broadcasters, urged members from coast to coast to offer broadcasting facilities for classroom work. A lot of stations took him up on the suggestion, including Denver, where school-free kids were suddenly brought up short by the announcement that lectures and lessons would be broadcast. We can only imagine their reaction, but it did not reach any high boil, owing to the end of the strike. Seriously, radio stood ready to do a magnificent emergency job, as Mr. Miller's statement to the broadcasters indicated. "This (strike) situation," he said, "presents a valuable opportunity for the individual broadcasters to demonstrate again their desire and ability to operate in the public interest. Dr. John W. Studebaker, U.S. Commissioner of Education, endorses our recommendation that stations in affected areas contact the superintendent of schools and offer the services of broadcasting in meeting the emergency."

FOREIGN ACTIVITIES in all fields of radio would seem to be booming, according to reports received by an interested Washington bureau. Surprising—to us, at least—is word from England that there are now from 25,000 to 30,000 television sets in the hands of the public over there, with the broadcasters giving full programs daily, including plays and coverage of news and sports events. (FCC estimates only 10,000 sets in the U.S. as of year-end, 1946.) Reason for the British lead in the field is that they started television ahead of us before the war, and had a comparable jump on the market when the shooting stopped. From Africa comes word via the Department of Commerce that the Union of South Africa may furnish a profitable, substantial market for U.S. electronic products in the future. Total estimated number of radio sets in operation are half a million. Radio is popular—communities are isolated in many instances, and use the air to keep posted and entertained. The Union suffered less than

almost any other place from the war—prospered, indeed, on gold mining, wool, hides, and other native products. U.S. products are popular and war restrictions did not permit purchase of new equipment. Imports are under no special restrictions if they are in the radio field.

NO RESTRICTIONS on importing radios into Argentina is a rule favorable to U.S. marketers, although State Department and other experts warn that anyone desiring to go into the Argentine should make a close study of all rules and regulations before attempting it. Estimates of consumption, while varying, are all good. A reasonable guess would be about a million receivers, more than half radio-phonograph combinations. War-born radio manufacturing plants in the country offer potential competition to outsiders, and high tariffs have been raised to protect the home industries. "Imported goods continue to retain a reputation for higher quality," says a Department of Commerce authority, "and United States firms can therefore still compete successfully, although high tariffs tend to restrict the market."

HAMS CONTINUE TO DEVELOP all kinds of gadgets, notably the recent job of reconversion by 33-year-old Edward McIntyre, a Naval research laboratory employe by day, a ham by night, at his home in Silver Springs, Md. He's converting a surplus tail-warning radar set from a B-29 into a domestic home-to-auto radio hook-up. McIntyre estimates that his set will have a range of from ten to twenty miles, and has an FCC experimental permit to operate it. How he's making it work is still a mystery, but if you want to hook up with him his ham station is W3KHJ.

THE CITIZENS RADIOCOMMUNICATION service—under which McIntyre got his experimental license—is shaping up under FCC supervision. Latest Commission move, begun in the early winter, is to get together with manufacturers to prepare technical requirements for equipment to be used in the field. FCC got the ball rolling by suggesting a list of requirements, but emphasized that the suggestions were not "to be regarded as proposed rules but as a preliminary proposal designed to organize discussion and comment." Suggestions from the industry were aired at subsequent meetings in Washington, and final rules should be forthcoming before spring. . . . Chief nut for the manufacturers to crack, according to FCC, was the ability of citizens' equipment to operate, "under all practical service conditions, on a frequency or frequencies within the allocated bands 460-470 mc." Whatever the final rules, FCC is agreed with everybody else that "the possible uses of this service

(Continued on page 163)

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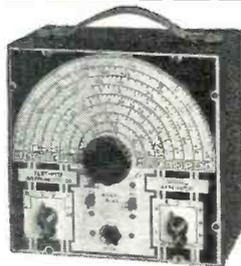
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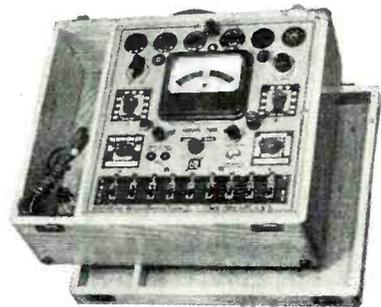
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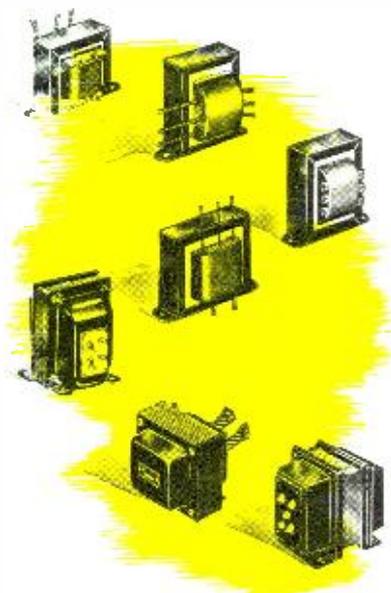
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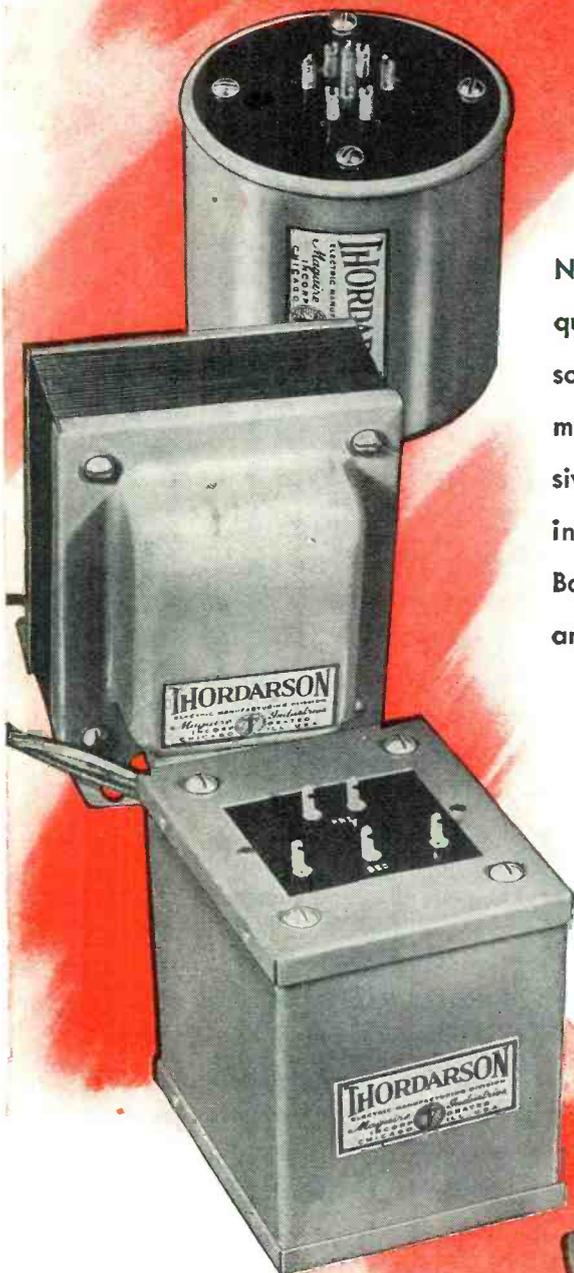
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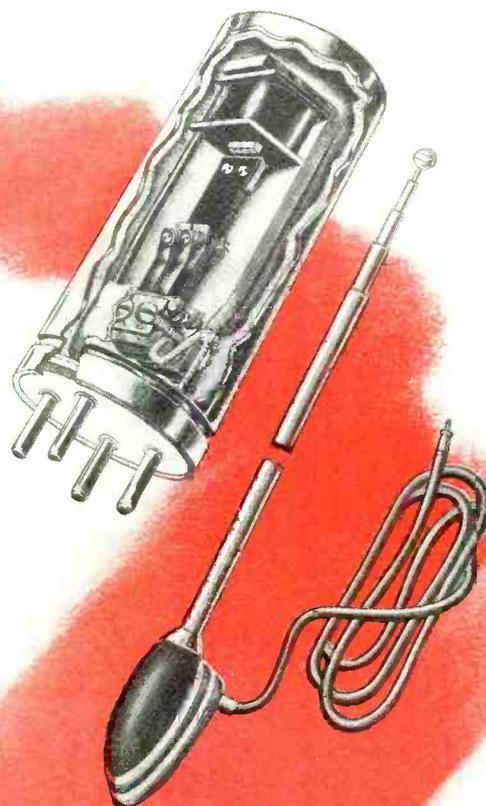
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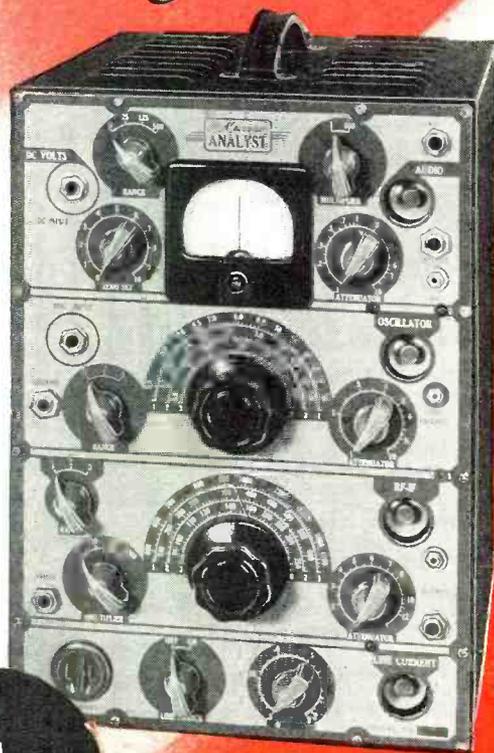


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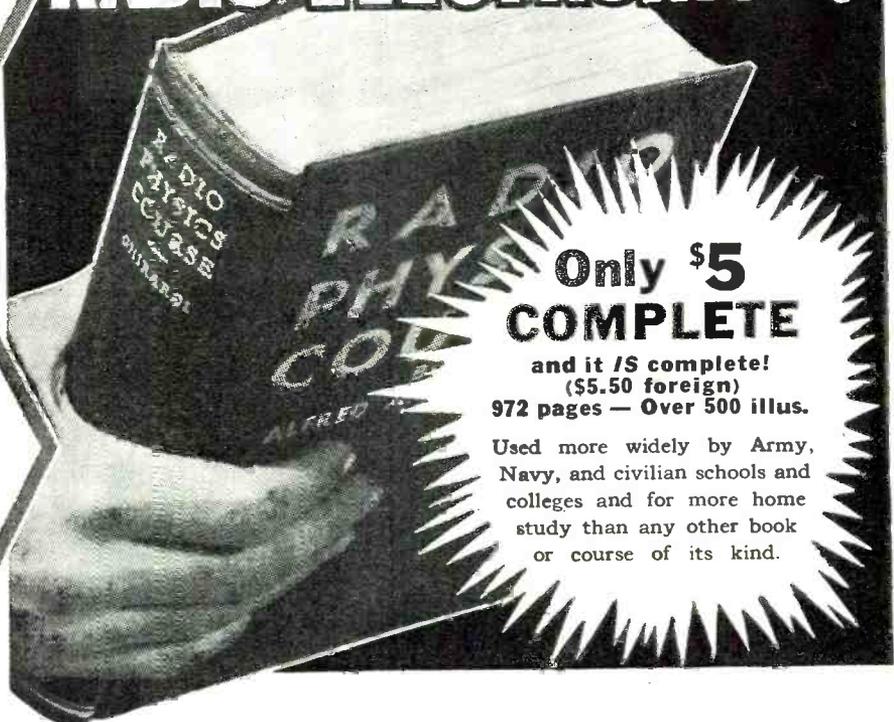
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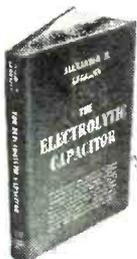
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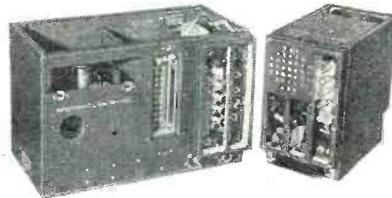


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1S5	1.25	6V6	1.10	34	.80
1T4	1.25	6V7	1.00	35 51	1.00
1T5	1.50	6W7	1.20	35W4	1.00
1V	1.00	6X5GT	1.00	35Z3	1.30
2A6	.75	6Y6G	1.00	37	.75
2B7	.75	7A4	1.00	38	.85
2E5	.65	7A5	1.00	39 44	.80
2X2/879	.90	7A6	1.00	41	.85
2Z2/884	.90	7A7	1.00	42	.85
3Q5	.45	7B4	1.00	45	.80
3Q5	1.60	7B5	1.00	46	1.00
3S4	1.25	7B6	1.00	49	.95
5U4	1.00	7B8	1.30	50L6	1.24
5V4	1.60	7C5	1.00	50	1.75
5X4	1.10	7C6	1.30	55	.50
5Y4GT	.70	7C7	1.60	56	.80
5Y4	.75	7E6	1.00	57	.75
5Z3	.95	7E7	1.30	59	.80
6A5	1.70	7F7	1.30	76	.75
6A6	.80	7H7	1.50	77	.75
6A8	1.00	7J7	1.50	78	.75
6ASG	1.70	7L7	1.50	79	.85
6AC5GT	1.00	7N7	1.50	80	.60
6AF5	1.00	7Q7	1.00	81	1.50
6AF6	1.60	7R7	1.30	82	.85
6B4	1.50	7S7	1.50	83	1.30
6B7	.95	7V7	1.80	83V	1.95
6B8	1.00	7W7	1.80	84 624	1.10
6C3	.95	7Y4	1.30	82	.85
6C6	1.00	7Z4	1.30	99	1.50
6C7	.45	12BE6	1.44	117L7GT	2.35
6C8	1.25	12F5GT	1.00	117Z6GT	1.60
6D6	.75	12J5GT	1.00	XXB	1.50
6D7	1.00	12SA7GT	1.30	XXFM	1.50
6F5	1.00	12SF5GT	1.00	XXL	1.50

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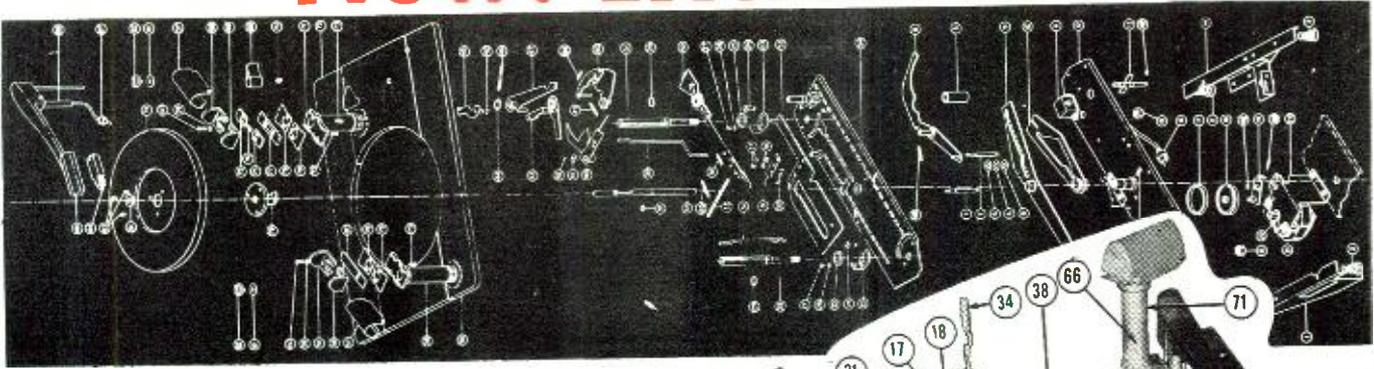
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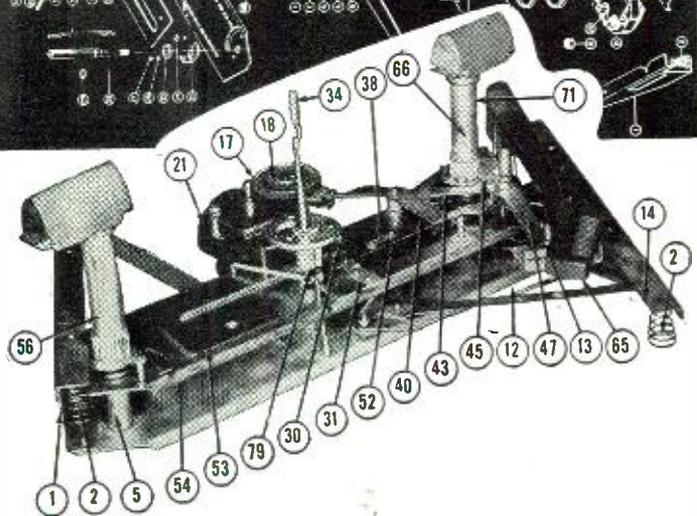
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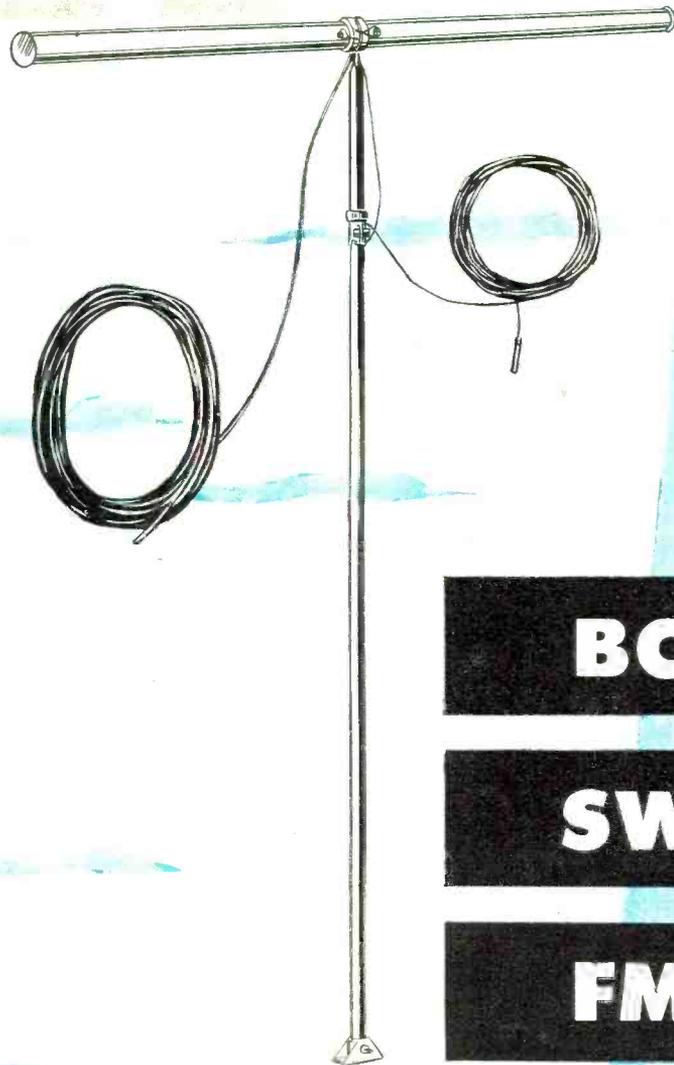
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In a comparative test with the best available standard doublet (with matching transformer) the Amphenol All-Wave Antenna proved far superior in gain—as well as being interference free.

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ESTABLISHED 1910

RADIO NEWS

Radar on the Great Lakes

By **NORMAN A. SCHORR**

Characteristics of six different types of radar installations now operating as test units aboard lake carriers.

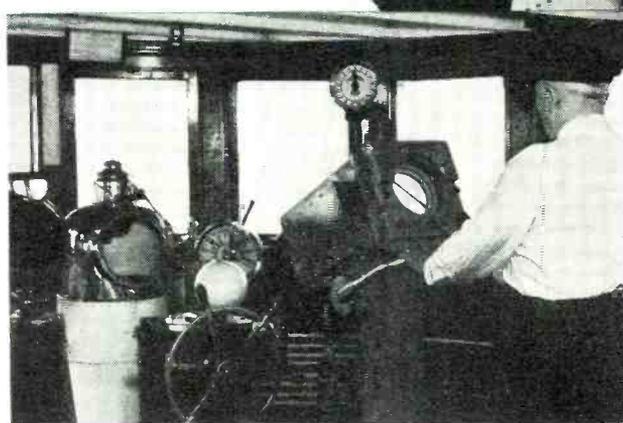
ADENSE fog suddenly descended on Lake Erie the morning of April 27, 1944. War shipping was at its height on this narrowest and most heavily-trafficked of the five Great Lakes. Within a few hours, two collisions occurred that cost the lives of 12 crew members and the loss of two cargo-laden ships. Without warning, the ore-carrier *James H. Reed*, collided head-on with the steamer *Ashcroft*, and sank quickly off Conneaut, O. Seventy-five miles west, the 4000-ton *Frank E. Vigor*, carrying a load of sulphur from Chicago to Buffalo, foundered and sank after colliding with the *Philip Minch*.

Accidents like these are rare in Great Lakes shipping history. In fact, they have occurred on Lake Erie an average of once in 20 years since the advent of steel vessels in 1886. Stringent traffic rules, a special system of whistle signals, carefully routed up and down courses, and more recently radio telephone, radio beams and direction finders have combined to hold down the number of accidents.

But still they have occurred—and when they do, the need for all-weather navigation instruments is emphasized.

Though collisions caused by fogs have been infrequent, it is not unusual for skippers to be forced to drop the hook and wait until adverse weather conditions lift. Fog is encountered frequently in the spring and fall, and

February, 1947



The ship "George F. Rand" was assigned to Raytheon for their radar installation. The wave guide run from the antenna to transmitter is 70 feet. The indicator, housing a 7" PPI, can be tilted 45 degrees vertically and rotated through 45 degrees horizontally.

occasionally at other times. In the late fall, storms of sleet and snow can be expected. In a recent year more than 4,000,000 gross tons of cargo space were lost as a result of delays, collisions and groundings due to fog. Bad weather has held up ships for as long as 30 hours. As many as 100 boats have been fog-bound at the locks of the Sault Sainte Marie canal at one time.

Great Lakes shippers took an immediate interest in radar as soon as the first successful marine application became known. Experience of the Coast Guard with radar during the war was watched as closely as security regulations permitted. A few sets were installed for brief trial runs, but ex-

tensive equipment for thorough experimentation was not available. It was not until after V-J Day that the shippers through their Lake Carriers Association initiated an active program, called the Radar Operational Research Project, to develop radar equipment best suited for Lake operations.

They needed a navigation aid that would make possible close-range sailing in thick weather. Such a radar design would of necessity have high accuracy and definition at close quarters and would be capable of clearly showing shore lines, other ships, and the comparatively small buoys and channel markers.

It was decided that the radar re-

Manufacturer	Band	Diameter of PPI (in inches)	Range Scales (in miles)	Transmitter Peak Power Output (in kw.)	Modulator	Pulse Length (in microseconds)	Pulse Repetition Rate (in cycles per second)	Antenna Construction	Beam Pattern at Half Power Points	Polarization	Rate of Antenna Rotation (in r.p.m.)	R.F. Transmission Line
GENERAL ELECTRIC	10 cm.	7	2, 6, 30	7	Pliotron	0.5	1500	Truncated Parabola	Vertical: 17° Horizontal: 5°	Vertical	11	Coaxial
RADIO-MARINE	3 cm.	12	1.5, 5, 15, 50	30 or more	"Hard" tube 5D21	Short Range: 0.25 Long Range: 1.0	3000 750	Parabolic Cylinder	Vertical: 18° Horizontal: 1.7°	Horizontal	10	Wave Guide
RAY-THEON	10 cm.	7	1.5, 5, 15, 50	15 or more	Hydrogen Thyatron	0.4	1000	Truncated Parabola	Vertical: 12° Horizontal: 3.5°	Horizontal	7	Wave Guide
SPERRY	3 cm.	12	2, 10, 40	35	4C35	0.25	1000	Parabolic Cylinder	Vertical: more than 15° Horizontal: 2° or less	Horizontal	15	Wave Guide
WESTERN ELECTRIC	3 cm.	7	1-40 (variable)	40	Hydrogen Thyatron	0.5	1000	Truncated Parabola	Vertical: 15° Horizontal: 2°	Horizontal	12	Wave Guide
WESTINGHOUSE	3 cm.	7	2, 8, 32	15 or more	Hydrogen Thyatron	0.4 (maximum)	2000	Truncated Parabola	Vertical: 15° Horizontal: 2°	Horizontal	12	Wave Guide

Table 1. Characteristics of radar sets installed in Lake Carriers Association's Radar Operational Research Project.

search men and engineers should be brought in direct contact with Great Lakes navigation personnel, so that each group might become familiar with the problems of the other. To this end, radar manufacturers were invited to install sets aboard a Lake cargo vessel during the 1946 season. Six manufacturers accepted the invitation and each was assigned a different ship on which to make an experimental installation that would operate on the Lakes. Upon conclusion of test runs and evaluation of re-

sults, minimum operating specifications will be set forth.

Since the Lake Carriers Association represents 90 per-cent of the bulk cargo carried on the Lakes, this project is being followed with great interest in marine shipping circles, particularly with regard to inland waterway navigation.

The busy Great Lakes are connected chiefly by rivers and dredged channels, some of which are no more than 600 or 700 feet in width. On an average trip a freighter will spend 25 to 30

per-cent of the time traveling in these confined waters.

Among the most tortuous of these are in the entrance to the locks of the Sault Sainte Marie Canal between Lakes Superior and Huron; the Straits of Mackinac between Huron and Michigan; the St. Clair flats and Detroit River between Huron and Erie; and the Welland Canal between Erie and Ontario.

One of the narrowest and most inadequate of the dredged channels is the 700-foot wide Southeast Bend around Harsens Island, in the delta of the St. Clair River. It is in an area subject to sudden fog. Up and down traffic must squeeze through a 2½ mile stretch of reverse bends that afford slight clearance. Each season the Bend sees about 20,000 vessel passages, carrying 90 to 100 million tons of ore, coal, grain and stone.

Another tight spot is the 4½ mile long West Neebish Channel, down bound from the Sault Canal. There, shores are as low or lower than a vessel's deck. Three miles of the channel are only 600 feet wide. Then it narrows for 5000 feet to a width of only 300 feet, and a depth of 24 feet, 8 inches—blasted through rock.

Typical ones of the larger bulk cargo vessels are 600 feet or more long, 60 feet wide and travel at a speed of 11 to 13 land miles per hour. All in all there are about 800 commercial vessels of both American and Canadian registry plying the Lakes, almost half of them major type vessels.

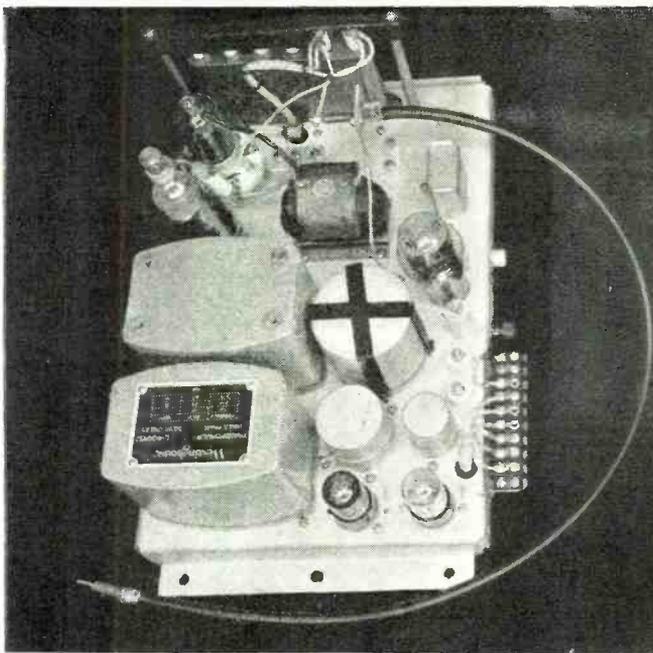
During busy times there is a two-way procession of ships going through the man-made locks and channels sometimes only 15 minutes apart. It is not difficult to visualize how impairment of visibility as a result of fog, sleet or other thick weather can seriously hamper traffic and even paralyze all navigation.



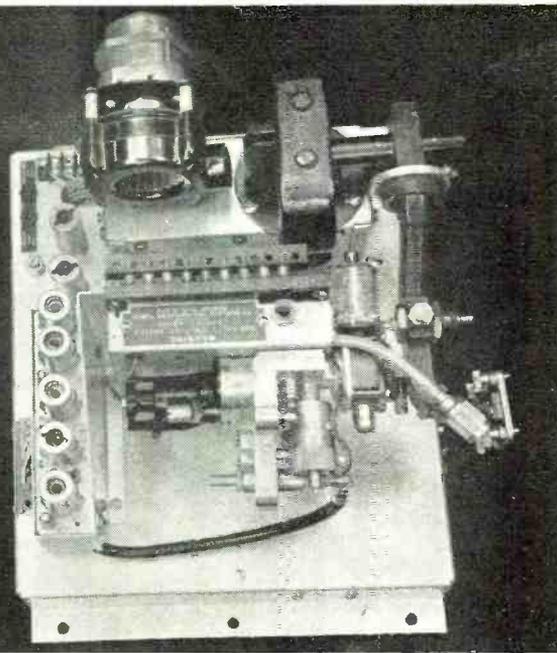
Indicator binnacle of the Sperry Gyroscope set houses 12" PPI and associated controls. Visible are range selector switch, variable range marker, bearing cursor, anti-clutter selector switch, and azimuth scale illumination control.

The parabolic reflector in the scanner component of the Sperry Gyroscope marine radar is 48 inches by 18 inches and rotates 360 degrees in azimuth at about 15 revolutions per minute. Contained in the splash-proof box are a driving motor (split-phase ½ horsepower squirrel cage induction motor) and a type 5G synchro generator.





Modulator section of the Westinghouse set is located in the weatherproof base of the antenna pedestal. Action of the sine-wave oscillator, blocking oscillator, and thyratron tube, all shown in the picture, triggers the magnetron 2000 times per sec.



Radio frequency head of the Westinghouse set is also installed in the lower section of the antenna pedestal. It contains the magnetron oscillator, the crystal detector, local oscillator, and the high-frequency circuits associated with them.

During fogs, a phenomenon known as "aberration of sound" often occurs and contributes to make navigation more hazardous. On such occasions, "dead spots" appear on the Lakes. In these areas whistle signals from approaching vessels either cannot be heard or are distorted so that they seem to come from a source other than their true one.

Other aspects of Great Lakes shipping that affect the job that radar is being called on to perform:

Extreme length of travel in the Lakes from Duluth to Montreal is more than 1300 miles, but the main movement of ships is over the 1000-mile run between the upper Lakes and Lake Erie. Sailing season averages eight months, from about April to December, when the Lakes are free of ice. During this period a bulk cargo vessel may travel a distance equal to $2\frac{1}{2}$ times the earth's circumference at the equator, making port at least twice a week, for about 4 to 5 hours at a time.

Compared to similar salt water vessels, these Lake carriers are somewhat larger and travel a few miles faster. During the war they delivered $4\frac{1}{2}$ times the total tonnage carried by all of America's merchant marine fleet on salt water.

The master of one of these vessels cannot sail down the winding course of a river or channel by setting a compass course as is done in ocean sailing. He must follow a course marked by buoys of various sorts. At night his course is indicated by red and green lights on top of these markers. In addition to a heading taken on the range lights. When the skipper reaches an open lake area the widely separated up and down courses are followed by compass bearings in reference to special shore lights.

Unlike the salt water master he cannot call on a harbor pilot, and a tug or two, to guide him into each of the 80-odd major ports on the United States and Canadian shores. He himself controls all the ship's movements from the time she raises anchor in the spring until she is laid up at the end of the season. An additional navigation problem is presented by the fact that many of the Lakes harbors are located at mouths of rivers.

This was the picture when the radar manufacturers entered the program last year.

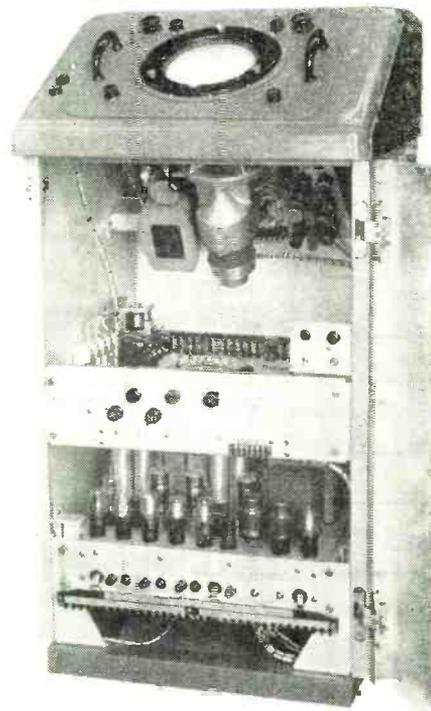
The surface search sets they installed are principally simplified versions of the military and naval designs in widespread use during the war. They are designed for reliable operation without the attention of technical personnel. A navigator can operate a radar set after an hour of practice. Installed to give a maximum over-all view of the horizon, they furnish a continuous radar picture of the waters surrounding a ship, detecting the presence and location of shore-lines, buoys, lighthouses and other vessels, with respect to the radar-equipped ship.

Unlike military radar sets which included the so-called A-type indicator, the simplified marine radar sets depend solely on the PPI (Plan Position Indicator) to give the ship's navigator range and bearing information. This is accomplished by transmitting short pulses of ultra-high frequency radio energy at a rapid rate. These powerful radio waves are concentrated in a beam that is narrow in the horizontal plane and comparatively wide in the vertical plane. They strike objects in their path and are scattered. A small fraction of the original waves is reflected back to the rotating antenna, which in the interval between pulses serves as the receiving antenna. The

reflected waves are amplified and fed to the fluorescent screen of a cathode ray tube where they are translated into spots of light.

Factors governing the determination of a range reading include an object's size, shape, reflectivity, height, radar sensitivity and the wavelength of the radar set. But in general, radar horizon is the basic limiting factor for maximum range readings. In other words, a large object will loom higher

Indicator console in the Westinghouse installation. Below the seven-inch PPI and its controls and circuits are the low voltage power supply and the intermediate and video frequency amplifiers.



A GE parabolic reflector installed atop the pilot house of the "Ernest T. Weir." First Mate Gallagher and Captain Hartman are inspecting the installation.



Captain Hartman, a veteran of more than 40 years' service on the Great Lakes studies the PPI of the General Electric "electronic navigator" aboard ship.

on the horizon and will offer a larger reflecting surface; hence it will be able to be detected at greater distances.

Since radio waves travel at a constant speed of 186,000 miles per second—like light—measurement of the time it takes for a signal to travel out and bounce back gives a reliable reading of range, or the distance between the ship and the object. On the sets in this project, readings are accurate to within approximately one or two percent.

The face of the scope is calibrated in miles. Maximum range can be varied, in steps, depending on how large an area the operator wishes to scan. Concentric marker rings, equally spaced, can be superimposed on the screen of the cathode ray tube to aid in estimating range. The minimum range at which an object can be detected is 100 yards and the maximum with any of the sets is 50 miles.

Transmitting a pulsed high-frequency signal is accomplished in this way: A high voltage pulse of microsecond duration causes a magnetron to oscillate. The resultant signal is sent to the antenna through a wave guide or coaxial system and directed into space by a reflector.

Reflected energy is returned to the transmitter and detected in an r.f. section, where an i.f. signal is produced according to the superheterodyne principle. The i.f. signal is then

amplified and detected. This time a video signal is the result and it is sent to the PPI indicator circuits, modulating a narrow electron beam. This beam shows up as a line of light on the scope face, and as it rotates, leaves a trail of objects visible to the observer as bright spots.

In order that range information be accurate, indicator circuits are timed to start the electron beam's radial sweep each time the magnetron emits a pulse. As a burst of energy leaves the antenna the beam in the tube starts its movement toward the rim, and completes its journey in the interval between pulses. It is in this interval that the reflected signal is picked up by the antenna and fed to the PPI.

Rotation of the antenna is linked to the magnetic deflection coils around the CRT, thus synchronizing the rotation of the electron beam. Since the high frequency energy travels in straight lines and at such great speeds, the reflections show up in proper bearing.

As the antenna's beam sweeps across the bow of a ship, a radio line called a "heading flasher" is intensified on the PPI. When the picture is stabilized with North at the top of the scope, this flasher indicates ship's direction or heading.

Equipment for azimuth stabilization is provided with some sets to furnish

a bearing with respect to true North. This is possible when a ship is equipped with a gyro-compass.

The radar picture is a continually changing one, and therefore the direction of any moving object may be noted. The path of another ship can be "observed" through a fog; and together with the use of navigational charts and standard techniques of seamanship, safe travel is made possible under adverse conditions.

In addition, an indication of an object's physical composition also can be learned from the blobs of light on the scope face. Shore lines are clearly outlined; rain appears as feathery masses. Buoys show up as small, but distinct dots. Ships may be accurately outlined, but more frequently resemble oval-shaped objects. A tug towing a barge often can be distinguished from two separate ships.

To help the receiver provide an accurate scope picture under varying conditions, it is equipped with STC (sensitivity time control), FTC (fast time constant) and AFC (automatic frequency control circuits).

STC suppresses "sea return," which is the reflection of signals from waves or particles of water. These signals impair observation of close target objects in rough weather. The STC circuit increases the receiver gain automatically with range, and is usually available to the operator in steps.

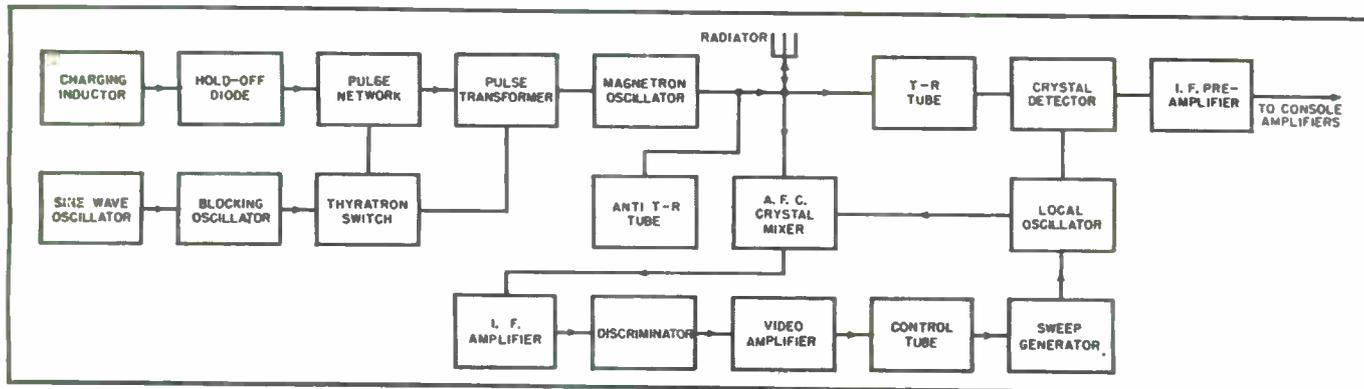
FTC breaks up large signals caused by interference or by closely-grouped targets. It is particularly useful in detecting objects like channel buoys in heavy "sea return" or heavy rain.

Automatic frequency control stabilizes receiver tuning with respect to the magnetron frequency.

Since one antenna is used for transmission and reception, the sensitive receiver must be protected during transmission periods. This is accomplished by a transmit-receive tube which fires and effectively short-circuits the receiver every time an outgoing pulse travels toward the antenna. To prevent any reflected power from being wasted by going to the quiescent magnetron between pulses, an anti-transmit-receive tube that presents a large impedance to the signal is employed.

The sets are designed to operate on
(Continued on page 144)

Modulator and r.f. head of Westinghouse radar set, including microwave section, a.f.c. control, and preamplifier.



Superregenerative Frequency Converter

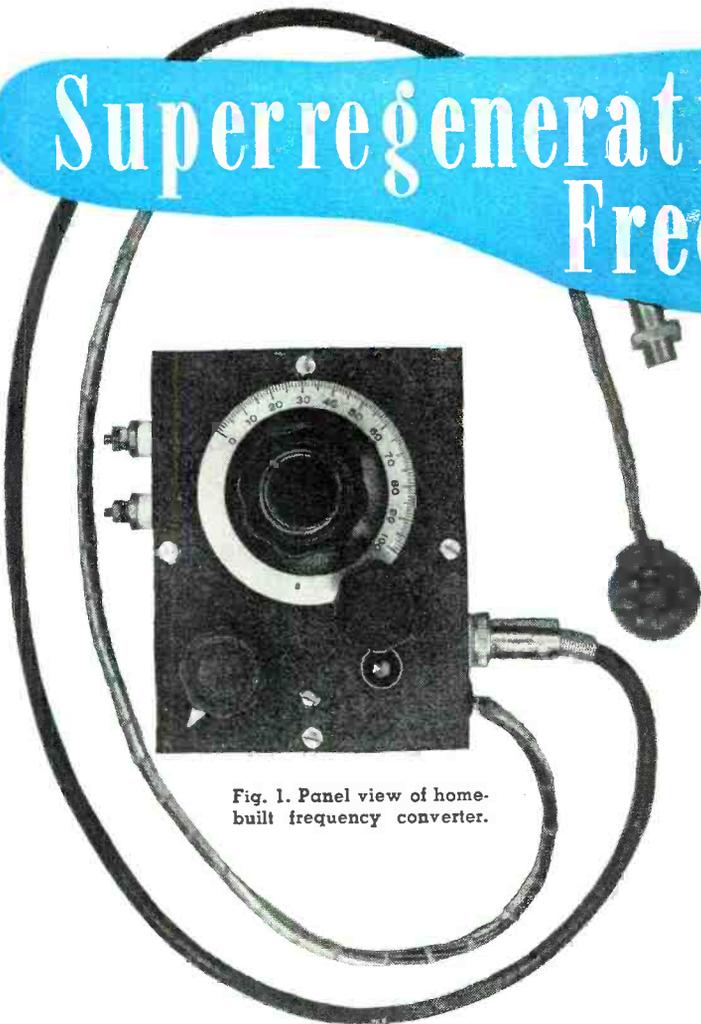


Fig. 1. Panel view of home-built frequency converter.

By
P. V. TRICE, W3QHS
 and
M. BARAT Jr., W3KIL

THE unit to be herein described provides a novel and inexpensive means of securing good reception of signals on the ultra-high and very-high frequency bands. The ultimate range which can be reached, must, of necessity, be determined by the type of tube used. The apparatus shown and described here was constructed primarily for use in the 144 mc. band but, if desired, the v.h. frequencies could be reached by the substitution of a Lighthouse tube. The principle involved, which consists of selecting a suitable quench frequency harmonic from the converter and feeding it through a low-frequency r.f.-audio outfit (receiver), is not basically new. Many ultra-high experimenters have, no doubt, at some time or other, noticed that the u.h.f. signals they were listening to on their superregenerative receiver, were, at the same time, receivable at a certain point on the near-by broadcast receiver. However, the signal from the latter was always distorted beyond the point of intelligible reception. This distortion was the result of the superregenerative receiver (local oscillator) over-

loading the input stages of the low frequency b.c. set.

In this converter, the distortion is eliminated by keeping the actual plate voltage applied to the tube to the minimum necessary to keep the self-quench action in effect; and by means of extremely loose coupling between the output of the converter and the input of the low-frequency receiver, controlling the amount of drive to the in-

put of the low-frequency stages, and thus obtaining normal, distortionless reception.

Although the quench frequency may occur somewhere between 10 and 100 kc., depending on the particular set, let us assume, for the sake of simplicity, that the fundamental quench frequency is 50 kc. Then as shown in the chart (Table 1) the harmonics
(Continued on page 133)

This inexpensive, easy-to-build converter will extend your present communications receiver into the v.h.f. and u.h.f. region.

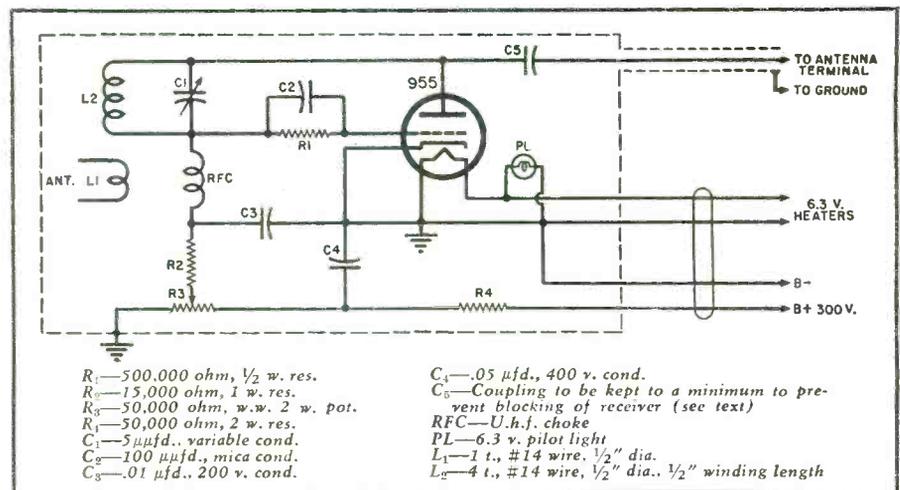
PRINCIPLE OF OPERATION

In the superregenerative frequency converter circuit, self-quenched, or one using a separate quench oscillator, the frequency of the incoming signal is changed to a new radio frequency (harmonics, see Table 1) that can be amplified and detected. The frequency is changed by means of the quenching process, the introduction into the circuit of an alternating voltage of a frequency above the audible range (20 to 200 kc.) in such a way as to vary the detector's operating point. As a consequence of the introduction of this quench or interruption frequency, the detector produces harmonics (Table 1) of the quench frequency which contain the modulation of the incoming signal. This quench frequency and/or its harmonics can be amplified thru a low frequency receiving system or radio frequency amplifier and the original modulation recovered.

This converter results in improved selectivity, sensitivity, and signal to noise (hiss) ratio. It detects and converts AM and FM signals, and acts as a limiter and a.v.c.

This conversion is not a heterodyne process, thus is able to convert direct to frequencies low enough that a stable, high gain amplifier may be used. It does not contain spurious r.f. signals known as "images," since conversion is a one step conversion and the high frequency does not have to be tuned so that other signals of another frequency will produce an output.

Fig. 2. Diagram of 144 mc. converter. Frequency range may be extended by substituting a "Lighthouse" tube. "A" and "B" voltages may be obtained direct from receiver.



A.C.-D.C. AUDIO AMPLIFIER

Front-top view of completed amplifier. Note in particular that all transformers have been eliminated.



By

GEORGE EANNARINO

Field Eng., Federal Telephone & Radio Corp.

This 10 watt, 4-tube audio amplifier using the new selenium rectifiers is easy and economical to build.

THIS transformerless power supply, four-tube audio amplifier having a maximum power output of 10 watts has the added feature of incorporating a miniature selenium rectifier in place of a conventional vacuum tube. Use of the selenium rectifier not only enables this amplifier to weigh less, cost less, and occupy less space, but also due to the long life and high current carrying capacity of this rectifier, improves its performance and reduces power supply failures to a minimum.

Sensitive enough for crystal microphone or phonograph pickup and with only a 10% distortion between the frequencies of 40 to 15,000 cycles at 8 watts output, this amplifier should find extensive application in home receivers, telephone equipment, loudspeaker systems, and low power voice transmitters. Here is a compact, inexpensive amplifier, which can also be used as a self-sustained component in all types of combination sets, a pre-speech amplifier or modulator in amateur voice transmitters, or a test in-

strument for checking audio systems.

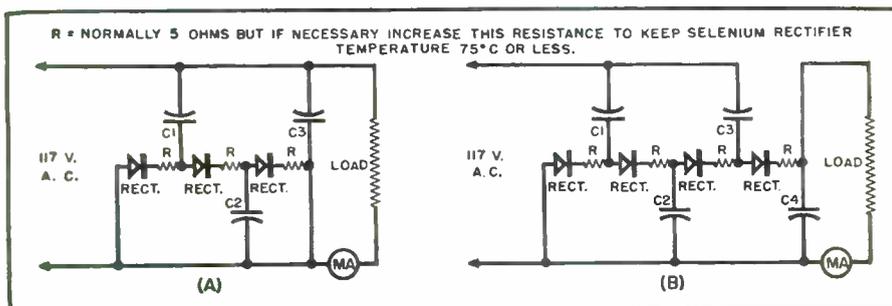
This amplifier can readily be incorporated into the original design of such equipment and offers the manufacturer an opportunity to cut his costs, speed production, and stimulate sales. Use of the selenium rectifier not only reduces the weight and size of the product, but also simplifies assembly and therefore saves production time.

As indicated on the schematic diagram, Fig. 2, this amplifier consists of three stages using four tubes—a 12SQ7 as the first audio, a 12J5 as the inverter, and two 50L6's in push-pull as the output. These circuits are conventional and it is only in the power supply, where no transformer is required, that this amplifier does not follow conventional design.

Elimination of the power transformer is accomplished by the use of two selenium rectifiers in a voltage doubler circuit which supplies 200 v.d.c. at 125 ma. to the two 50L6 output tubes. No filament is required either, since all the filaments are connected in series and are placed across the a.c. line. Thus a large saving in weight, space and expense is obtained without any loss in efficiency or performance of the amplifier.

The use of a rectifier in voltage multiplier circuits is in itself not novel and has been used before. However, when applied to vacuum tube rectifiers, this design is highly impractical. There are two reasons for this. In the first place, with the tube heaters connected in series in this type of chain circuit, there exists dangerously high potential differences between

Fig. 1. (A) Voltage tripler circuit using three 200 ma. selenium rectifiers. With 40 μ fd. for C_1 , C_2 , and C_3 , a d.c. output of 325 volts can be obtained with a load of 200 ma. (B) Voltage quadrupler circuit using four 200 ma. selenium rectifiers. With 40 μ fd. for C_1 , C_2 , C_3 , and C_4 , a d.c. output of 425 volts can be obtained at 200 ma.



heaters and cathodes of the rectifier tubes at the high voltage end of the system. This difficulty might, of course, be obviated by the use of heater supply transformers but this destroys the simplicity of the system.¹ However, since selenium rectifiers do not use filaments, this problem does not exist when they are used. Low current rating, resulting in poor voltage regulation, is the second reason for the inadaptability of vacuum tubes to this type of a circuit.

From the theory of power supplies² it is known that the degree of regulation will depend to a great extent on the size of the condenser immediately following the rectifier (shunt condenser input-filter circuit). The size of this condenser, in turn, is limited by the current carrying capacity of the rectifier. Since a selenium rectifier will safely pass more current—both transient and steady state—a larger condenser can be used and improved voltage regulation obtained.

The voltage doubler circuit used in this amplifier is shown in the schematic diagram (Fig. 2). The maximum voltage output that could be obtained at 150 ma. is approximately 255 volts when a 40 μ f. condenser is used. Since only 205 volts are needed for the plates of the 50L6's a 22 ohm safety factor resistor and a 200 ohm dropping resistor are inserted in the circuit. The function of the 22 ohm resistor is both to drop the voltage and to limit the peak condenser charging current, thereby increasing the life of the selenium rectifiers.

Of course this circuit may be modified to meet any individual requirements. For instance a simple method whereby the 10 watts maximum output can be increased to 15 watts is to replace the 50L6 tubes with 6L6 and the 150 ma. selenium rectifiers with the 200 ma. type. Likewise lower powered amplifiers can be constructed using the a.c.-d.c. power supply circuit shown in Fig. 3.

If even higher powered outputs are desired a voltage tripler or even quadrupler circuit, shown on Figs. 1A and 1B, can be utilized. The voltage tripler circuit can be used to power a 20 watt maximum output amplifier. In this case the same amplifier circuit is used except that a 6SQ7, 6J5 and two 6L6's replace the 12SQ7, 12J5 and two 50L6's, and a filament transformer is added to the power supply.

It should be noted that when these transformerless circuits are used, as indicated in Fig. 2, an isolated ground (chassis not d.c. ground) must be used. The reason for this is that the standard practice in most communities in the United States requires that one side of the house wiring be connected to ground at the electric meter. It is readily seen that if the power plug is so inserted in the outlet that the chassis is connected to the ungrounded side, the full line voltage can occur between chassis (if isolated ground is

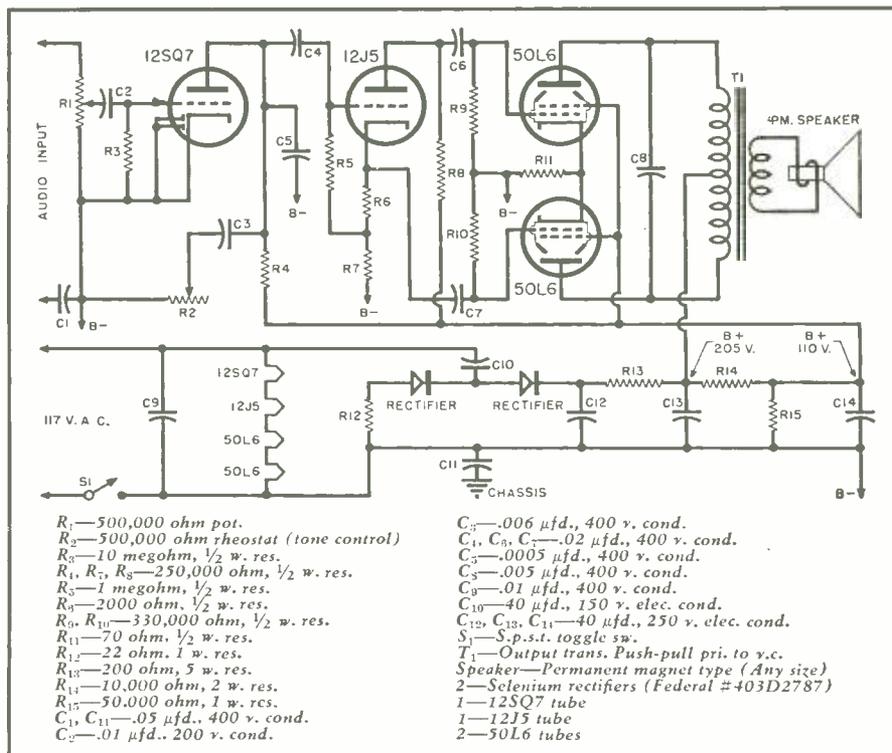


Fig. 2. Schematic diagram of 4-tube, 117 volt a.c.-d.c. audio amplifier.

not used) and any other grounded conductor such as a waterpipe, radiator system or outlet face plate.

In order to use this unit in conjunction with other equipment a .05 μ f. condenser should be connected between the isolated ground and the chassis. This will provide adequate radio frequency grounding or by-pass of the power line¹ and at the same time, if the .05 μ f. value is adhered to, it will prevent the chassis from being at a high d.c. or 60 cycle potential.

—30—

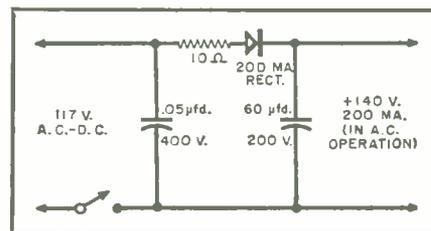
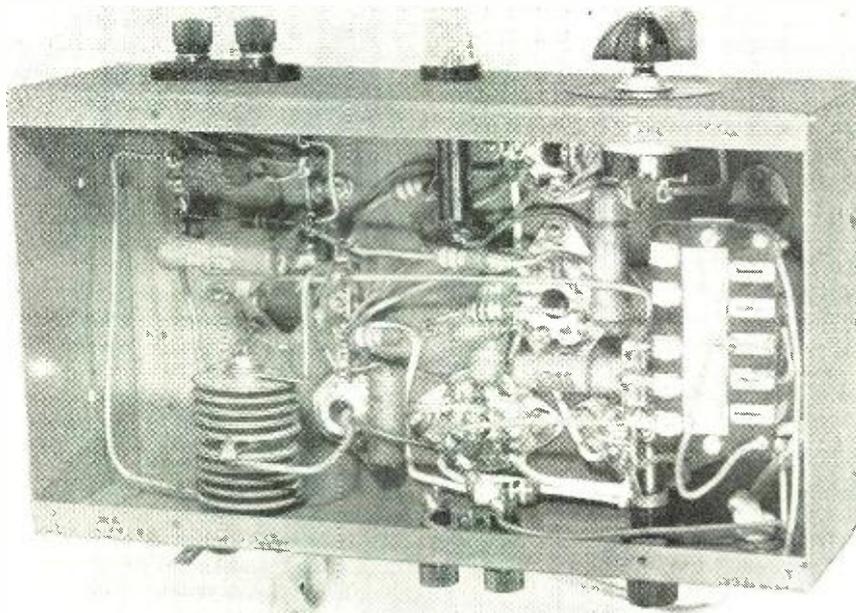


Fig. 3. Schematic diagram of an a.c.-d.c. selenium rectifier power supply which can be used to operate a 6 watt audio amplifier, using same circuit shown in Fig. 2.

Under-chassis view of amplifier shows position of the two selenium rectifiers.



¹ "Mallory Technical Manual"—page 59.
² Terman, F. E. "Radio Engineering"—pages 491-498.

Retailing Basics



What merchandise shall I carry?



How shall I dress my store?

That Pay Off

By **DR. LOUIS BADER**

Assoc. Professor of Marketing
New York University

Although the points stressed by the author are not new, they are of sufficient importance to be reemphasized for both old and new dealers.

ONE of the most important problems a dealer has to face is how to get customers into his store to buy radios and appliances. This is the crux of successful retailing—sales promotion. Related to it is another problem which should be dealt with first, i.e., Dealer Sales Quotas and Allocation.

Manufacturers and national distributors estimate a total sales potential based on studies of recognized trading areas. A quota is set for each area. Dealers are then selected, usually with the understanding that they are to secure, from the areas they cover, a certain amount of business. When all of the dealers' quotas are added together the total should equal the manufacturers' sales potential. That much planning the manufacturers and national distributors must do.

The assigned quota for each item that the dealer handles should be made the *central point or core* of his sales promotion plan. Without such a point his sales promotion work may become chaotic, seem difficult to understand, and may be ineffective.

The foresighted dealer, unless in the country, will allocate a sales quota for each residential block in his area. The dealer's own marketing survey will furnish data for each block and provide complete information on the number of families, their incomes, and the condition of their homes. The dealer who carries a full line of appliances ought to sell \$1200 to \$1500 worth of merchandise to each family during the next five or six years, assuming that the period is one of full prosperity. It is also assumed that the trading area will average 1500 to 1600 occupied wired homes. Under these conditions and in a normal market, the aggressive and well-equipped



The manner in which you and your employees greet your customers goes a long way toward establishing your company's reputation.

dealer with sufficient capital, should do between \$200,000 and \$400,000 worth of business annually. A dealer with an especially full line of the smaller, and in some cases, "impulse buying" items might increase his sales volume and profits materially regardless of the size of the trading area. Conversely, stiff competition might reduce his share considerably.

In connection with the sales quota, the dealer should work out some simple system of control which would enable him to keep tabs on his block

sales as against expectations so that special attention could be given to those areas where sales do not meet the quota.

The over-all business that the manufacturer expects to secure is going to be divided among many types of dealers. Most department, furniture and variety stores are looking forward to establishing or re-establishing radio and appliance departments. They are usually very aggressive merchandisers. It is not too early, therefore, for other dealers to take stock

of themselves as merchandisers, to check over what successful merchants have done, and to emulate them.

Observations and talks with many successful business men have provided several interesting conclusions:

1. *Personality of the dealer and his salesmen.* We are convinced that this is the most important single factor in the success of retailers and many other business men. We all have personality, some people have the right kind and others the wrong kind for this work. The right kind of personality suggests to the customer that the dealer is a pleasant sort of person who is sincerely interested in him and his desires. The atmosphere of the store should indicate immediately to the customer that the dealer and his employees are at his service. The dealer and his clerk should show by their attitudes and actions that they really want to serve the customer and that the size of the order is a secondary consideration. Customers should be greeted with a genuinely pleasant inquiry as to what can be done for them; an interest should be shown in their conversation, and their opinions should be respected.

People cease to patronize certain stores when their wishes and feelings are ignored by the owner and/or his sales personnel. No one likes to be ridiculed, thus, real or implied slights which border on ridicule constitute a sure way to lose customers.

Not everyone who enters your store will be blessed with your good taste. If some of the requests for merchandise seem ludicrous to you or your staff, they must still be treated seriously and the customer should be assisted as courteously as your most cherished sales prospect. Never forget for a moment that the most important subject in the world to any person is himself. You can never make a customer unhappy by letting him talk about himself, his problems, his ideas or his dreams.

While the very thought of being subjected to the whims of your customers leaves you with chills running up and down your spine and a defensive attitude that would do credit to the Marines, these are personality traits which can be developed—in fact, must be developed if you are to become a successful retailer.

2. *The merchandise to carry.* Equally important to the success of a retail venture is the choice of suitable merchandise. The dealer must know his trading area intimately, what merchandise his clientele can buy, and will want to buy. He should carry the most complete line of goods that his trading area can sustain. In addition to complete lines, he must also select merchandise in the price ranges which his customers can afford. This may entail carrying several price ranges within each product line, but each line should be the very best value for the money the customer has to spend.

A great many people know the nationally advertised lines. Dealers will,

therefore, find it profitable to carry such lines. Since nearly all dealers seek brand lines, a particular dealer may not always secure the agency for the particular brand he would like to carry. In such cases he will take what he can get and be prepared to explain to prospective customers why *he has selected* the X washing machine rather than the Z machine. Each brand has its outstanding selling points and these then become the reason for the selection of that product by the particular dealer.

3. *The dealer's store.* It has been assumed that the progressive dealer will have selected the most advantageous location within his means, but his responsibility toward his store and his customers does not cease with this consideration.

The appearance of the store, both inside and out, is vital to securing and maintaining a good business reputation. First of all, the alert dealer will have a show window that does a real selling job. This is the customer's first contact with the organization—it must be effective. It goes without saying that the merchandise on display should be arranged in a neat and attractive array, and the over-all effect should be one of military cleanliness. This is important particularly in displays of appliances. The glossy white finishes of refrigerators, ranges, etc., will reflect every bit of dirt and soil on them.

The second point of contact with the dealer's store is the sales floor. Merchandise should be so arranged that demonstrations can be conducted easily without the necessity for removing merchandise from one part of the floor to another. Adequate provision should

be made for convenience outlets in order that appliances can be operated for the customer's benefit.

In arranging the sales floor as a traffic builder, thought should be given to the placing of merchandise and service centers to the rear of the store in order to draw traffic through the entire merchandise display. The public utility companies put the cashier's window at the rear of the show room; the supermarkets put meat and dairy products at the back of the store, etc. This arrangement pays off in the increase in the purchase of impulse items. The wide-awake dealer will investigate the possibility of rearranging his show rooms to conform with these time-tested selling techniques.

4. *The presence of the dealer on the floor of his store.* Most people like to feel important and a pleasant greeting from the owner of the radio and appliance store will go a long way toward creating the feeling of goodwill engendered by such attentions. The presence of the dealer on the sales floor has two important aspects; he conveys the impression that he is interested in his customers and he keeps his sales personnel on its collective toes.

5. *Advertising the store and the product.* Since every dealer will advertise in some form or another, the important thing for the dealer to decide is how much he is willing to set aside for this purpose each year. After this sum has been determined, a breakdown should be made according to the media to be used; newspapers, handbills, direct mail, radio, etc.

Many manufacturers and national distributors have already given the
(Continued on page 164)



A well-wrapped package in distinctive paper is a good advertisement for you.

TRANSMISSION LINE SYSTEMS

By C. SPEAR

for FM & Television Home Receivers

Conventional antenna systems with which most servicemen are acquainted in standard broadcast work will not suffice in FM and television installations. Each antenna system for these higher frequency bands must be individually "engineered."

THE trend toward the use of higher frequency bands for FM and television has accentuated the importance of an efficient transmission line system between antenna and receiver. For as the frequency goes up it becomes increasingly dif-

ficult to feed an adequate signal from the antenna to the receiver and every effort must be made to conserve the comparatively little energy that is available. For this reason high gain directive antennas become necessary in many localities, and by the same logic highly efficient transmission line systems must be installed.

Fortunately, due to the advances made during the war in the high frequency cable field, low-loss transmission lines are available at low cost and if used properly will transmit the energy picked up by the antenna to the receiver without undue loss. However, the word "properly" has a great deal of significance, for another adverse effect of the increase in frequency is to make mismatching more critical and unless transmission lines are installed with a complete understanding of this phenomenon they may be useless.

This latter statement is intended only to emphasize the importance of the problem, and not in any way to

indicate a difficult or hopeless condition, for the remedy is both simple to perform and understand.

It is the objective of the author to unveil the mystery of matching and indicate the necessary calculations—requiring only a knowledge of fundamental multiplication and division, a straight edge, and some rule of the thumb procedures—with which the serviceman can solve virtually any of his transmission line problems.

Included in these h.f. cable line problems that can easily be solved are; how to match any antenna to any receiver whether it be FM, television, radar, instrument landing, Army, Navy or any other electronic device; the effect of mismatches in terms of power or signal lost and how they can be corrected; how to intelligently select the appropriate transmission line; the "net" gain of directive antennas. In addition to a discussion of these questions some of the terms frequently used in the field will be clearly defined and converted into simpler expressions.

"Decibels," one of the terms that will be used very frequently throughout this article, should be carefully defined. The decibel, abbreviated db., is a numerical means of expressing the ratio of two compared powers or voltages. The following formula shows the relation between db. and power: $db. = 10 \log P_1/P_2$, where P_1 and P_2 are the two powers compared; or in terms of voltages where E_1 and E_2 are the two voltages compared, $db. = 20 \log E_1/E_2$, assuming that the two voltages are measured across equal impedances.

For example, if a dipole antenna normally picks up 1 microvolt of signal, and, after adding directive arrays, it picks up 10 microvolts, then the gain of the antenna in db. due to the array is: $20 \log 10 = 20$ db.

Likewise, if a transmission line receives 10 milliwatts from an antenna, but delivers only 5 milliwatts to the receiver then the power lost in the cable is: $10 \log 2 = 3$ db.

In order to simplify the calculation

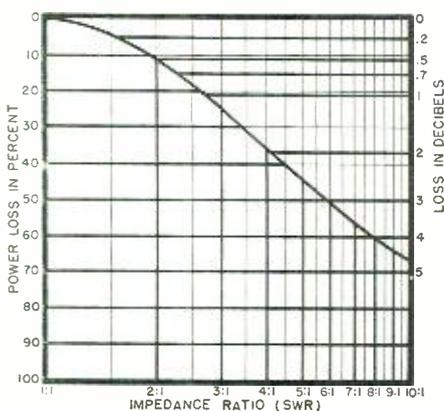
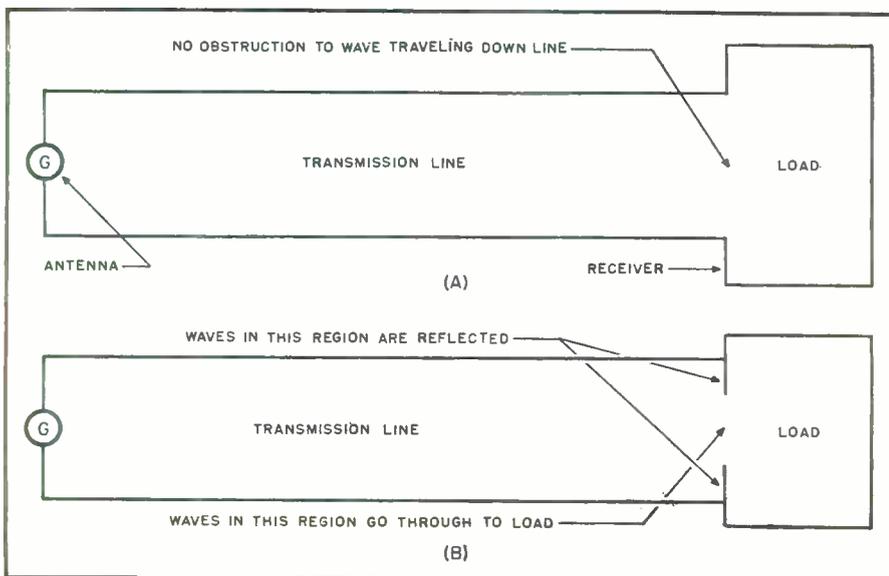


Fig. 1. Power loss that occurs when a mismatch of antenna to receiver exists.

Fig. 2. Semi-pictorial representation of what an electrical wave experiences at end of transmission line. (A) Perfect match and (B) when mismatch occurs.



of the decibels gained or lost see the conversion table (Table 1). From this table the reader can convert db. into power or voltage ratios or vice versa without the need of logarithm tables or a slide rule.

There are three sources of power loss between antenna and receiver; mismatch between antenna and transmission line, attenuation or power loss in the transmission line, mismatch between transmission line and receiver.

Antenna Mismatch

One of the fundamental concepts of power transmission is that to obtain maximum power transfer, the output impedance of the generator (in this case the antenna) must be equal to the input impedance of the load (in this case receiver). Thus if the antenna resistance is 70 ohms, the receiver input should be 70 ohms, otherwise some of the power is lost. This is shown in Fig. 1, which is a graphic presentation of the signal voltage lost due to mismatch.

At the present time consideration of the antenna impedance is very important for two reasons. In the first place receiver input and antenna impedances may vary to a great extent due to the lack of standardization amongst the various manufacturers, and due to the fact that many surplus Army and Navy receivers, designed for use with special antennas, may be circulated for general use. Secondly the addition of directive arrays changes the antenna impedance, and therefore it is necessary to calculate the power loss due to mismatch in order to determine the net or effective gain of the antenna. For example a typical problem of this type might be:

Given: An antenna array which gives a 5 db. gain but changes the impedance from 300 ohms to 100 ohms. The original antenna was matched to the receiver—calculate the net gain.

Solution: From Fig. 1 we note that a 3:1 impedance mismatch ratio results in signal which is 25 per-cent or 1.2 db. less. The net gain is therefore only 3.8 db. It then becomes a matter of mathematics whether the extra expense is worth the resultant gain. Of course as the mismatch becomes greater, the effective gain decreases, and the array becomes useless unless a matching network is utilized. However the matching can be performed rather simply, and the details will be discussed later in the article.

Attenuation of the Cable

The limiting factor on the minimum amount of power loss possible in any transmission line system is the attenuation or power loss of the cable; for any power lost due to mismatch can be corrected by means of matching circuits, but there is no remedy for the power lost due to the attenuation of the cable. Though there is no fixed standard, cable attenuation is usually rated in db. per 100 feet by most manufacturers. However, the

LOSS		DB.	GAIN	
POWER RATIO	VOLTAGE RATIO		POWER RATIO	VOLTAGE RATIO
1.000	1.000	0	1.000	1.000
.977	.988	0.1	1.023	1.011
.955	.977	0.2	1.047	1.023
.891	.944	0.5	1.122	1.059
.794	.891	1.0	1.259	1.122
.631	.794	2.0	1.585	1.259
.501	.708	3.0	1.995	1.413
.398	.631	4.0	2.512	1.585
.316	.562	5.0	3.162	1.778
.251	.501	6.0	3.981	1.995
.199	.447	7.0	5.012	2.239
.158	.398	8.0	6.310	2.512
.126	.355	9.0	7.943	2.818
.100	.316	10.0	10.000	3.162
.010	.100	20.0	100.0	10.00
.001	.0316	30.0	1000.0	31.62

Table 1. Decibel conversion table. Power or voltage ratios can be converted to db. (or vice versa) without the need of logarithm tables or slide rule.

power loss is proportional to the length of the cable. That is, 100 times more power is dissipated in a 100 foot cable than in a one foot cable. Therefore cable is sometimes rated in db. per foot instead of per 100 feet so that it will sound more efficient. For example, a h.f. cable whose attenuation is 20 db. per 100 foot (a very high value) could be rated at 0.2 db. per foot or 0.016 db. per inch.

Another factor that affects the attenuation is the frequency at which it is used; for the power loss of any h.f. line increases approximately as the square of the frequency. This is an essential fact particularly at the present time, since many of the cables are rated at the old FM frequency range of about 45 mc., and many manufacturers have not had a chance to reevaluate their cables so as to rate them at the new FM frequency band centering around 100 mc. Thus a 4-db.-per-100-foot cable rated at 30 mc., would be rated at approximately 6.8 db. per 100 feet at 100 mc.

Matching the Transmission Line To Load

All the sources of power loss discussed heretofore are not limited to high frequency receiver equipment, but apply equally as well to all types

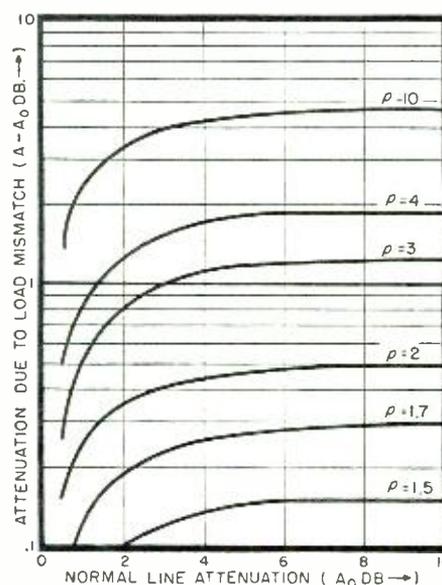


Fig. 3. Graph shows increment of attenuation as a function of the standing wave ratio (SWR) and normal line attenuation. Note in particular that the power loss due to transmission line mismatch does not become serious until the standing wave ratio is about 3:1.

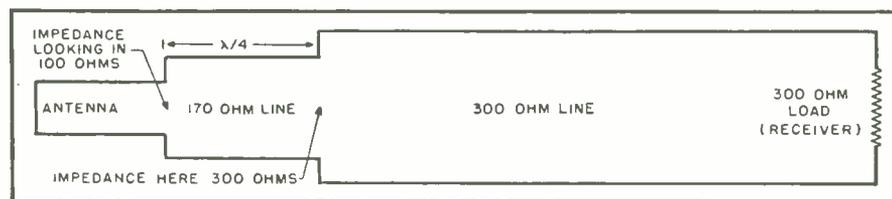
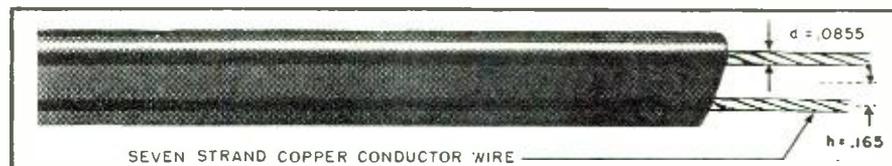


Fig. 4. Method of matching antenna to receiver via a quarter-wave transformer.

Intelin type K-200 antenna lead-in wire. The characteristic impedance of this wire is 200 ohms, while the attenuation at 30 mc. is .4 db. per 100 feet.



of apparatus regardless of their frequency. However, very little attention has been given to them in the past because in the AM broadcasting range power was plentiful and there was no need for a highly efficient transmission system. Matching the transmission line to the load is a problem met only in high frequency receivers. For, in the megacycle range, the transmission line must be terminated in a load whose impedance is equal to the characteristic impedance of the line, otherwise reflection occurs causing standing waves, and a subsequent increase of power loss. (An exception to this statement is the special case of tuned lines—but this phenomenon has no significance in the problems considered in this article.) Therefore a 70 ohm line must be terminated in a 70 ohm

load or, from a more practical viewpoint, if the receiver input impedance is 70 ohms—then a 70 ohm transmission line should be used.

The idea of reflection and standing waves, and its relationship to power loss requires additional elaboration. Fig. 2 gives a pictorial representation of what an electrical wave experiences when it reaches the end of a transmission line for different load terminations. Fig. 2A indicates perfect matching, that is, all the power goes into the load—no obstacle in its way. Fig. 2B on the other hand shows a load which reflects about 50 per-cent of the wave. That is, the portion of the wave that travelled down the center, still goes unmolested into the load. The rest of the wave, however, hits the barrier and is reflected back

down the transmission line. Then it hits the generator and the process is repeated. Again 50 per-cent of the wave goes through and the rest is reflected once again. Of course the generator is continuously sending out waves so that there is always a wave travelling in both directions which causes the phenomenon of standing waves. The magnitude of these waves is dependent on the amount of reflection that occurs, and is called the standing wave ratio.

Obviously if no power is lost as the reflected wave travels up and down the transmission line, eventually all the power will be transferred into the load. However, if attenuation does occur, then a certain percentage of power is lost due to each reflection, and it is this power loss that is considered to be the attenuation due to standing waves or mismatch. The magnitude of this increased attenuation is therefore proportional to two parameters. In the first place it is dependent on the percentage of the wave that is reflected back (the standing wave ratio) and secondly, it depends on the attenuation of the cable.

The standing wave ratio can be calculated as a function of mismatch. For example, if a 70 ohm line is terminated in either a 140 or a 35 ohm load the standing wave ratio will be 2:1. Fig. 3 is a graphic representation of the increment of attenuation as a function of the standing wave ratio (SWR) and normal line attenuation. As indicated in Fig. 3 the power lost due to transmission line mismatch does not become serious until the standing wave ratio is about 3:1.

The following is a typical illustration of how these calculations may be helpful.

Given: A 70 ohm input receiver requiring a transmission line 100 feet long. Available are a 6 db. per 100 foot, 70 ohm line, a 4 db. per 100 foot, 100 ohm line and a 3 db. per 100 foot, 300 ohm line. Which line should be used?

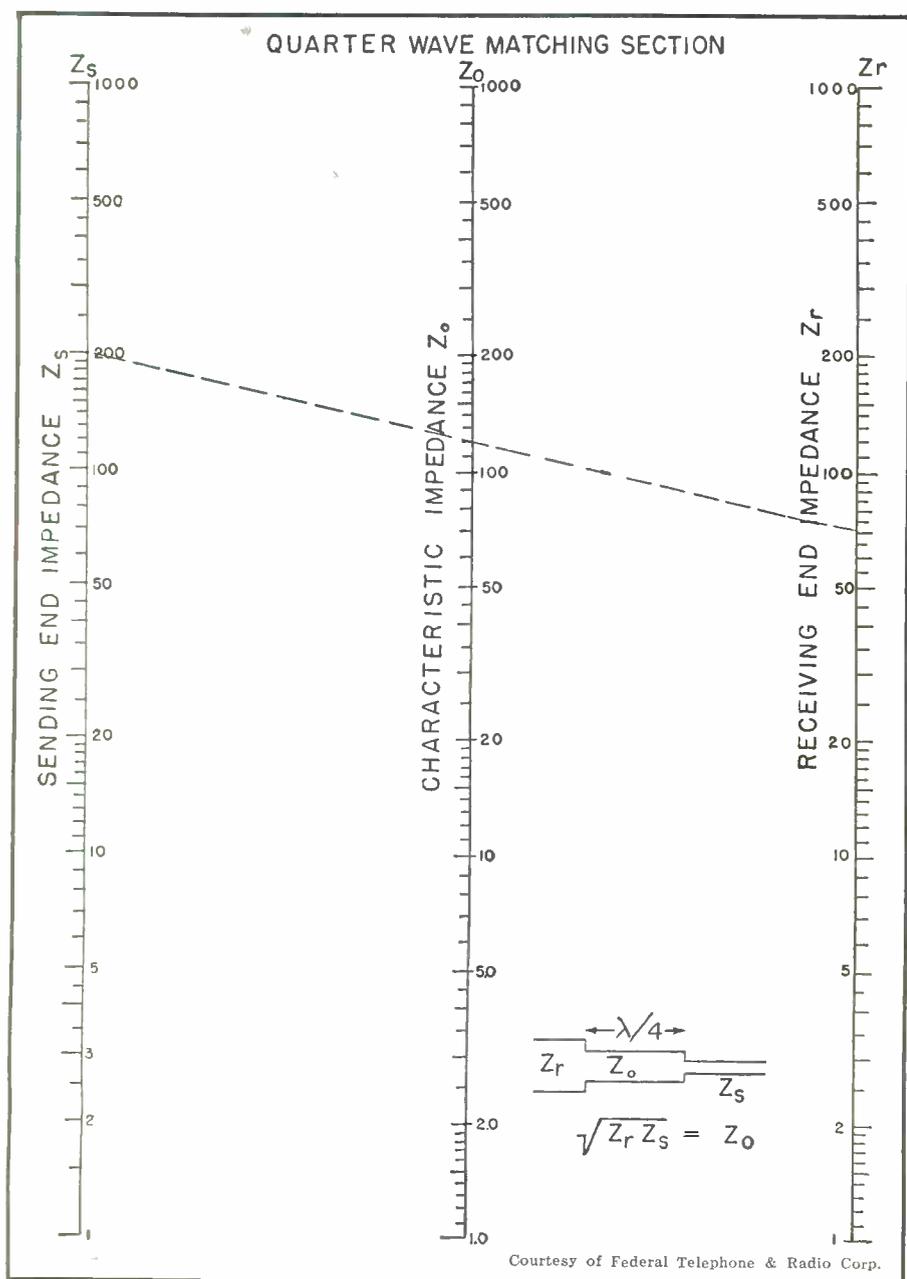
Solution: The power lost by the 6 db. line is 6 db. because it is perfectly matched. The power loss of the 4 db. line is 4 db. plus .15 db. due to a standing wave ratio of 1.4 as indicated in Fig. 3 or 4.15 db. The attenuation of the 3 db. line is 3 plus 1.5 db. due to a standing wave ratio of over 4:1 or about 4.5 db. Obviously the 4 db. per 100 foot, 100 ohm line would be the best cable to use.

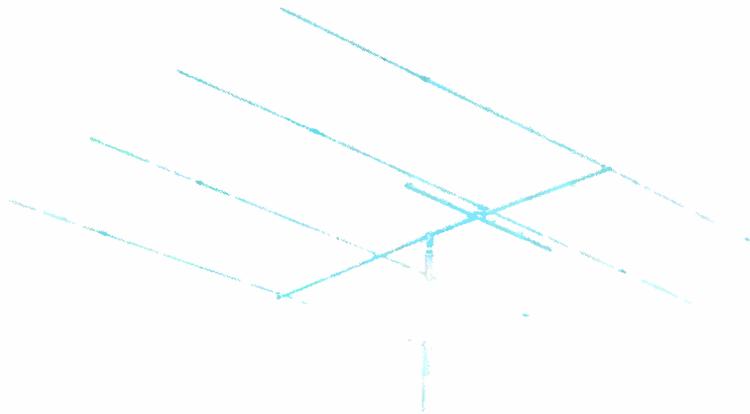
Quarter-Wave Matching Line

As previously indicated, an antenna mismatch can very possibly materially reduce the signal voltage picked up by the receiver to a point where it completely nullifies the other advantages that the antenna may have, such as, economy, availability, simplicity or power gain. Obviously, if a simple medium existed whereby the mismatch could be corrected, it would provide a far better solution to the problem than to use a different antenna.

(Continued on page 137)

Fig. 5. This chart may be used to obtain the surge impedance of a quarter-wave matching section used as an impedance transformer from one real impedance to another. In the example shown: $Z_r = 72$ ohms; $Z_s = 200$ ohms, indicating a quarter-wave matching section of 120 ohms is needed.





An Inexpensive

4-ELEMENT ARRAY

By VINCENT C. HALE

Construction details covering a high gain beam which may be built of readily available materials.

SINCE the original papers published by Yagi and Brown on the superior advantages of the multi-element array for transmitting and receiving, amateurs have probably evinced more interest in this type of antenna than any other, for the higher frequency bands. Particularly is this true of ten meter operation, since a well designed rig with modest power capabilities, used in conjunction with a beam of proper design and adjustment, can equal on most counts a relatively high power rig with a simple antenna system. The same holds true, with certain modifications, for the receiving situation.

Culling from the many articles available, and from a somewhat varied personal experience in the matter of beams, the author has evolved the array to be described, incorporating in its manufacture those features that would give a maximum of performance and a minimum of trouble and expense. It has been found desirable to eliminate all wood in the structure, since invariably warpage and aging will adversely affect the operation of a beam so constructed. Metal tubing, light but strong, has been used throughout, and the antenna proper, for ease of feed and adjustment, has alone been insulated from the supporting structure.

While a close-spaced, three-element array is satisfactory, the addition of another director, properly adjusted, results in superior performance and adds but little to the cost. Accordingly this antenna system uses two directors, the antenna proper, and one reflector, all spaced 1/10 wave, for compactness primarily, but also because the impedance so obtained makes a good match very easily attainable by several methods. There is little advantage to be gained in using any particular one of the matching methods . . . personal preference and ease of obtaining material will be the primary criteria of choice, rather than any especial benefits to be obtained. These optional feed methods have all been tried, and found to be

practically equal in performance. A description of each system is found in the *Handbook*, and the builder will find that any can be adapted to the particular needs and desires of the individual.

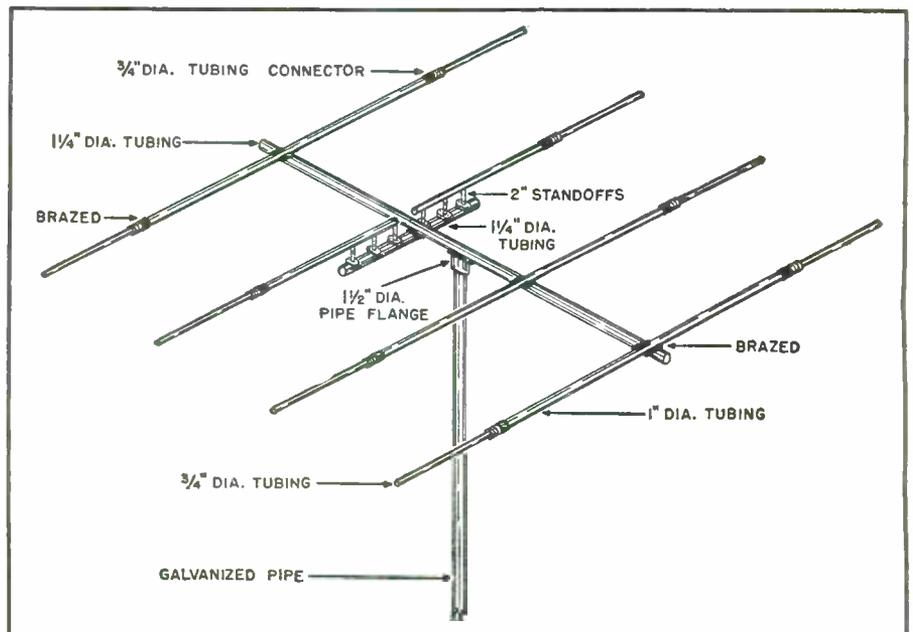
The particular beam shown in Fig. 1 was made from sections of 1 1/4", 1" and 3/4" thin wall tubing, known as steeltube. These sizes were used because of the relative ease with which this diameter tubing was available in this particular locality. Smaller sizes

can, of course, be used, and will work equally as well. Aluminum, brass, dural, copper, etc., can be used as well as the steeltube, and performance will be practically the same.

The complete listing of material for the beam proper is as follows:
 4 sections 10' long, 1" dia. tubing.
 4 sections 10' long, 3/4" dia. tubing.
 1 section 10' long, 1 1/4" dia. tubing.
 1 1 1/2" pipe flange, threaded internally.

(Continued on page 78)

Fig. 1. Mechanical details for the construction of 4-element array.





Servicemen's associations get excellent cooperation from manufacturers and jobbers in keeping posted on radio developments. Bill Behr, president of the New Jersey Assn., Henry Johnson, ad manager for Sylvania and Rene Jacobs, V.P. of Dale Distributors, look over one of the door prizes.

Service Associations Can Be Successful

By **DAVE KRANTZ**
 Pres., Philadelphia Radio Service Men's Assoc.

Servicemen's associations fill the urgent need of today's technician by supplying him with a clearing house for problems of his business.

TO MOST citizens, Philadelphia is known principally as the cradle of American liberty, repository of our beloved Liberty Bell and scene of many of the early struggles to secure the future of our

country. To those of us who live in this sprawling metropolis, it is the scene of a continuing battle to maintain our business existences and to wrench a livelihood from them.

This is especially true of those of

Members of the New Jersey servicemen's association listen attentively as Sylvania's Walter R. Jones discusses circuit analysis. Up-to-the-minute information, as supplied by service organizations to their members, is the pressing need of radio men.



us who elected to try to make a living out of the business of selling and servicing radio receivers. Within Philadelphia's borders, you will find areas which reflect every level of living condition to be found in any densely populated city. Rich man, poor man—they all have radio receivers and we make available the service equipment, the knowledge and the ability to keep those receivers in working order. Our ambition is to be able to do this work efficiently and profitably.

Radio service as a business came into being spontaneously. In most cases, radio manufacturers distributed their products indiscriminately without any regard for the availability of service in the areas where these receivers would be used. Further, many intricate and sometimes questionable circuits are employed without any supporting schematic or operating data to assist the radio serviceman to locate the reason for the failure when he is called on to repair the equipment. At no time, to the best of the writer's knowledge, has any manufacturer made a serious attempt to train independent field servicemen to handle the necessary service for his home receivers.

Since its growth stems from local needs for service, radio servicing as a business attracts a heterogeneous group of individuals, most of whom are interested in radio service primarily through an intense personal interest in the mysteries of this new science. For the most part these men are good technicians in that they comprehend the functional operation of a radio circuit. However, few of them are even well-grounded in radio theory. In other words, they know *why* a radio receiver works, but not *how*.

Running a business, to the average person, means merely opening a store

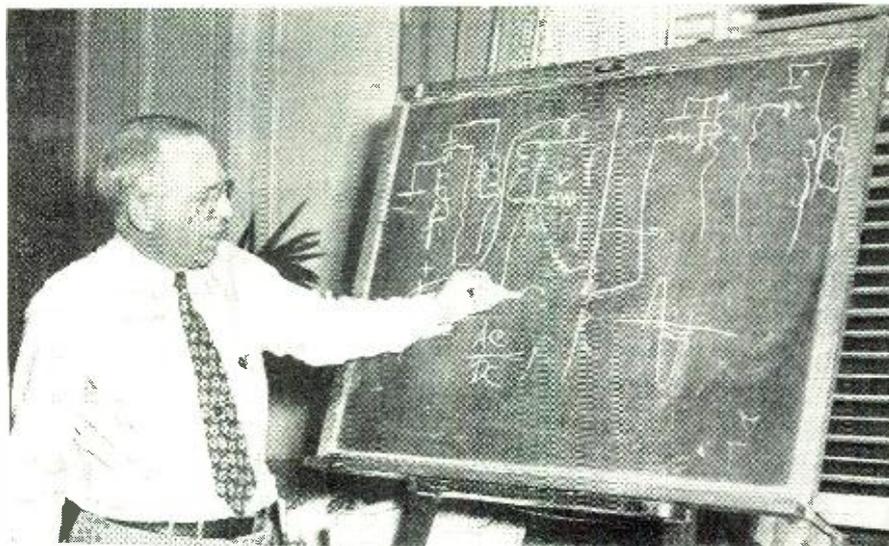
at some convenient location and making your services or goods available to the public. This, too, is the attitude of the average radio service business novice, who ingeniously assumes that his skill in repairing radios—usually perfected in his kitchen repairing neighbors' sets—will be wafted on the wings of happy customers' conversations to bring a stream of repair jobs beating a path to his door.

As the service dealer flounders about trying to induce people to bring their radio repair jobs to his shop, he usually tries every unprofitable scheme in the book in the hope of increasing his volume of business. Seldom does the individual, as a product of his own thinking, reach the conclusion that he is first of all a retailer and second a technician. He usually fails to realize that if he doesn't know how to merchandise his services in a profitable volume, all of the money-making artifices avail him nothing.

With the thought in mind that we could lift the level of radio servicing as a business and at the same time, the stature of the men engaged in it in the eyes of the public and of fellow businessmen, a group of us formed the Philadelphia Radio Service Men's Association a number of years ago. In the course of its fifteen years of existence, PRSMA has successfully weathered all of the storms of organizational and operational difficulty which usually beset voluntary associations. Through trial and error a type of organizational structure was evolved which insures against the common dangers which beset such associations and which in so many cases, result in eventual disintegration.

There has been so much interest expressed in the organization of PRSMA that I would like in this article to briefly outline the operation of the association and its various committees.

The organization is headed up by a Governing Board of eighteen members, each of whom is elected for a three-year term. One-third of this



Walter R. Jones, Chief Engineer, Radio Tube Division of Sylvania, highlights his discussion of circuit analysis with a chalk talk.

Board comes up for reelection or replacement each year. The Association's program is directed by its five officers who are elected by secret ballot each year.

The Association's programs are carried out by a group of eight committees, each of which is headed by a chairman, who, in turn, is a member of the Association's Advisory Board.

The following breakdown of the committee structure will give a general idea of the functioning of these various units.

Entertainment Committee—This group arranges all technical meetings. The primary purpose of these meetings is to permit local distributors to present engineers familiar with the lines the distributor carries. This provides the opportunity for members to acquire a better understanding of the technical details of various types of equipment and products, and promotes a better understanding between distributor and servicemen.

Membership Committee—The func-

tion of this committee is to pass on all applications for membership in the Association. Through examination and investigation, they determine the qualifications of each new applicant and recommend his acceptance or rejection for membership.

Employment and Veterans Committee—This group has the responsibility of ferreting out employment opportunities for members and veterans.

Education Committee—This committee was set up to carry out a program for courses in electronics, both basic and advanced, at local institutions and at closed meetings of the Association. It is charged with the responsibility of securing and distributing technical literature to members of the organization.

Magazine Committee—"PR S M A News" has been a financially successful monthly house organ for a dozen years. The preparation and distribution of this publication is the responsibility of the Magazine Committee.

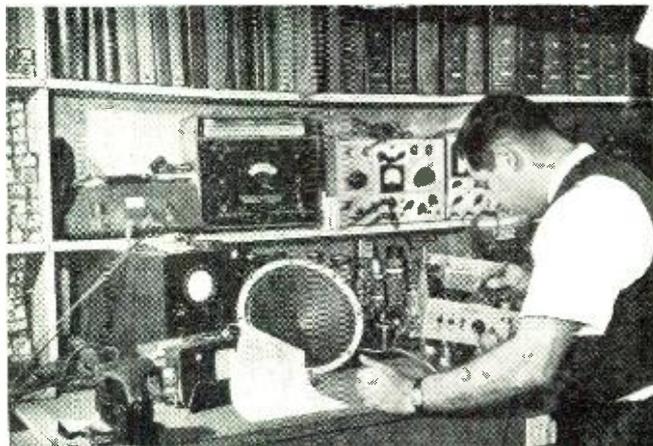
Grievance Committee—Any and all complaints are diligently checked by

(Continued on page 122)

Many Eastern service organizations are already equipped to handle television and FM installations and repairs. Here Frank Krantz and Reginald Cherrill of Witte Radio and Television Company, Philadelphia, check a couple of television receivers.



Author at work in his shop in Philadelphia. A clean, uncluttered service bench, up-to-date test equipment, and complete reference data, in addition to ample electrical outlets, all combine to make for an efficient radio servicing operation.



Capacity Operated RELAYS

By
R. G. ROWE, W2FMF
Consulting Engineer

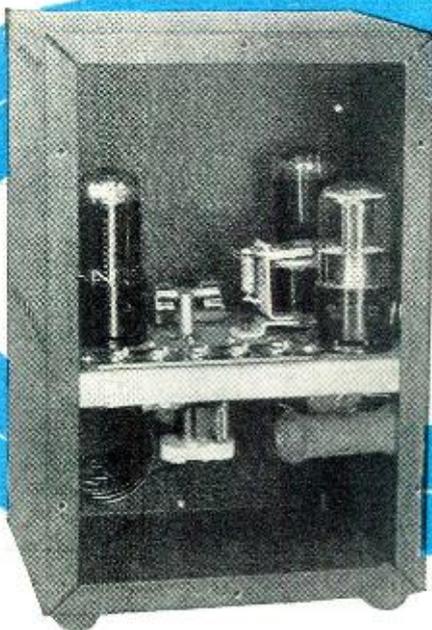


Fig. 1. Rear view of home built oscillator and negative impedance unit. Schematic is shown in Fig. 5.

Although adapted primarily to various industrial applications, this novel device will be of interest to the experimenter. Many intriguing setups can be operated simply by body-capacity effects.

becomes part of the frequency determining network of a variable frequency oscillator, the output of which may be "zero beat" with a fixed oscillator in a mixer circuit. A change in the capacitance of the sensing element, in producing a frequency shift of the variable frequency oscillator, is reflected as a beat note in the mixer output which may be rectified or further altered to activate a relay or other load circuit.

A second general type of capacity-operated relay consists of two identical radio frequency oscillators, the tank inductances of which are link-coupled. A sensing capacitor is connected in shunt with the frequency determining network of one of the oscillators. When the two oscillators are in phase with one another, no current flows in the link circuit. When a capacitance change is delivered by the sensing element, the frequency of the corresponding oscillator attempts to change and currents flow in the intercoupling link in an effort to keep the two oscillators synchronized. These currents may be rectified or otherwise altered to operate the relay or load.¹

A third general type of capacity-operated relay consists in a crystal controlled radio frequency oscillator, in which the sensing capacitor shunts the tank circuit. The oscillator tank may be so designed as to operate on the tank capacitance-plate current curve at a point where reasonably small capacitance changes will produce sufficient plate current excursion to operate a relay in the anode supply circuit.²

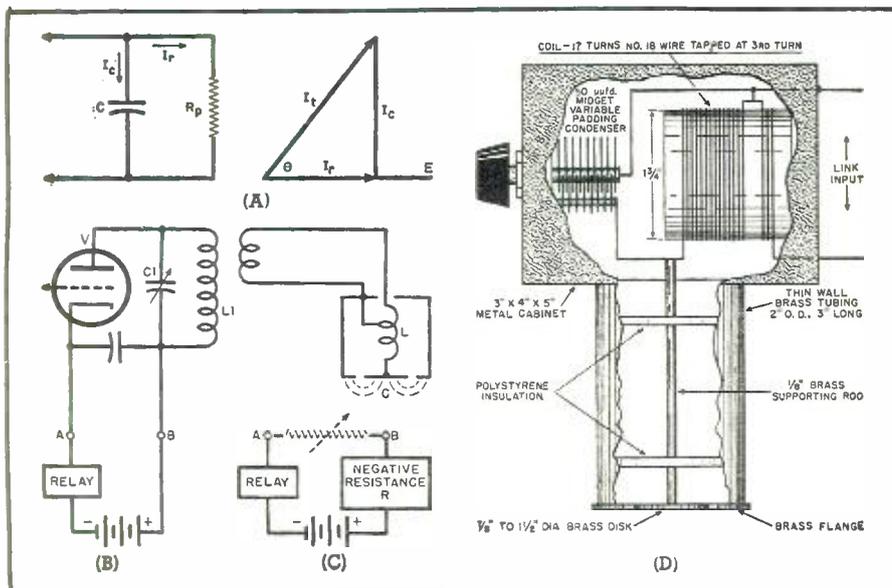
A fourth general type of capacity-operated relay, and one enjoying wide popularity, consists of a radio frequency oscillator in which the sensing capacitor is so connected as to control the amplitude of oscillation by effectively modifying the phase or amplitude of the regenerative feedback voltage. The radio frequency output voltage, or some portion thereof, may

A CAPACITY-OPERATED relay may be described as an instrument which responds to a change in capacitance, or in the character of the capacitance, in a capacity-sensing element by activating or deactivating a current responsive load. The load may be a relay for the operation of an indicating or alarm circuit, a motor for the actuation of a

valve or a multiplicity of other electrical devices. In general, the term "capacity-operated relay" implies an "on" or an "off" snap-action function as a result of a capacitance change, rather than a smooth, gradual function.

One general type of capacity-operated relay employs the beat principle, wherein a capacity sensing element

Fig. 2. (A). Vector analysis of sensing circuit. (B). A capacity-operated relay using a sensing capacitor and inductance, link coupled to an r.f. source. A greater change in control resistance across AB can be obtained by adding a negative resistance as shown in C. In our completed unit this negative resistance is in the form of vacuum tubes, V_1 and V_2 (Fig. 5). (D). Construction details of sensing element shown in schematic diagram, Fig. 5.



be rectified, amplified and employed to operate the relay or load device.^{3, 4, 5, 6, 7, 8, 9}

In all capacity-operated relay setups, the sensing capacitor, which is usually designed according to the dictates of the particular application, obviously must be located at the site of the function being sensed. In all of the aforementioned relay types, the remainder of the electronic apparatus should be located near the sensing capacitor to insure short coupling leads, if the maximum potential sensitivity is to be realized. It will be appreciated how the connecting leads shunt the sensing capacitor so that a small capacitance change of the sensing element itself represents only a small percentage change of the total "lumped" capacitance. By eliminating the lumped capacitance it is in general possible to employ smaller capacitance changes to trigger the relay and, hence, more compact sensing capacitors may be used. Further, in many applications it is undesirable or impossible to locate the relatively bulky, delicate capacity-operated circuit at the site of the function being sensed. One such possible approach to this problem is indicated wherein a secondary LC circuit shunts the primary LC circuit by virtue of a link coupling.¹⁰

A new method will be described wherein a conveniently small LC circuit, comprising a sensing capacitor and an inductance, may be located at the site of the function being sensed and link-coupled through a low impedance, low-loss line to a specially designed radio frequency source.¹¹

With reference to Fig. 2B, there is shown a sensing capacitor and inductance, LC, link-coupled to a radio fre-

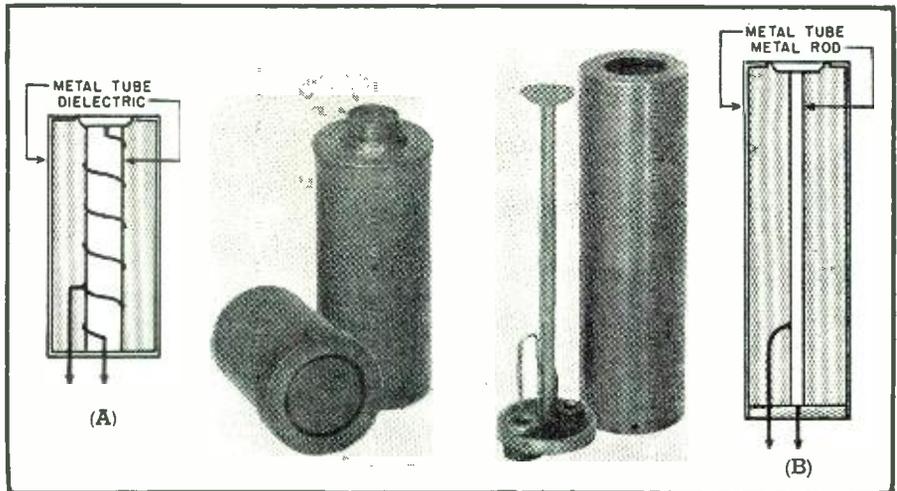


Fig. 3. Two different types of sensing elements that have been used successfully. (A) For the lower frequencies where appreciable inductance is required for resonance, and (B) For higher operating frequencies, this coaxial type is applicable.

quency source comprising tank circuit L_1C_1 and tube V, in which the grid circuit is deleted for convenience. It is known that when resonance is obtained between LC and L_1C_1 , LC will exhibit unity power factor and reflect a purely resistive load to L_1C_1 . The magnitude of this reflected resistance will be determined largely by the resistance of the inductance L and the resistance of the dielectric material in the capacitor field, provided that the link line losses are kept to a minimum. The exact nature of the effect of this load on the source, where the source may be a self-excited oscillator or a radio frequency amplifier, is rather complex and beyond the scope of the present article.

However, in the case in point, the introduction of reflected resistance in L_1C_1 effectively lowers this tank cir-

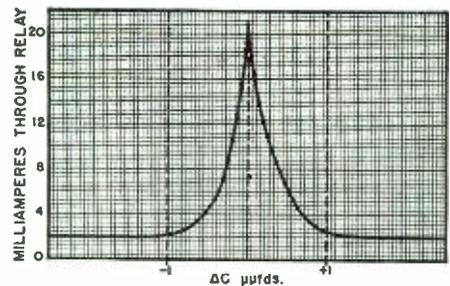
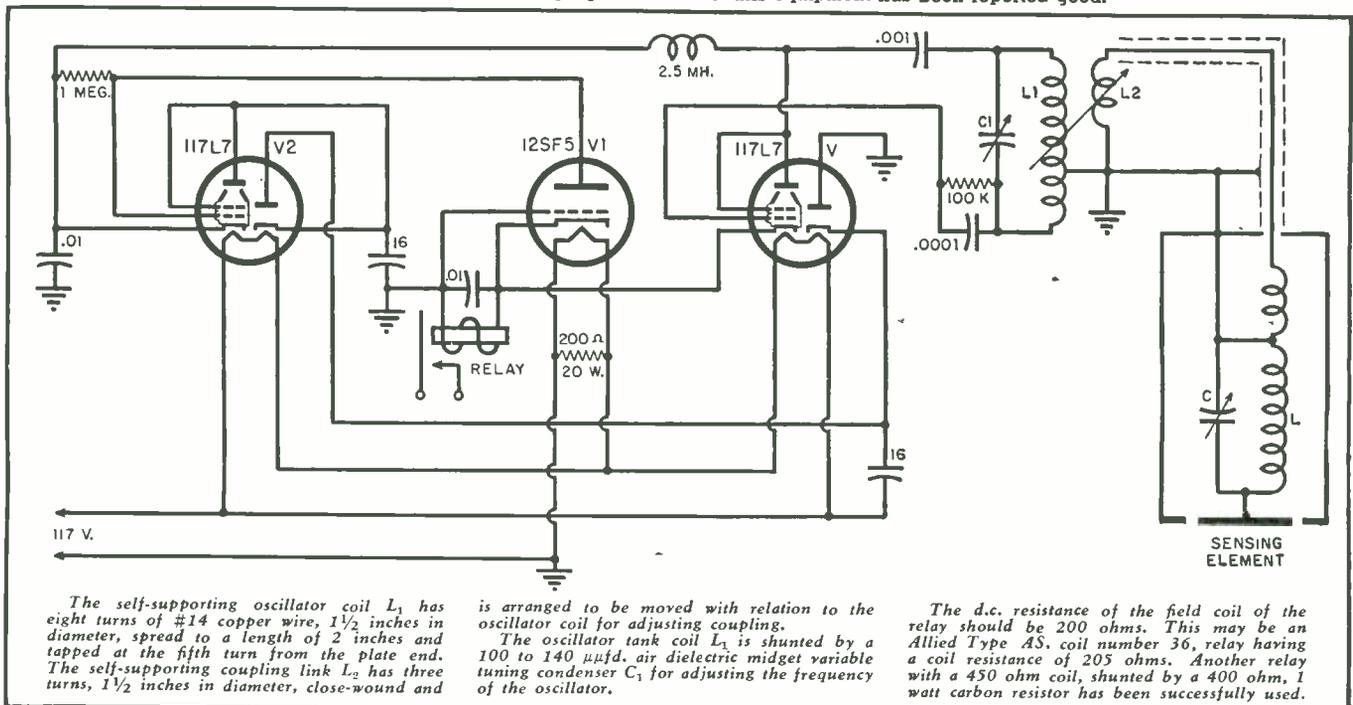


Fig. 4. Graph illustrates the current change that can be obtained through the relay shown in the schematic diagram, Fig. 5.

cuit impedance, resulting in a relatively high plate current flow through tube V. As C is detuned, the effective impedance of L_1C_1 increases, thus reducing plate current through tube V. While not meant to represent theoretical limits, plate current
(Continued on page 135)

Fig. 5. Schematic diagram of home built capacity-operated relay. Although tube filaments are operating below rated voltage, performance of this equipment has been reported good.





The 1N34 crystal diode when mounted in housing shown makes a convenient test probe.

CRYSTAL DIODE Reduces Probe Size

By **ALBERT BEIN**
Radio Eng., National Radio Service.

This simple and compact crystal diode probe makes the signal tracing of small receivers practical.

APPPLICATION of the crystal diode has made signal tracing practical for the radio serviceman by reducing the size of the probe for application to compact receivers and eliminating tuned bands and channels and volt or ohm ranges requiring adjustment when a volt-ohm meter is used. In addition, signal tracing technique analyzes the audio component of the broadcast signal for the source of hum, noise, oscillation, microphonics and other operational faults instead of simply measuring the electrical characteristics of various components which may or may not be the cause of faulty operation.

Unlike the conventional type of signal tracer, which indicates the difference of carrier frequency, the crystal diode probe indicates difference in modulation or changes in the audio component of the signal. All frequencies between 90 kc. and 33 mc. are demodulated by the crystal diode and fed directly into an a.c. audio amplifier.

The crystal probe may be easily constructed by fitting a *Sylvania* Type 1N34 germanium crystal diode and a ¼ watt ceramic type carbon series resistor into a standard voltmeter probe or an *Amphenol* r.f. coaxial probe with capacitance removed. The coaxial probe is recommended. Space

allowed for the capacitance is ample for the *Sylvania* crystal and ¼ watt resistor. Shielded cable should be used with either type of probe and should be pushed in as far as possible to reduce capacity effects. Connecting the plus side of crystal to probe will result in greater output at broadcast frequencies.

Value of the ¼ watt series resistor depends on amplifier gain and signal generator output. With an average signal generator and hi-mu triode and pentode output amplifier the value will be about 100,000 ohms with a possible range from 50,000 ohms to ½ megohm. A .001 µfd. mica r.f. bypass condenser will prevent pickup of r.f. currents at frequencies below 1000 kc. To prevent crystal damage a .01 µfd. blocking condenser is recommended. These capacitances may be mounted in the input section of the amplifier as shown in Fig. 1A.

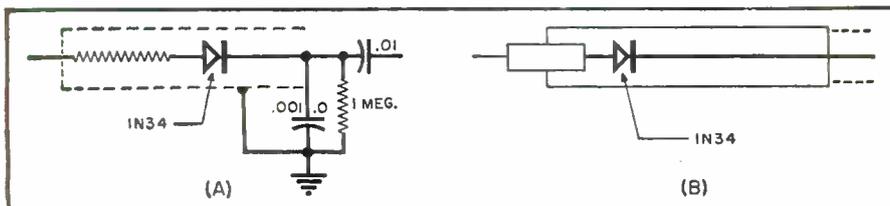
To reduce loading effects of the probe, which should contain a minimum of metal, the ¼ watt ceramic resistor may be used as the probe point by cutting off the external lead wire to within ¼" of the resistor body and using it as a probe point as shown in Fig. 1B. This arrangement will have negligible loading effect even at high frequencies.

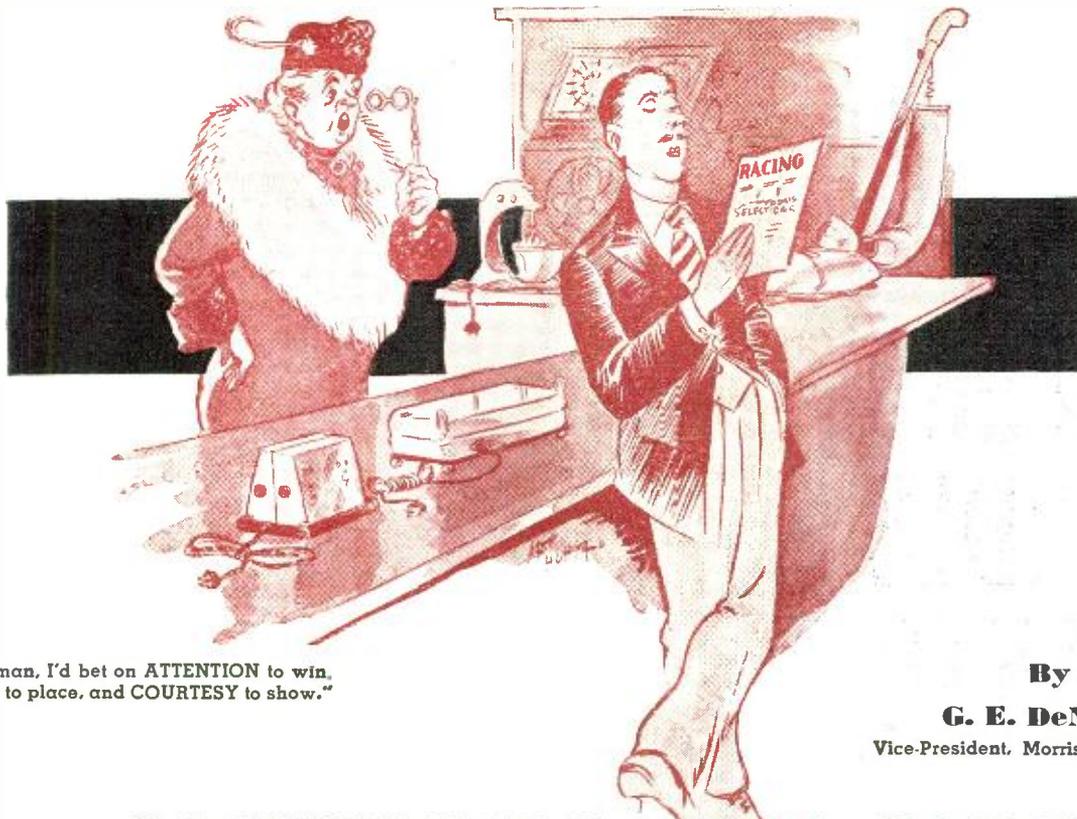
If the probe is made to plug into the wide band amplifier of a signal tracer containing a vacuum tube voltmeter and scope, waveform and sensitivity may be checked at service test frequencies. The crystal diode probe is connected to the signal generator which is operated through its entire range. The result will usually be a good waveform and good signal strength throughout a range of 90 kc. to 33 mc. Frequently signal strength is adequate to drive both the scope and the v.t.v.m. off scale.

Straight a.c. amplifiers should be used with the crystal diode probe.

(Continued on page 147)

Fig. 1 (A). Arrangement of resistor, blocking and bypass condensers in probe utilizing 1N34 crystal diode. Output of the probe is increased at broadcast frequencies when the positive terminal is connected to probe tip. At high frequencies increased output is obtained by connecting the negative terminal of the crystal to the probe tip. (B) Physical arrangement of crystal diode probe using ceramic type carbon resistor's pigtail lead, cut to ¼" length, as a probe point for high-frequency applications.





"Young man, I'd bet on ATTENTION to win, SERVICE to place, and COURTESY to show."

By
G. E. DeNIKE
 Vice-President, Morris F. Taylor Co.

CONSUMERS ARE SORE

WHEN we heard the tale of the returned veteran who decided he and his buddies had better start rehabilitating civilians, we listened with a wry smile. The lad was undertaking a project which might well utilize his full time and talent. "War nerves" of the civilians is a disease induced in large measure by the treatment accorded them by the very persons who might be expected to exert a soothing influence, the merchants of America.

From having been the silver tongued persuaders of the prewar years, merchants and those in their employ did a turnabout which left the consumers with a mixed train of emotions. First shocked and incredulous, then mildly resentful but resigned and finally irate we find today's consumer in a vengeful mood.

How often have you heard "There'll come a day," or how often have you said it yourself when you've been ignored, insulted or intimidated by a storekeeper. That day the consumer has yearned for is dawning. Sooner than we think possible our gigantic production machinery will be spewing forth mountains of consumer goods. Certainly there will be a time lag before they reach every retail outlet, before shelves are filled and showrooms replete, but don't delude yourself that eager millions of consumers are going to storm retail outlets, cash in hand. Don't imagine that they are going to brook wartime insults characteristic of over-confident, under-supplied merchants of the painful

The first wave of buyers which hits your store will be people sorely in need of merchandise. You can make or break your reputation by the way you handle them now.

sales demotion era. As rapidly as supply loosens, sales resistance will stiffen. That day when the millions have dreamed of giving the merchant a piece of their mind and stalking proudly out to purchase elsewhere is at hand.

Be assured that the waiting queue which characterized the cigarette shortage will not form and patiently wait to buy radios and appliances. Consumers are sore and they're going to take some salving before they lay down the cash for what you have to sell them.

The widespread advertising and publicity on new products is going to keep the prospective buyer in a wary mood. There are even signs of an incipient buyers' strike. Dolores Bigelow of Burton Bigelow Organization warns of this danger in an article in "Retailing" wherein she points out that in 1921, a

nationwide consumers' strike expressed a revolt against the retailers' failure to reduce inflated war prices and brought on one of the severest depressions in American history. We well remember how, eventually, prices tumbled all along the line, thousands of stores went bankrupt, factories closed, millions of men were out of work. All because merchandisers had been blind to the fomenting mood of the masses.

(Continued on page 148)

This type of sales demotion, so typical of the wartime period, will have to be corrected by all retailers now.



144 mc. HANDIE TALKIE

By
C. T. HAIST, Jr., W6TWL
General Electric Co.



Fig. 1. Over-all view of completed unit.

Complete construction details of a home-built handie talkie featuring separate transmitter and receiver.

LOTS of interest and enthusiasm has been shown in the handie-talkie sets I designed, built and described in the June issue of *QST* for 1944 and the April issue in 1946. I have now combined my ideas for a third set. This is a handie-talkie to end all handie-talkies.

The first two sets being of the transceiver type had one disadvantage that had to be eliminated. Since the same tube was used for the oscillator for transmitting as well as a detector for receiving, the transmit and receive frequency was not quite the same. This is not objectionable when working a fixed station having a separate transmitter and receiver but does present a problem when two hand sets are used. The result is that on every transmission the receiving station has to retune to receive the other transmitter. This, in turn, changed the transmitting frequency so the other station had to retune when receiving. The different operating frequency of the oscillator

and detector is brought about by the different potential applied to the plate and the introduction of the quench voltage in the grid circuit.

The new set consists of a separate transmitter and receiver using three tubes. The circuit is so arranged that only two tubes are used in either "transmit" or "receive." Simple switching for "transmit" or "receive" is accomplished by switching the filaments of the tubes. Two tubes are connected in series for 3 volt operation and the selection of the oscillator or detector is had by switching either tube in series with the third tube which is the modulator or audio amplifier. Switching of grid and plate circuits are not necessary in this arrangement. This increases the efficiency of the circuit by keeping the leads short.

Antenna switching is accomplished with another section of the same switch. No loss occurs in this circuit even with a common fibre insulated switch, since the switch is at

a point of low r.f. voltage of the $\frac{1}{4}$ wavelength antenna. A third section of the switch closes the microphone circuit when transmitting.

With the 3 volt filament supply and the tubes connected as shown, the modulator amplifier tube is automatically provided with a 3 volt grid bias. If $67\frac{1}{2}$ or 90 volts of "B" supply is used, it will be necessary to insert additional bias (two pen-lite cells between secondary of T_1 and ground) to keep the plate current drain down. A 1S4 connected as a triode is used for the oscillator tube. A 957 tube is used for the detector. A 30 ohm resistor R_1 is connected across the filament connections since the filament drain is .05 amp. in the 957, and .1 in the other two tubes. A 958 could be used and the resistor eliminated, but the 957 makes the better detector and the radiation on receiving is less. The modulator or amplifier is another 1S4 tube. The rest of the circuit is conventional except that the earphone for receiving is used as a Heising modulation choke when transmitting. Since transceiver transformers are at a premium now, a midget 3 to 1 audio transformer with an additional winding for the mike was used. The midget transformer core is disassembled and the winding cover paper is removed. A single layer of #30 cotton covered wire is wound over the secondary winding of the transformer and the winding shellacked for holding it in place and for protection. The 3 volt filament circuit is also used to supply the mike current.

Switch S_2 , as shown in the circuit diagram, is used for turning the set "on" and "off." This switch was later modified so that the set turned on when the antenna was pulled out of the case. Two leaf springs taken from an old headphone jack were mounted along the side of the polystyrene antenna holder. By fastening a polystyrene block on the end of one spring (providing a cam action) the contact was made to close when the antenna was pulled out. The block riding on the antenna when the antenna is in the case keeps the filament circuit open.

The chassis is a $\frac{1}{8}$ " \times 2 $\frac{5}{8}$ " \times 4 $\frac{1}{2}$ " piece of polystyrene. The chassis is drilled as shown in Fig. 8. All parts are mounted and wiring is completed before the chassis is inserted in the case. This provides ease of wiring and service. Double tie points mounted on each end of the transformer provide soldering terminals for the microphone, earphone, and "B" battery leads. The A lead from the "on" and "off" switch is the only wire coming from the chassis to be connected. On the under side of the chassis small angles are mounted under the transformer mounting screws to provide a means of holding the chassis to the case. The front end of the chassis is held by the polystyrene antenna support going through the top of the case. Tube socket VS_1 is supported by soldering pins 2 and 6 to the stator plate supports of tuning conden-

ser C_4 . Socket VS_3 is supported by a small brass angle. Tank coils L_1 and L_3 are self-supporting and their leads are soldered directly to the condenser stator and rotor connections. L_2 and L_4 antenna coupling coils are single turn loops supported by 4-40 screws. Assembly details are shown in Fig. 6. The knobs for the tuning condensers are made from a polystyrene rod as shown in Fig. 7C. The knobs extend through slots on both sides of the case. The condensers are turned by thumbing the edge of the knob. This method leaves the case free from large protruding knobs that would be bumped and turned in handling. A piece of hard finish white paper is glued to the back of the knobs and the condensers are then calibrated for the two meter band. Two small windows $\frac{1}{4} \times \frac{5}{16}$ are filed in the back of the case for viewing the figures. In filing the windows a small point should be left in the center of the slot for the index pointer.

Below the chassis is the battery compartment. A $67\frac{1}{2}$ volt battery is supported off the rear of the case by a small channel made from a piece of aluminum. This provides clearance for the antenna when it is raised or lowered. Bias cells for the 1S4 modulator are placed on each side of the antenna under the "B" battery. Below the "B" battery is located the flash light cells for the filament circuit. The two batteries are connected in series and the connections may be soldered to the batteries or a bracket made so that the batteries may be plugged in.

The earphones and microphones are

Fig. 3. Front view of unit with cover removed; internal assembly arrangement.

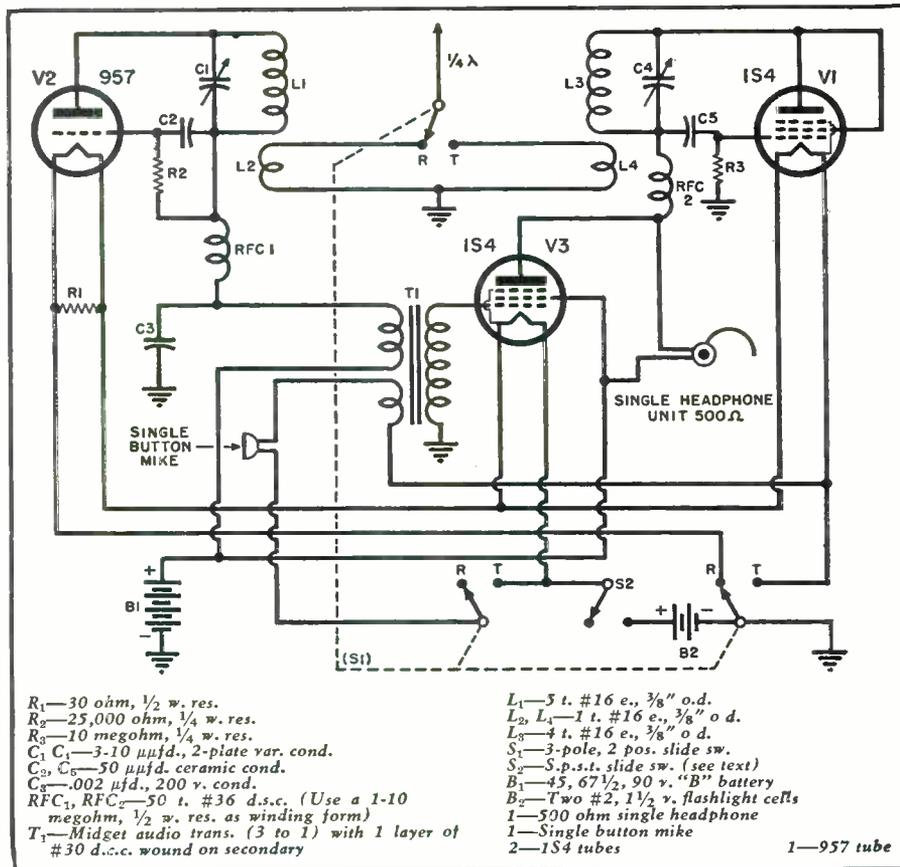
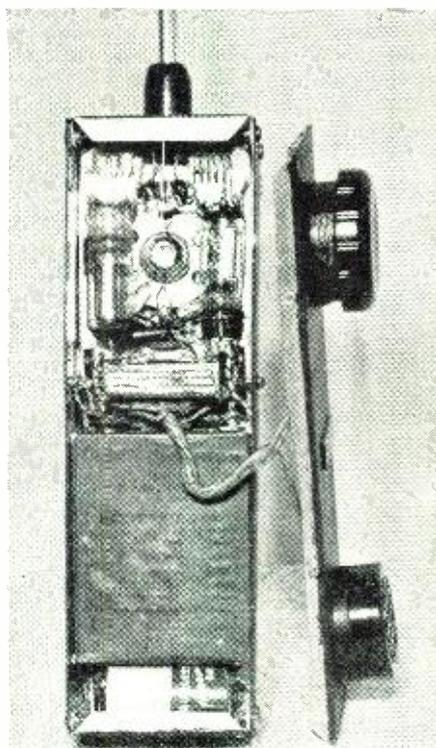
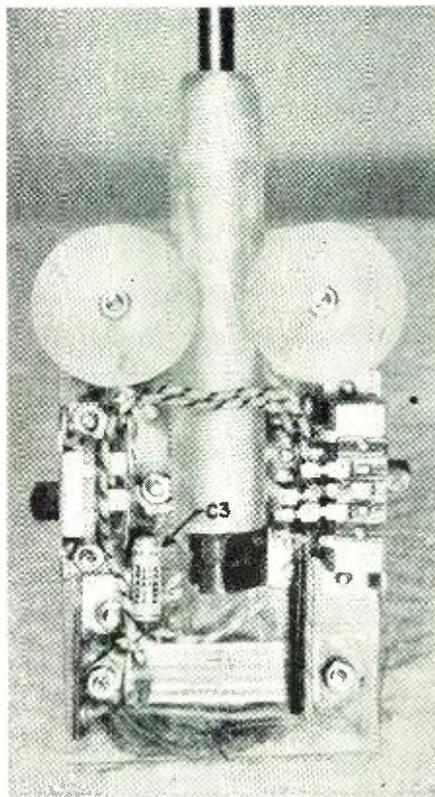


Fig. 2. Schematic diagram of three-tube, 144 mc. home-built handie-talkie.

fastened to the cover of the case with machine screws. Flexible leads are connected to the two units and brought down to their respective tie point terminals on the transformer.

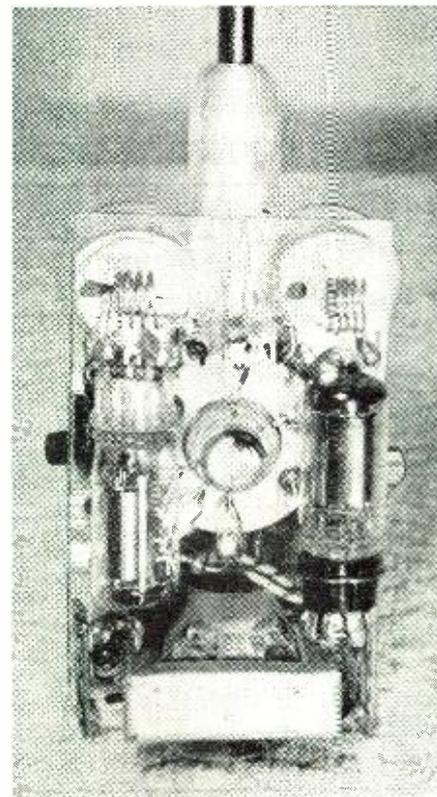
Fig. 4. Rear view of transmitter-receiver portion of 144 megacycle handie-talkie.



The telescoping antenna is a modified auto radio antenna. With the auto antenna extended, the bottom section is cut off so that it is ap-

(Continued on page 131)

Fig. 5. Front view of transmitter-receiver shows placement of component parts.



Television Takes to the Air



Fig. 1. Complete camera unit of the "Block" airborne television set.

By **JORDAN McQUAY**

**Technical review of the warborn "Block"
and "Ring" television systems which will be
used for airborne on-the-spot video news coverage**

THE rapid advance of television during the past half-decade has brought about the development of an important specialized phase; highly mobile, *completely airborne* television equipment.

Television pickup and transmitting equipment that once might have weighed tons and filled a large room now has been redesigned, modified, and built to "suitcase" compactness, while retaining a high degree of picture fidelity. Although useful in many other applications, the extreme portability of the equipment makes it particularly adaptable for use in aircraft.

And thus: Television takes to the air.

Using cameras equipped with super-sensitive Image Orthicons, the newest of airborne televisions incorporates all of the latest and most efficient video techniques, including use of improved automatic gain control, synchronizing, picture shading, and automatic frequency control circuits for scanning.

Ranking in technical importance with radar and the proximity fuse, airborne television was largely a wartime development.

Two principal types of gear provided electronic "eyes" for remote controlled aircraft, flying bombs, and other types of guided missiles. Airborne televisions were also used to observe naval and military actions, as well as general reconnaissance work and the transmission of maps, charts, and other tactical information.

But use of this type of equipment is not limited to warfare. Its greatest future lies ahead.

Many of the video and electronic circuit developments are even now being incorporated in new commercial television apparatus.

Laboratory work is now under way to convert and adapt this warborn equipment for practical peacetime employment.

What will airborne television do?

It will provide revolutionary news-

reel-type coverage of important events for rebroadcasting into the homes of television set owners. "On-the-spot" coverage of fires, floods, accidents, disasters, parades, and other events of public interest can be obtained over long or short distances, from moving vehicles, boats, airplanes, and helicopters. Such instantaneous transmission of eye-witness views of important events will bring a new meaning of realism to broadcast-television.

Other important uses of this portable television equipment include exploration of unknown terrain, and the transmission of such data to ships or planes, whose pilots may be unfamiliar with the region.

Small, fixed installations can be used as electronic "watchdogs," where peril from heat, chemical, or radioactive processes would render human observation impossible.

Because it is relatively small and light in weight, the equipment lends itself to either fixed or mobile installations and for *any* kind of visual supervision or investigation.

Besides being lightweight and diminutive, the equipment operates satisfactorily with the small transmitting antennas practicable for airplanes, on airplane power supply, and under unusual physical handicaps of noise and extreme vibration.

Two distinct types of airborne tele-

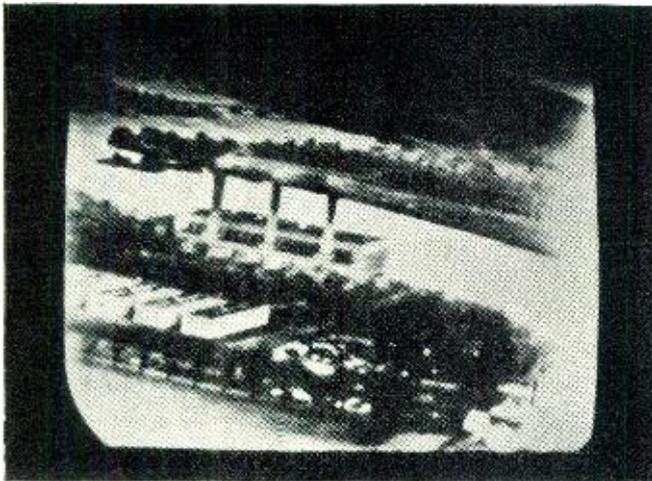


Fig. 2. Typical image televised by the "Block" airborne set. Picture shows a river-side power plant picked up at 3000 ft.

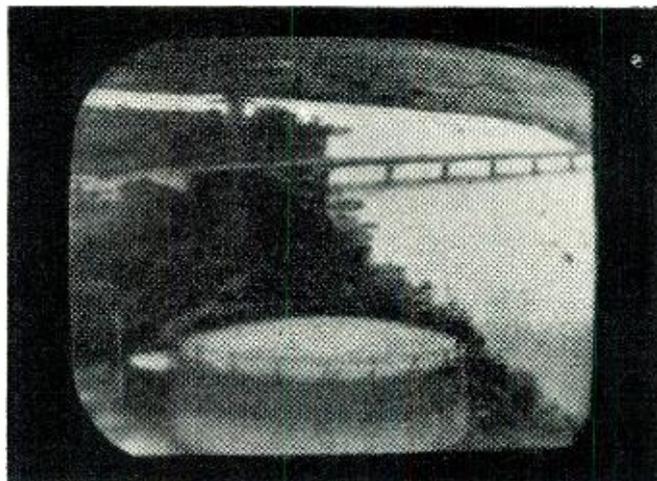


Fig. 5. Typical image televised by "Ring" airborne equipment. Scene is Sousa bridge and storage tank on the Potomac River.

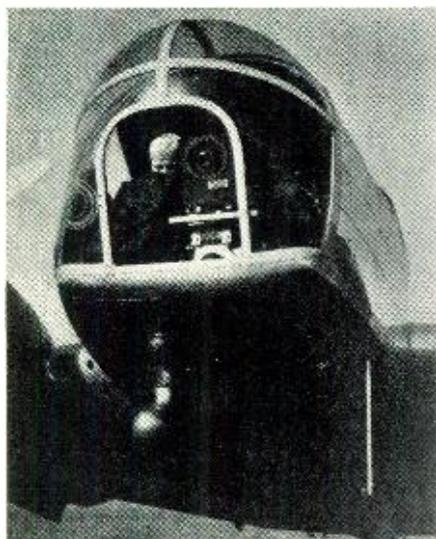


Fig. 3. "Block" television camera mounted in nose of plane and ready for action.

vision equipment were developed during the war by engineers and scientists of the *Radio Corporation of America*, the *National Broadcasting Company*, and the United States Navy. For security reasons, the two television systems were identified by special code names: "Block" and "Ring." But since the war these names have become permanent nomenclature.

The *Block* system is a small, compact televisor suitable for short-range pickup and transmission of pictures,

operating up to about 50 miles. The complete apparatus, including power supplies and a single camera, weighs only 100 pounds. It operates unattended, and provides good picture fidelity under most operating conditions.

The *Ring* system is much larger in size, using two or more cameras and a crew of four operating engineers. This equipment has a range of over 200 miles when transmitting at an altitude of 15,000 feet. And the complete apparatus weighs about 500 pounds.

The *Ring* system provides considerably greater picture fidelity than is possible with the smaller *Block* system, chiefly because components of the *Ring* system can be operated at all times under optimum operating conditions, while components of the *Block* system cannot be adjusted during flight and thus can be operated only under average operating conditions.

However, such a comparison of the two systems is not strictly fair, since each type of airborne equipment was designed for a particular tactical purpose. And the two systems were not intended to compete with each other.

Block Equipment

The *Block* airborne television system (Fig. 4) is a small but complete television broadcasting system, normally installed in high-speed reconnaissance aircraft.

The entire *Block* equipment is housed in a single demountable unit

(Fig. 1) containing all components necessary for televising and transmitting images. The power supply for the unit is self-contained and operates directly from the plane's generator.

Block equipment functions automatically and is unattended. The camera-unit is fixed, usually in the nose of the aircraft (Fig. 3). Any panning effect is accomplished by the plane's pilot, who moves the controls of the plane in such a manner that the television camera screens the desired object or target.

The camera uses an Image Orthicon, and the output of this tube is fed to a video amplifier whose gain is preset (Fig. 4). The video signal is then combined with appropriate sync and shading signals in the conventional manner, and this combined signal—sync plus video—is applied to the modulator stage. This amplified signal is then used to grid-modulate the power output stage of the transmitter. The output stage is also plate-modulated by a separate sync signal from the sync generator.

Thus the transmitter is decidedly unique in that it combines both grid and plate sync modulation.

The purpose of this modulation arrangement is to maintain the percentage of sync modulation constant, increasing the range, reliability, and electronic stability of the televised picture.

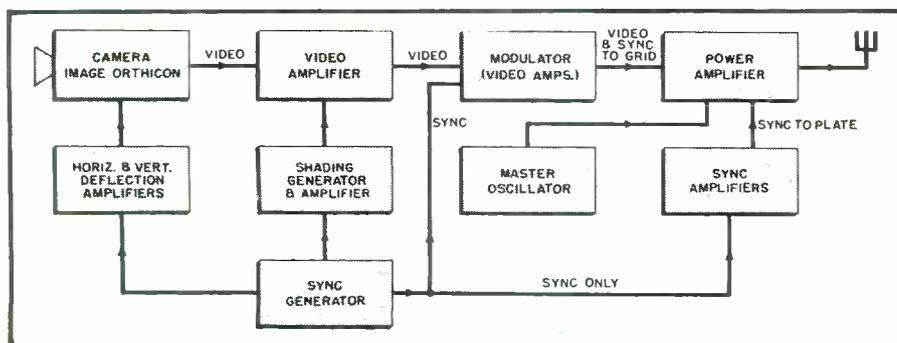
Operating frequency of the *Block* transmitter is between 264 and 372 megacycles, controlled by a master oscillator stage. The output of the transmitter delivers approximately 60 watts of power to special transmitting antennas used for each of ten workable channels.

Scanning standards for *Block* equipment require sequential scanning at 350 lines, 40 frames per second.

Sequential scanning is used for purposes of circuit simplicity. This method of scanning, however, provides considerably less resolution, primarily because of adjacent-line halation.

Since the *Block* equipment operates unattended, it must be properly adjusted by the technical ground crew

Fig. 4. Simplified functional diagram of "Block" television system.



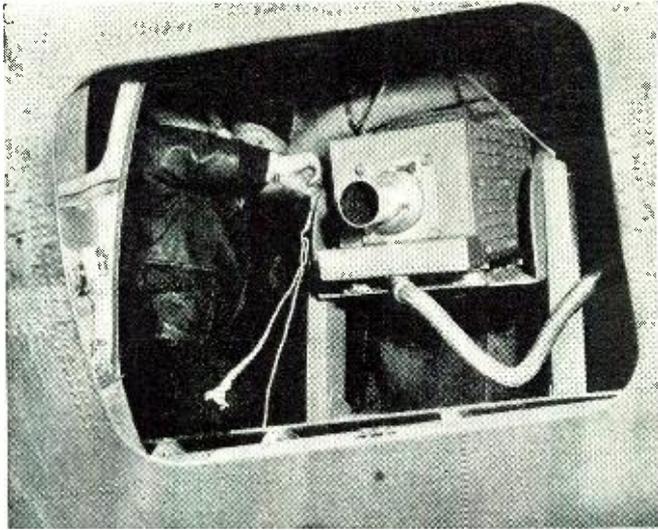


Fig. 6. "Ring" type camera mounted in the waist of aircraft. This camera was used principally for close-up observations.

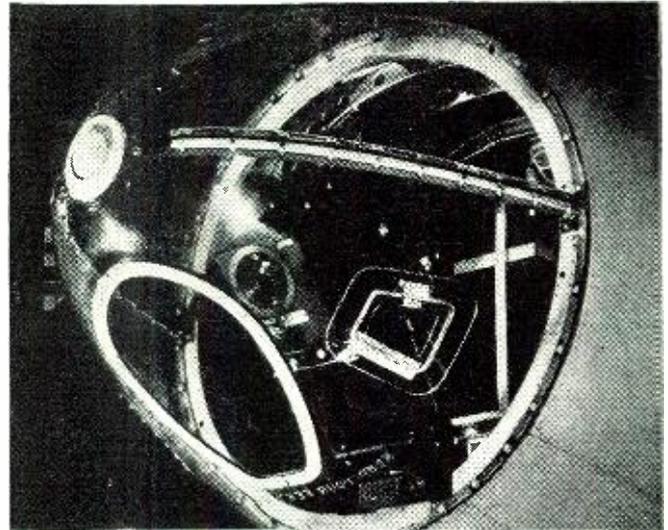


Fig. 7. "Ring" camera mounted in the nose of aircraft. This camera is usually used for shooting general over-all scenes.

before it becomes airborne. In operation the gear must have fixed focus, fixed lens aperture, fixed shading, and fixed camera positioning in the nose of the plane. For these reasons the equipment can never function with an efficiency comparable to the larger *Ring* system since the *Block* equipment must be adjusted for average (not optimum) operating conditions. Any variance from the average operating conditions will be detrimental to its operation thus impairing the picture quality.

In its early stage of development *Block* equipment was used by the Navy's Special Task Air Group One during attacks on Bougainville and Rabaul. The targets there were successfully relayed back over a distance of 15 miles.

In a slightly modified form *Block* equipment was also used extensively during the war for control of guided missiles, including glide bombs, "crash" boats, and other death-dealing devices in need of visual control or observation of final results.

A typical image televised by the *Block* equipment is shown in Fig. 2.

Ring Equipment

The *Ring* airborne television system (Fig. 8) is also a complete television broadcasting system, but it's normally installed in medium or large airplanes.

While the previous *Block* system was designed to be compact and expendable if necessary, the *Ring* equipment was built for television production along standards comparable to those expected from portable ground equipment now in use to cover boxing, football games, and other special events.

Two pickup cameras are generally used with *Ring* equipment, but three or more could be used if desired. Each is operated by a television cameraman. A transmitter engineer is required to supervise operation of the 1 kilowatt video transmitter. All technical operations within the plane are controlled and monitored by the video control engineer.

Thus in the more general installation, four television engineers are required to operate the *Ring* equipment, these in addition to the usual plane crew.

This television system is specifically designed for synchronized control of all technical operations under the direct supervision of the video control engineer.

The cameras are not fixed, but are free to move. They are each equipped with lenses of different angles to permit observation of an over-all area or, when desired, the observation of pinpoint targets within a given area. And when required, specific targets can be greatly enlarged.

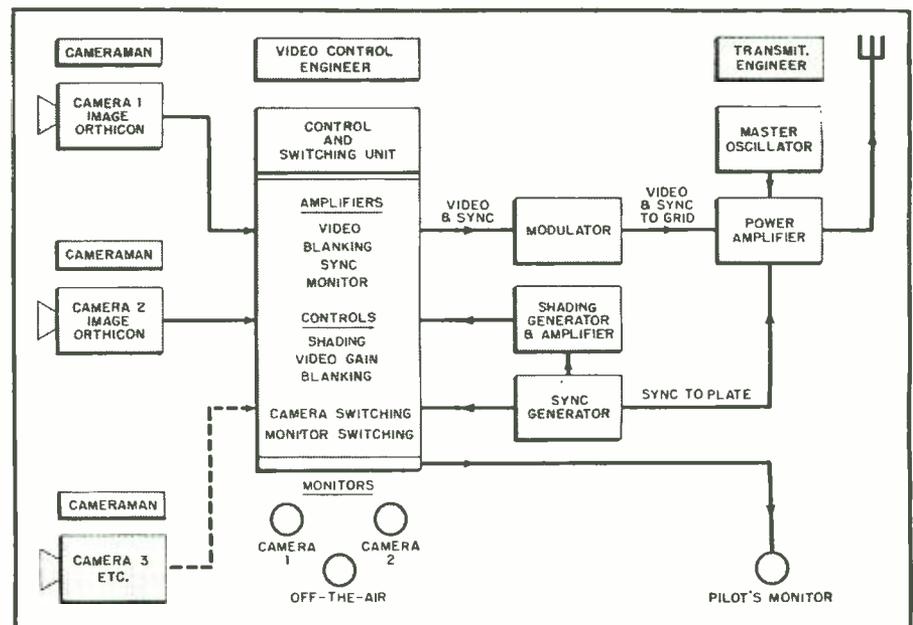
Picture monitoring is an important part of the *Ring* equipment. One monitoring scope is for the exclusive use of the plane's pilot, providing the pilot with a view of either output of the two cameras. Then, by means of closely integrated communication be-

tween the pilot, video control engineer, the cameramen, and ground base headquarters it's a simple matter to locate pinpoint targets.

This integrated control is only one of the many duties of the video control engineer. He's also responsible for shading of each camera, controlling the video output and blanking level for each camera, directing each cameraman (via the plane's intercom system) on matters of excessive brightness, lens apertures, panning, and focusing. This engineer is the focal point for all communications with the ground base headquarters and with any other planes involved in an operation.

Because all components of the *Ring* equipment are under the constant control, scrutiny, and supervision of a complete engineering staff, all of the many technical adjustments can be maintained continually at their optimum during the entire flight or
(Continued on page 100)

Fig. 8. Block diagram illustrates principle of operation of "Ring" television system.



Distortion Analyzer

Simplicity of construction and operation puts this test instrument within the reach of the average serviceman.

By J. T. GOODE

Asst. Chief Eng.
Packard-Bell Co.

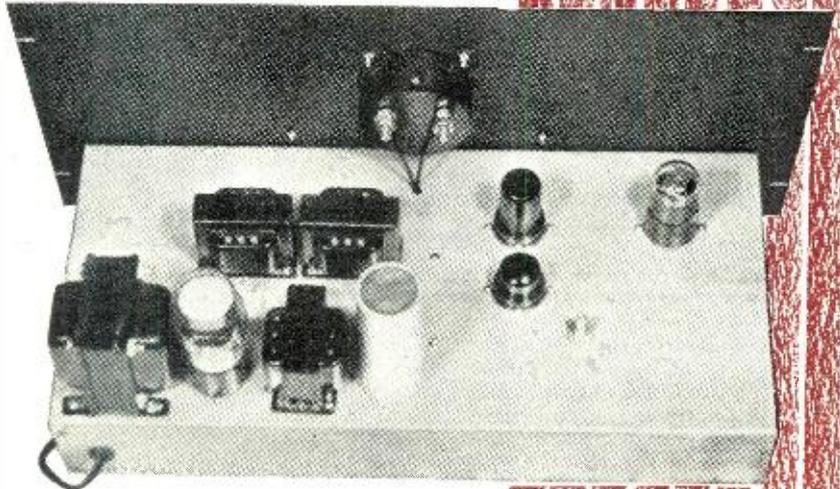
THE equipment to be discussed in this article when used in conjunction with the *RC* audio oscillator discussed in last month's issue gives the operator an opportunity to delve into some of the mysteries of audio amplifiers. An engineer who has constructed several audio amplifiers soon finds out that one amplifier operates differently from another. The difference may be in tone quality, power output, or both.

If distortion measuring equipment is not available, the engineer is not in a position to analyze properly what is causing the difference other than by checking voltages and observing patterns on an oscilloscope.

Under some conditions the voltages will be identical and continuity tests will indicate no change. By substitution of parts the difficulty is usually determined and corrected. A distortion analyzer makes it possible to check stage by stage and adjust each value of resistor, condenser, or transformer for optimum operating conditions. The use of common resistor and condenser values for resistance-coupled amplifiers is normal practice, but actually some definite value of resistor, condenser, or transformer will give optimum operating conditions if proper equipment is used to indicate slight changes when these values are varied.

A well designed amplifier will naturally have a minimum amount of distortion. It is extremely difficult for an engineer to simply listen to a loudspeaker and determine by substitution of parts when the amplifier is giving minimum distortion. The use of an oscilloscope aids the situation materially but still does not completely suit the purpose.

When determining the correct value of resistance for a particular circuit and selecting an optimum value, it is necessary to use something that will indicate small changes, such as a fraction of 1%, in that some changes of this value of resistance may cause only a slight improvement. For instance, the plate resistor in a resistance-coupled amplifier may be changed from 100,000 ohms to 150,000 ohms, decreasing the distortion by 1%. The screen resistor on this same stage is adjusted from 500,000 ohms to 750,000 ohms, reducing the distortion another 1%. By selecting these optimum values, we have reduced the distortion in



Top rear view of distortion analyzer. Cost is reduced by using minimum number of components.

this amplifier 2%, but with an oscilloscope this change would not be noticed and most certainly not by a listening test, yet 2% of distortion was removed from the circuit.

The same adjustment made on the following amplifier stage could result in another decrease of distortion in the order of 1% or 2%. The net result of the over-all amplifier distortion would be in the order of 4% or 5%, which is a worthwhile improvement. In transformer design, distortion becomes a very important factor. Selection of a transformer that gives maximum gain may result in an increase in distortion over another transformer that gives slightly less gain.

The difference in percentage of distortion can be less than that observed on an oscilloscope. In amplifier design, the addition of a tone control or negative feedback circuit is normal. Tone controls sometime result in an increase in distortion as well as high frequency attenuation. The percentage of distortion created under such conditions can be compensated for if the amount of distortion can be indicated. Negative feedback is normally used to reduce distortion. The use of a distortion analyzer makes it possible to determine what effect this feedback is causing and how much feedback is optimum.

The distortion analyzer becomes an important piece of equipment for servicing radios. Placing new tubes in a receiver may result in no particular improvement in the quality of the set. New tubes have a habit of being defective, and when such a condition exists, the technician may spend con-

siderable time determining the difficulty. A simple distortion test immediately indicates the difficulty.

The use of this distortion analyzer is extremely simple. By connecting the distortion analyzer to any part of the audio circuit, the distortion can be read in direct percentage. Going from stage to stage in a matter of seconds, the source of distortion can be located.

Understanding the operation of a distortion analyzer aids the operator in determining where a distortion measurement can be made to aid design or the repair of existing equipment. The distortion analyzer consists of four tubes: (1) 6SN7, amplifier stage; (2) 6SR7, vacuum tube voltmeter amplifier; (3) 6H6, vacuum tube voltmeter rectifier; (4) a type 80 tube used in the power supply. The 6SN7 amplifier stage amplifies low voltages, creating a sufficient voltage for the distortion filter. This amplifier is distortionless (.1% or less). The output of this amplifier is sent into the bridged-T filters.

Two filters may be selected by a switch on the front panel, one frequency at 400 cycles and the other at 1000 cycles. These filters cancel the fundamental frequency, leaving all harmonics. The vacuum tube voltmeter is simply switched from input to output of the bridged-T filters, and the difference in voltage determines the percentage of distortion. The 6SR7 amplifier amplifies the input or output of the filter, creating sufficient voltage for the 6H6 rectifier tube. The power supply voltage is adjusted so that 200 volts is applied to the plate

circuit of the 6SN7 and 6SR7 tubes.

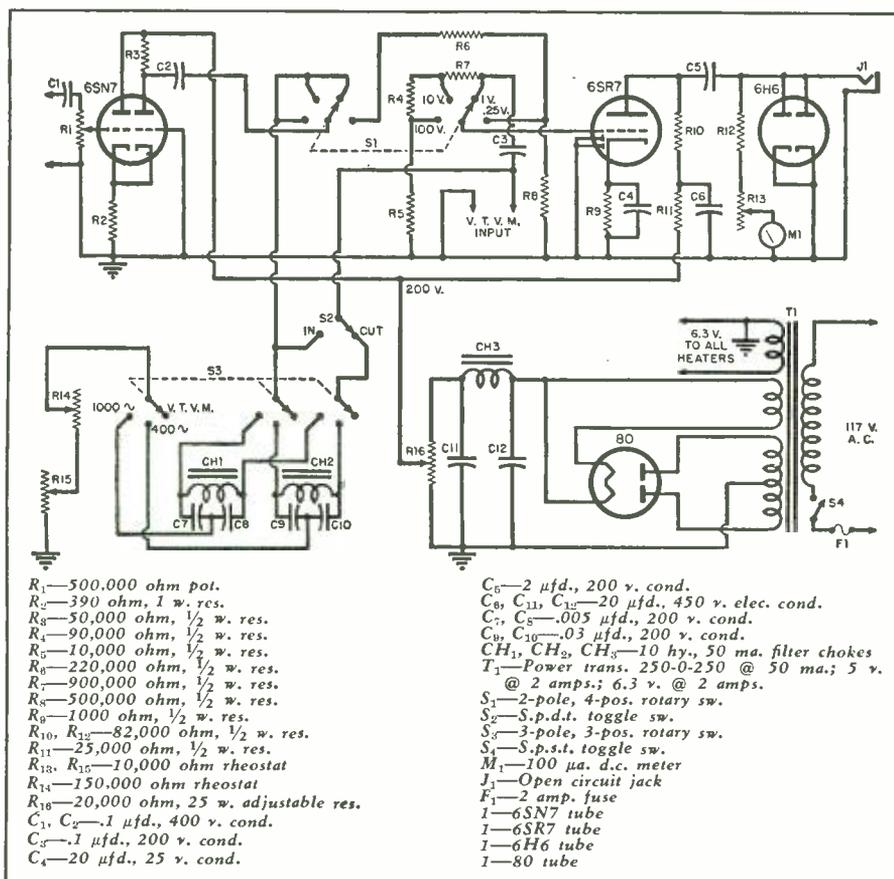
The 6SN7 amplifier is an extremely simple audio circuit. The first section of the amplifier operates as cathode follower, and the voltage created by the common cathode resistor is then impressed on the grid of the second stage of the amplifier, which creates an extremely low impedance grid circuit as well as negative feedback. The gain of this amplifier is approximately 5. The operation of the bridged-T filter circuit is to cancel the fundamental without materially affecting the harmonics. This filter does just that, effectively.

The filter consists of an iron core coil with two condensers in series shunting it. The center tap of these condensers is connected to two variable resistors. One variable resistor is 150,000 ohms and the other is 10,000 ohms. The 150,000 ohm resistor becomes the coarse adjustment, and the 10,000 ohm resistor becomes the fine adjustment. By means of a three-pole, three-position switch, the two filters may be selected, and the third position of the switch will allow the use of the vacuum tube voltmeter circuit for other purposes.

A single-pole, double-throw switch connects the vacuum tube voltmeter to the input or output circuit of the filters. At this point the voltage is fed into the vacuum tube voltmeter decade switch. This decade switch will select various voltage ranges. The output of the amplifier is then fed into the plate circuit of the 6H6 and the rectified current is indicated by a 100-microampere meter. A 10,000 ohm variable resistor is connected in series with the meter, which creates a calibration adjustment for the meter.

The operation of the vacuum tube voltmeter is as follows: 1 volt is fed into the vacuum tube voltmeter with the switch in the 1 volt position. The 10,000 ohm calibration resistor is then varied for full scale deflection of 100 microamperes. After this adjustment is made, the vacuum tube voltmeter will be in calibration on all voltage ranges with the exception of the .25 volt range, providing the decade resistors are of the correct value. By measuring several resistors of the same value, it is possible to select a set of three resistors that will give 1% or 2% accuracy. For instance, if the nearest value to 900,000 ohms turns out to be 950,000 ohms, then select a 95,000 ohm resistor in place of the 90,000 ohm resistor. Next, select a slightly higher value for the 10,000 ohm resistor. In other words, the total resistance of the three resistors is not critical, since the grid circuit offers no load, and it is simply a voltage divider. The resistance values selected added together will total 1 megohm. The total resistance could be two megohms, one and one-half megohms, or any other value in that region as long as the steps in the decade follow in steps of ten to one.

The author was able to bridge a quantity of 10% resistors and create a decade that was accurate within 1%



Schematic diagram of the completely a.c. operated, 4-tube distortion analyzer.

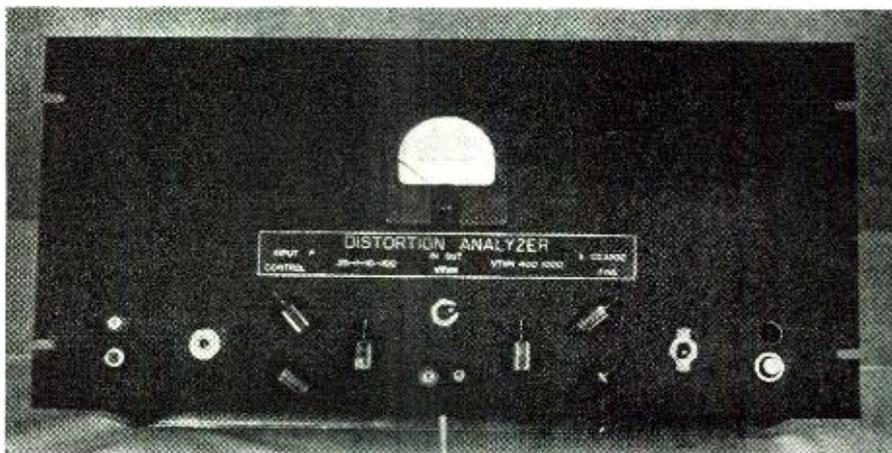
in a matter of minutes. The purchase of 1% resistors would, of course, eliminate the problem but would increase the cost of construction. When the voltage selector switch is moved to the .25 volt position, the gain of the 6SN7 amplifier stage is utilized. To calibrate this set of resistors, rotate the input control to maximum and apply .25 volt to the input terminal. Connect a 500,000 ohm variable resistor in place of the 220,000 ohm resistor which connects between the contacts of the selector switch. Adjust this resistor until full scale deflection is indicated by the 100 microampere meter. Remove the variable resistor from the

circuit and measure its resistance, substituting a fixed resistor for that particular value.

The 500,000 ohm resistor from the switch contact to ground is not critical if placed in the circuit prior to the adjustment just mentioned. By placing the filter selector switch in the vacuum tube voltmeter position and the "in or out" switch in the "out" position, it is then possible to use the vacuum tube voltmeter for purposes other than distortion measurements.

For voltages of 1 volt, 10 volts, or 100 volts, use the vacuum tube voltmeter binding posts. For voltages less
(Continued on page 140)

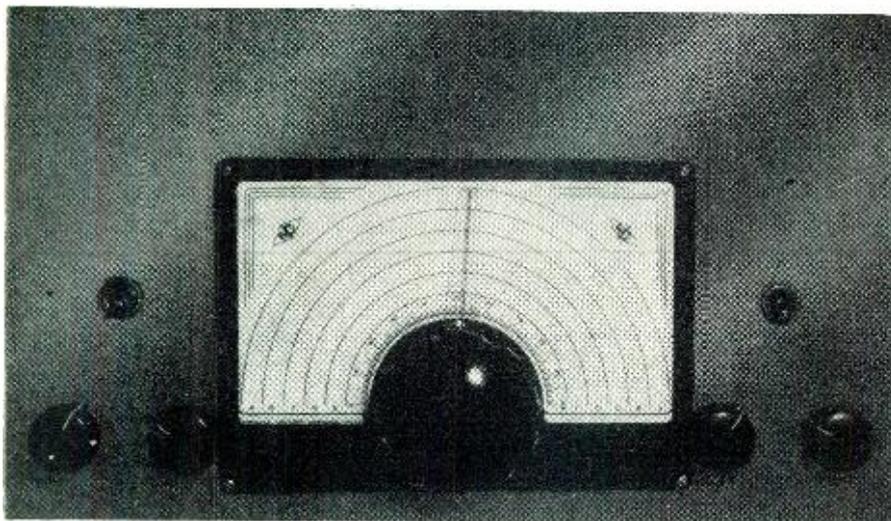
Front panel view shows proper location of various operating controls. In order to achieve a symmetrical panel layout, the control toward the left of the panel, below the "Input Control" is a dummy and not used. It may be omitted entirely.



A 5-TUBE HAM SUPER

By C. V. HAYS, W6RTP

Complete construction details for a short-wave receiver that can be built at reasonable cost.



Panel view of completed receiver. Controls from left to right are: volume control, R_{11} ; a.v.c. control, R_{16} ; tuning condenser C_{12} , C_{13} ; regeneration control, R_{17} ; and standby switch, S_1 . Toggle switch S_2 , is to the left and S_3 is to the right.

IN THE design of a suitable amateur communications-type receiver there are several approaches open to the builder. If the only consideration, or the primary one at least, is the matter of performance, then the problem simply becomes one of choosing the best circuits and components available. However, many hams do not have the requisite pocket-book to indulge in the deluxe type receivers commonly to be found, and the usually-to-be-seen simpler type of receiver is almost always frankly *disregarded* which the designer admits will not hope to equal in performance the more elaborate jobs; i.e., it lacks sensitivity, has no selectivity, usually has no speaker output stage, no b.f.o., etc., etc. This article will give data on the construction of an inexpensive communications job which makes no apologies insofar as performance is concerned—the cheapness has been obtained by deleting heavy panels and chassis, cabinet, meter, pilot light, etc., and by using a simple type of dial

whose excellence of action is well known among hams, yet is not expensive. A simple type of power supply adds further to the economy, so that the builder's \$20-\$25 purchases pure performance without doo-dads.

The front end of the receiver employs a high gain 7V7 or 7G7 tube, fed conversion voltage from a simple 7A4 Hartley oscillator in a method which ensures quiet, high conversion gain detection in this critical spot. A single stage of 1600 kc. i.f., using a type 6SF7 tube may be used if the builder desires a.v.c.; if not, a conventional 6SJ7 tube in this spot is recommended, merely leaving out the a.v.c. circuit shown in the schematic. The i.f. stage has regeneration of a simple sort applied to it by inserting a variable series resistance between the chassis and the screen grid bypass condenser, giving a degree of selectivity, easily controllable, that can be adjusted to the familiar "ping" sound common to crystal filters for c.w. work, or used in broadcast positions as desired. Careful layout

and shielding, as well as good bypassing, etc., are necessary in the i.f. stage—we want the regeneration to be introduced *when* we want it, and as *much* as we want it, only! Build the stage exactly as shown, not forgetting a 1" x 1¼" shield (of tin or brass) which connects to pins 3 & 8 (ground), if a 6SF7 is used. If a tube of the 6SJ7 type is used, just make sure the shield solders to a good ground connection, and isolates plate and grid circuits.

Following the i.f. stage, we use a 6SN7, which tube has two complete triode units in one envelope, for a combined plate second detector and b.f.o., in which use it has proved an excellent performer. Lay out the socket so that pins 1, 2, and 3 point at the b.f.o. transformer, and the pins 4, 5, 6 come as close as possible to the last i.f. transformer; this will ensure neat, easy wiring, with all leads spaced sufficiently. No other precautions are necessary in the second detector circuit—follow the parts placement exactly for the b.f.o. section, and no trouble will be experienced with "birdies" when using b.f.o. for c.w. work, with the shielding as shown. A different layout might require that all component parts of the b.f.o. circuit be shielded separately, so that chassis layout given had best be followed in the interest of painless construction.

The audio stage is a conventional 6V6, which more than sufficiently excites a 5" PM speaker for those who wish speaker performance—if phones only are used or desired, the 6V6 stage can be deleted, the 6SN7 detector giving more than enough gain for such operation. In the interest of laziness, the output transformer was fastened directly to the chassis, instead of on the speaker itself, as is common practice. It has worked out better thus than on the speaker, since in carrying the little job from place to place, it is a simple matter to find a permanent magnet speaker of some sort lying around, and since the receiver has its own output transformer, it is a simple matter to fire up the 5-tuber for demonstration, etc., without the necessity of finding a suitable matching transformer.

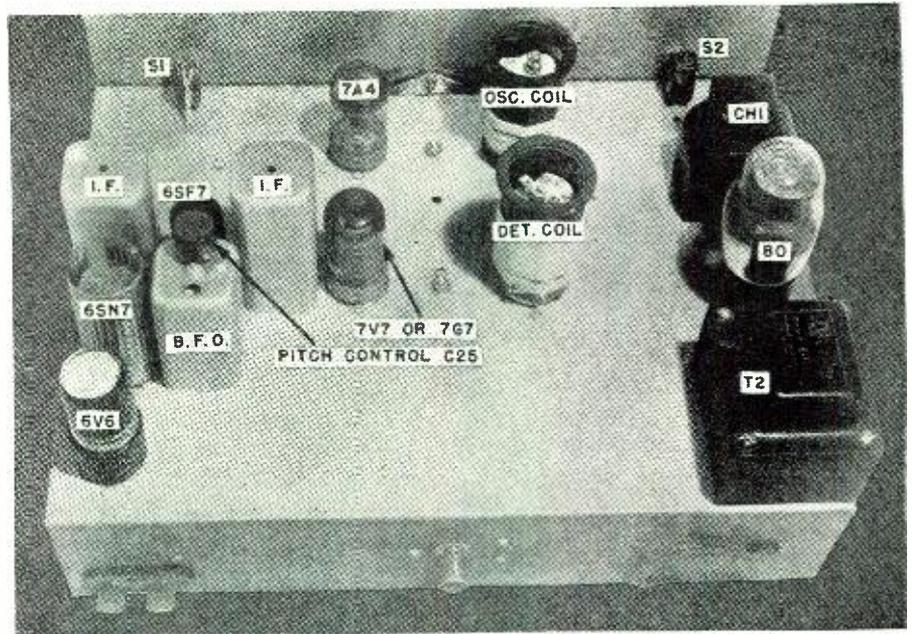
Alignment of the receiver is a simple matter. With a set of coils installed (80 meters is good) turn on S_3 , and, with audio gain open, r.f. gain open, and the tuning gang set half-mesh, turn the osc. trimmer (in coil form) slowly for signal indication (3750 kc.) from the signal generator—the lower signal is the one used in the model shown, but the oscillator can just as well work on the high side—then peak the detector trimmer for maximum signal, and the little super is ready to go. The matter of i.f. alignment is equally simple, and needs no word except one of caution perhaps—if your i.f.'s are new, it is a good idea *not* to change any trimmer screw adjustments until you are ready to adjust the i.f. stage—the transformers are usually set for frequency, and will need merely a bit of touching-up. I.f.

adjustments are made with regeneration full off.

The manner of obtaining bias is simple and positive, and affords a large degree of smooth control, as well as allowing the cathode of the i.f. stage to be grounded directly, an important point in quiet, high-gain stages. It is not recommended that this bias method be changed, but copied exactly as is, for best performance of the receiver.

In wiring the job, it is recommended that the constructor, particularly if not too experienced in receiver building, follow the parts placement exactly. It will be found convenient to wire all filaments first, keeping the filament lead spaced well away from grid and plate leads, and running it in chassis edges when possible, grounding one filament pin of each stage directly at the sockets. The author advocates, if at all possible, building the little job backwards, that is, wiring and testing the audio stage, then the second detector, i.f., converter and oscillator, then when all circuits "perk," wiring the b.f.o. stage. This avoids the common trouble of having possibly two or three wiring errors, etc., in a row to contend with. In following this method, wire cathode and grounds first, then plate, then grid circuits. (NB—This type of converter/oscillator must be tested with both converter and local oscillator wired and operating with proper coils installed, to insure bias for the first detector. Always turn off switch S_1 when changing coils.)

It is wise to build your i.f. stage first



Top view of short-wave receiver shows placement of major component parts.

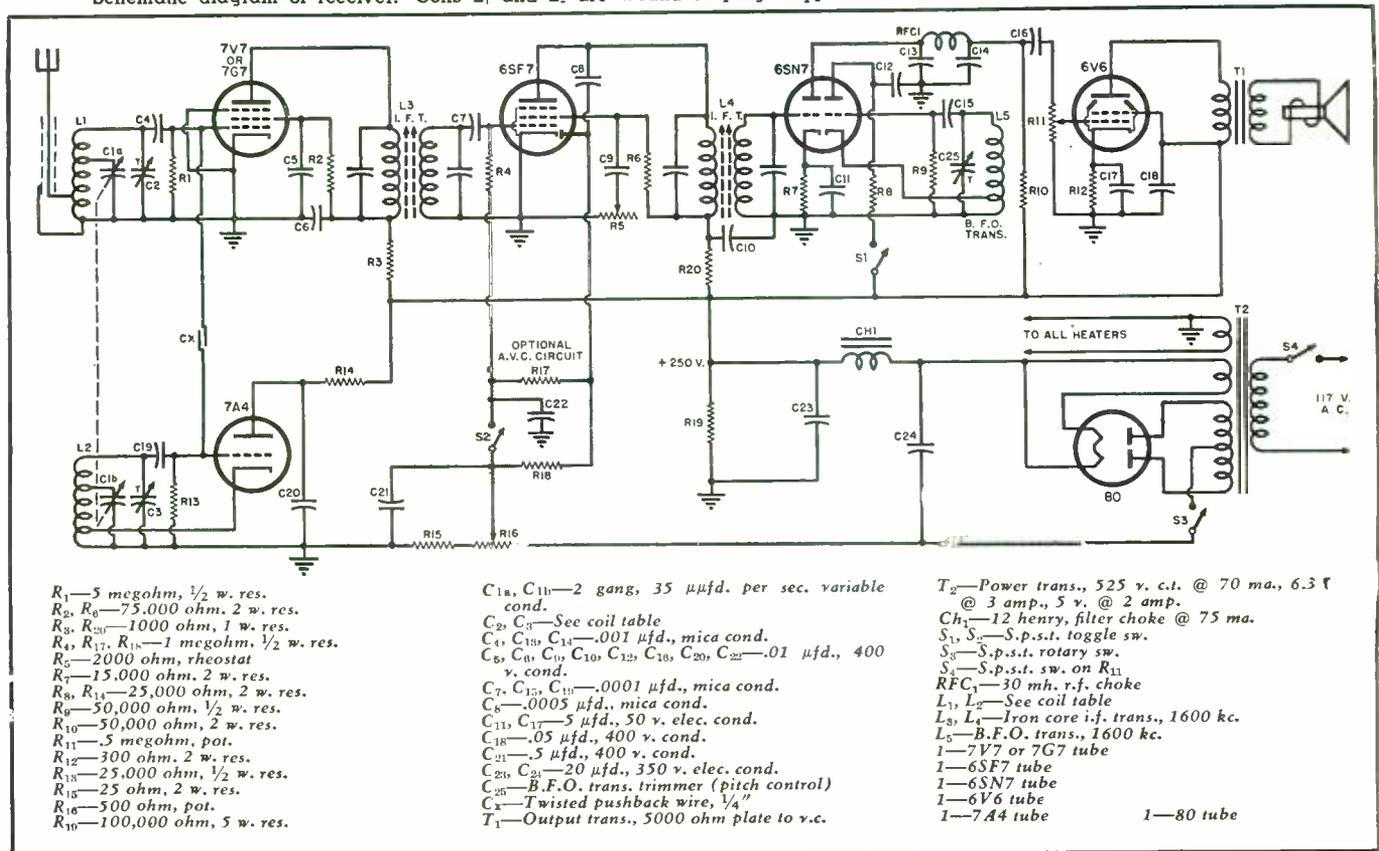
with the regeneration control (R_5) out of the circuit—simply ground the i.f. screen by-pass condenser (C_6) directly, until the i.f. stage is properly aligned and operating perfectly, which means that no hissing nor noise of any kind is audible in the output without signal being applied to the i.f. grid. This is important if you wish a dead-quiet receiver, a highly desirable condition for weak signal reception; once the stage is operating properly, unsolder the ground end of C_6 and connect it to

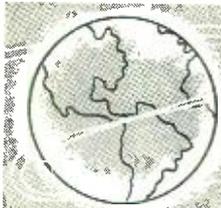
R_5 as shown in the schematic diagram—increasing the value of R_5 will then be found to give smooth selectivity.

The author highly recommends the inclusion of the type 6SF7 tube in the i.f. position, since it allows simple, good a.v.c. to be obtained. A careful study of the schematic will show the foolproof action of the a.v.c. circuit, and its inclusion is very desirable if phone operation is contemplated. The operation of the circuit

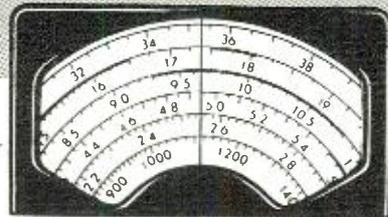
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Schematic diagram of receiver. Coils L_1 and L_2 are wound on plug-in type forms to cover 10, 20, 40, and 80 meter bands.





International SHORT-WAVE



Compiled by **KENNETH R. BOORD**

IT IS with great pleasure that this month's ISW Department is dedicated to two widely-separated short-wave outlets—*Radio Saigon*, French Indo-China, and *Radio Central America*, Republic of Panama.

For the benefit of ISW readers, I am quoting portions of a letter just received from Mrs. R. G. (Margaret Morgan) Coughlin, formerly of Pennsylvania, who is now "*Speakerime Anglaise*" at *Radio Saigon*, French Indo-China:

"*Radio Saigon* received your grand letter about ten days ago and was delighted to hear that the signal comes through so clearly. We of the English Department were particularly pleased with your comments on the English programs and your pleasure at hearing English over a foreign station. I am the woman announcer you referred to as speaking 'fluent' English. That comes naturally to me, as I am an American. My husband is in the foreign service here and I, to keep myself occupied, have taken a job with *Radio Saigon* as 'afternoon' English announcer. The work is extremely interesting and we've received letters from radio listeners all over the world, reporting reception of our English programs.

"By the time you receive this, I will have stopped broadcasting regularly, as I've found it too heavy a schedule to swing along with my other duties. I will continue to help

with the programs, however, and will probably continue to give the Tuesday 'afternoon' broadcast and the French lesson.

"*Radio Saigon* had one of the strongest signals in the Far East before the war and, I am told, had the finest record collection. Practically everything was destroyed in the arsenal explosion which occurred last April, however, and the station has been forced to begin building 'from scratch' with very primitive equipment. We are gradually building up again; but it will be a difficult task with equipment from overseas so hard to procure.

"We give two *English* broadcasts a day—the first at 4:45-5:30 EST; * the second, 8:30-9:30 a.m. The 'afternoon' broadcast consists usually of 15 minutes of dance music, followed by 10 to 15 minutes of news. At 5:15 a.m. there is usually a 10-minute special feature; and the program is concluded with music. Features include an English lesson for French listeners on Mondays and Fridays; a French lesson for English listeners on Tuesdays (taught by myself); a short talk on subjects of general interest on Wednesdays; our Listener's Letter Box (replying to letters received from short-wave listeners) on Thursdays; and over the week-end, occasional special talks or sports lectures. The 'night' broadcasts follow the same pattern, except that there is always a

half-hour of music (popular, classical, or semi-classical), preceding the news (usually heard around 9 a.m.); the English lessons are also omitted in the 'evening' period and music is substituted.

"The shortage of personnel necessitates our programs being rather simple; however, we hope soon to be able to include occasional skits, plays, and other special features.

"Let me assure you that your reception of our station on August 7 on the 11.78 frequency was most accurate . . . I surely hope you will be tuning in this frequency Thursday afternoon when I answer your letter over the air." (*Your ISW Editor missed it!*)

Mrs. Coughlin concluded, "Thanks so much for your letter and also for the RADIO NEWS which is much appreciated; it is the first record I've seen of other Far East stations and their wavelengths. Please continue to write us; and if you have any suggestions or material that we could use on our English broadcasts, they would be much appreciated, as there is little of that sort of thing left in post-war Saigon."

(*Your ISW Editor is trying to arrange a special DX broadcast from Radio Saigon for some Sunday in March or April, dedicated to readers of RADIO NEWS, for around 5:15 a.m. (1015 GMT). Watch for it!*)

Technical data on *Radio Saigon*, furnished by Mrs. Coughlin, follows:

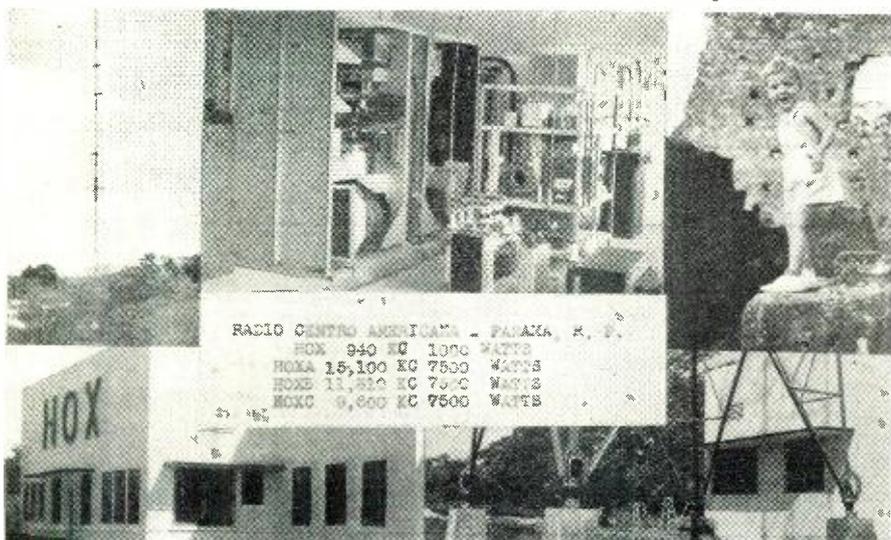
The station radiates on 11.780, 4.810, and 1050 kilocycles in the 25-, 62-, and 285-meter bands, respectively. Studio is located at 198 Rue Chasseloup Laubat, Saigon, French Indo-China. Transmitters are located at Phu T-no, 3 miles from Saigon. The station is owned and operated by the *Haut Commissariat de France pour le Pacifique*. Studio equipment is emergency equipment; former studios were destroyed in an ammunition depot explosion in April, 1946.

The s.w. transmitter on 11.780 operates on a non-directive, half-wave antenna; the 4.810 one with a non-directive, delta-matched. Output power is 12 kw., input power, 50 kw. Final stage tubes are (two) water-cooled 10 kws. anode voltage 8800 volts; modulation is Class A.

Full schedules of *Radio Saigon* are: Daily, 6-7:30 p.m.; 9:45-12 midnight;

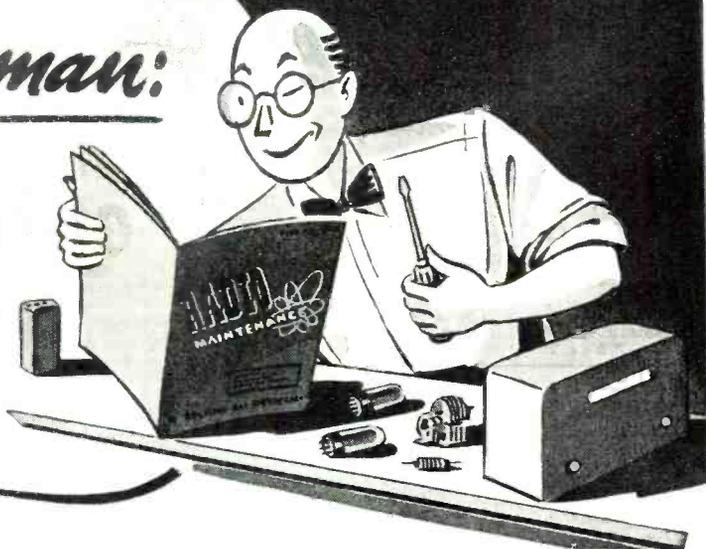
* Unless otherwise indicated, all times herein are expressed in American Eastern Standard Time, 6 hours BEHIND GMT.

This photograph "verie" has been sent to all parts of the world by HOXA, Box 1335, Panama City, Republic of Panama, and features scenes around the station. A new series of verie cards is being prepared for distribution in the very near future.



Radio Serviceman:

here's a valuable
tool for your shop!



**RADIO
MAINTENANCE**

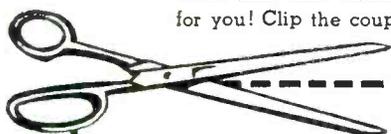
MAGAZINE serves the Radio Service man with original articles on servicing techniques, educational articles on how to use all kind of test equipment, and "know-how" that will speed your servicing.

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Radio Maintenance Magazine is a trade publication. You can't buy it on the newsstands. A one year subscription—twelve full months—costs only \$2.50.* If you double up on two years, the cost is only \$4.00. Either way, you win in the long run.

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A fine instrument having a sensitivity of 1000 ohms per volt.
Ranges: Volts DC, 0-5/10/50/500/1000;
Mills DC, 0-1;
Ohms full scale, 0-5000/50,000/500,000;
Ohms center scale, 30/300/3000.

NET complete with batteries **9.75**

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Same instrument as above but has 2500 ohms per volt sensitivity.

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MODEL 452A
Volt — Ohmmeter
A superb instrument—100 microampere meter gives 10000 ohms per volt sensitivity.
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Ohms center scale, 30/300/3000/30,000.

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Reads: AC-DC volts, 0-25/50/125/250;
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Mfd.	Voltage	Net			
10	25	27¢			
25	25	36¢			
100	25	52¢			
10	50	32¢			
8	150	32¢	30/20	150	88¢
16	150	42¢	100/30	150	94¢
20	150	44¢	20	250	59¢
30	150	47¢	8	450	44¢
20/20	150	70¢	16	450	64¢

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and 3:30-9:45 a.m.; English periods begin at 5:45 and 8:30 a.m.
* * *

Radio Central America

We are indebted to the staff of *Radio Central America*, Box 1335, Panama City, Republic of Panama, for this interesting article prepared expressly for readers of RADIO NEWS:

"New equipment now being installed at Station HOX, Panama, will make *Radio Central America* the first radio outlet to give complete long-wave coverage of the Republic of Panama and other parts of Central America as well, although Panama now has nine stations in operation and seven others in various stages of construction.

"The new equipment consists of a one-kilowatt transmitter, beam antenna for short-wave transmissions which will increase the power of the station approximately six times; new recording facilities; and FM transmitters.

"*Radio Central America* first went on regular schedule on October 12, 1946, after three years of planning and painful accumulation of equipment and building materials.

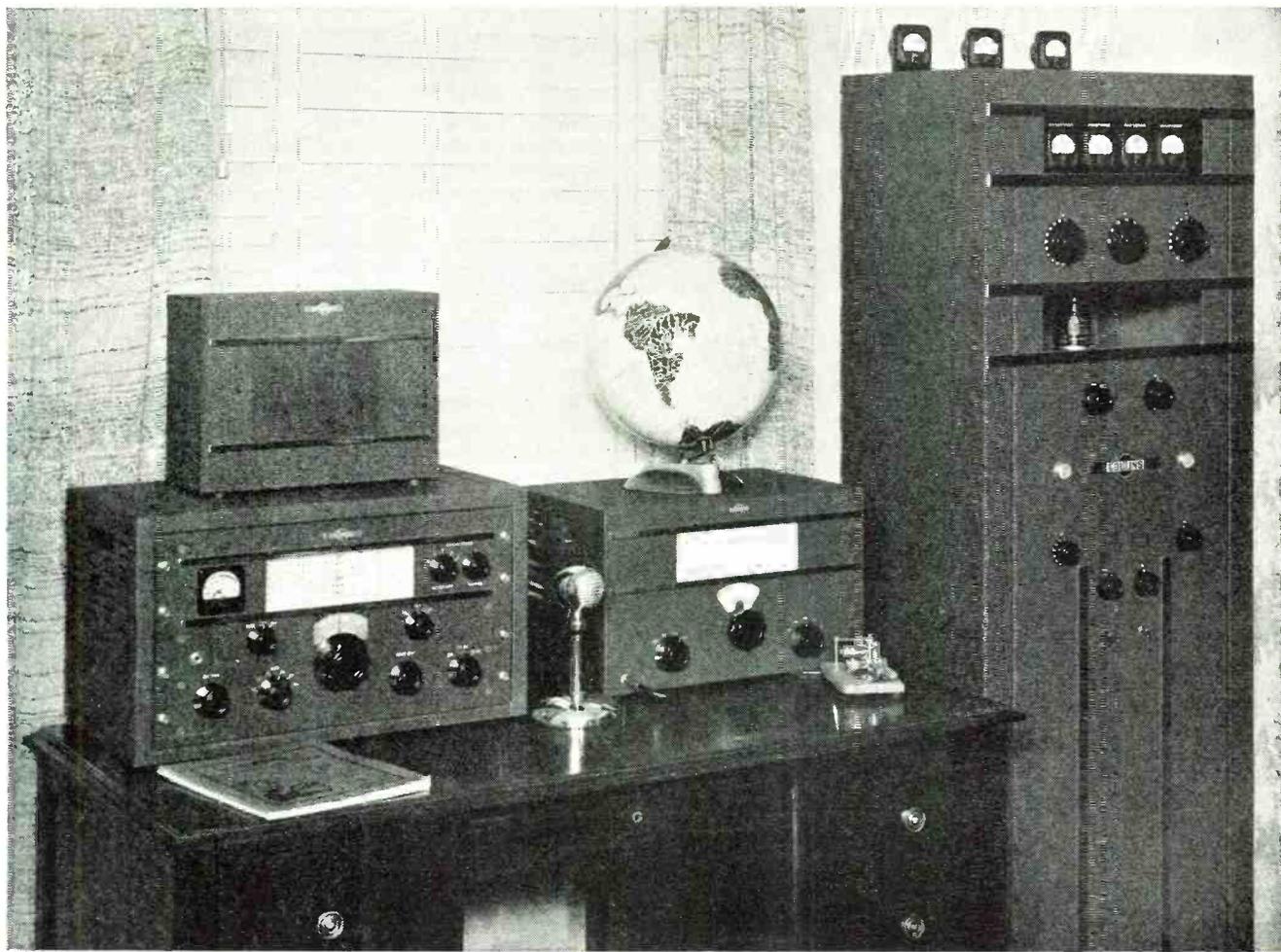
"Although the Republic of Panama has long had several commercial radio stations (due to local restrictions, there is but one amateur station on the Isthmus, although the amateur field is expected to be opened shortly), the promoters of *Radio Central America* were not satisfied with the local radio stations, and were determined to add a new station to the list.

"This group of Panama businessmen, therefore, placed orders for equipment through the Panama Radio Corporation and applied to the Government of Panama for a construction license. At that time—1943—it was a difficult question to answer—which was the harder to get, building materials or radio equipment. For some time, *Radio Central America* remained a 'paper company.'

"The end of the war brought not only equipment to *Radio Central America*, but also the services of two young Americans, James T. Cooper, Raleigh, North Carolina, and Wilbur T. Morrison, Lancaster, Pennsylvania. Cooper, now English Program Director of Station HOX, was formerly with WIP, Philadelphia, and both he and Morrison were in radio work with the Army Air Forces on the Isthmus during the war. Cooper was for a time director of USO stage and radio activities in Cristobal, Canal Zone.

"After two years of waiting, equipment and building materials for HOX began to arrive. In December, 1945, work began on the building which now houses the station's transmitting equipment and temporary studios. Workmen began setting up the transmitting equipment in February of 1946, and in April the all-steel *Blaw-Knox* tower which is HOX's BCB antenna, began to rise toward its present height of 261 feet, seven inches.

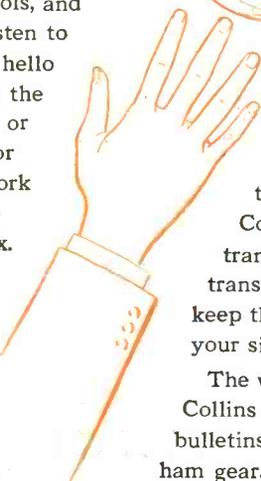
"Late in July, 1946, HOX began to make test broadcasts. Letters poured



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Snap on the filaments, settle yourself at the controls, and enjoy a most satisfying world tour—by radio. Listen to the musical CQ from Latin America, the cheerful hello from Canada. Hear the eagerness in the voice of the American operating portable from Casablanca or Tinian. Maybe you're searching the DX bands for the G4—or was it an HB9—that you used to work every Saturday. Or perhaps your next door neighbor wants to send a message to his aunt in Phoenix.

Sharpen up the incoming signal you've selected on the Collins 75A receiver. You have a crystal filter that you can adjust with ease. The r-f gain control does not affect the pitch of a cw note. And the receiver is so stable that line voltage fluctuations—or the slam of a door—will not require frantic retuning to find the signal again.

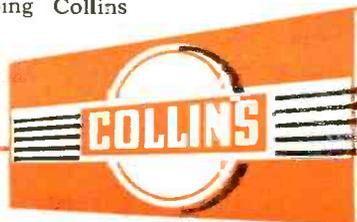


Even under adverse conditions your reception will be better with the 75A.

Then switch the Collins 30K transmitter to the Operate position and you're on the air. Use either fone or cw. You can change frequency quickly if you desire. The permeability tuned oscillator (PTO) controlled exciter—the Collins 310A—sits right on the operating desk. Both transmitter and exciter are bandswitching. The 30K transmitter has a speech clipper in the audio circuit to keep the modulation at a high level. Notice how it helps your signal, particularly in QRM or QRN.

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in from all over the world reporting that the station was coming in fine—better than some local stations, the letters invariably said. With the exceptions of Bolivia, Uruguay, and Paraguay, HOX received confirmation of the strength of its signal from all countries of the Western Hemisphere and from every state in the United States. *Why Bolivia, Uruguay, and Paraguay have remained silent is still a mystery!* Responses have come in from Hawaii, Portugal, India, Liberia, Norway, Nigeria, Egypt, Germany, Newfoundland, The Netherlands East Indies, England, the Christmas Islands, Denmark, Australia, New Zealand, and a number of places in the Pacific, identified only by APO numbers. One letter from Germany—in a tight, careful script—covered several pages with a painstaking description of HOX reception; the writer, a radio technician, said that he had once had a transmitter of his own but that 'it burned down about three years ago.'

Reports from Sweden were especially notable. As reported in the November (1946) issue of RADIO NEWS, the Swedes are great radio listeners. Chief Engineer Morrison, of HOX, says that, judging solely by the mail received by *Radio Central America*, from Sweden, "one would think that all Swedes speak English, listen to the radio avidly, and are great stamp collectors!" Morrison lists the Swedes as *Radio Central America's* greatest for-

eign fans, and after them, Canadians and Cubans.

"Like most Panama radio enterprises, *Radio Central America* now transmits on more than one frequency. At present on the air are Stations HOX, 940 kcs., and HOXA, 15.100. Eventually, it is planned to radiate over Stations HOXB, 11.810; HOXC, 9.660; HOXD, 1310 kcs.; and HOXFM, 43.300. HOXFM will be Panama's first and only FM station; it will serve chiefly as a link between *Radio Central America's* downtown studios—now under construction—and the transmitter, which is located in Panama City's suburbs.

"At present, transmissions over HOX and HOXA are identical. From 11 a.m. until 9 p.m. each day, Spanish programs are transmitted over both frequencies, and from 9 p.m. until midnight, *English* language broadcasts are radiated.

"It is planned, however, when all the new equipment is ready for use, to expand the *English* language broadcasts to a full day and to broadcast them on a frequency different from the Spanish language outlet.

"When *Radio Central America* goes on the air with a full-time program in English, it will be broadcasting more English than any other station in Panama, and probably more than any other in Central America. Before HOX appeared on the scene, Panama radio stations broadcast almost entirely in Spanish with only a few pro-

grams—such as short newscasts—in English. Heretofore, the only all-English broadcast from the Isthmus was done by the *Armed Forces Radio Station* in the Canal Zone, which still broadcasts all day in *English*.

"Other Panama stations have protested the existence of the AFRS and its continuance after the end of the war. They charge that it offers unfair competition to Panama stations because the great majority of English-speaking residents on the Isthmus prefer to listen to programs in English rather than in Spanish. During the recent Inter-American Radio Congress in Mexico City, the Panama delegate—an employee of one of the local stations—put in an official protest against the AFRS which protest was adopted by the Congress. Even so, authorities of the Canal Zone have shown little disposition to remove the AFRS which they regard as a considerable morale factor among the men of the U.S. Army and Navy stationed on the Isthmus. The recent announcement concerning the Caribbean Area indicates that there will be more soldiers and sailors on the Isthmus in the future than there are now, and that probably, unless budget considerations force its removal, the AFRS will continue business at the same old stand.

"Despite the many protests by various Panama radio enterprises against the AFRS, *Radio Central America* was the first Panama station to offer ac-

(Continued on page 104)

Fahnestock Clips

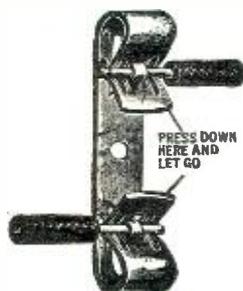
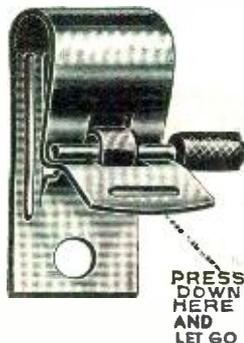
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If you can, visit one of our stores. If you can't come to see us, write, phone or telegraph and your inquiry will be answered promptly and fully. Newark has the stock, Newark has the 'know how', Newark can help you.



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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. G4.



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As listed below:

No.	Watts	Inputs	List	Your Cost
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A15	12	3	97.50	52.86
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A 8	8	3	87.50	51.45
A 9	8	2	75.00	44.10
A 5	8	2	60.00	35.28
AC-DC Model	8	3	75.00	44.10

HAWAIIAN ELECTRIC GUITAR

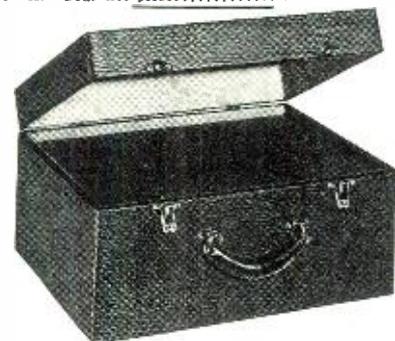
Beautiful black plastic, trimmed with chrome, 23" scale, 4 1/2 octaves of playing range. List \$50.00. Your Cost.....\$29.40



DeLuxe PHONO CABINET

Covered in luxurious, genuine brown leatherette, has deluxe brass hardware throughout, made completely of plywood with brown plastic handle, has padded top and bottom. Motor board 14" x 14 1/2". Overall dimensions 16" L x 15" W x 8" H. Your net price.....

\$8.95



Portable Phonograph case, of sturdy, durable plywood, in handsome brown leatherette finish. Inside dimensions 16 1/2" long, 14" wide, 9 1/2" high. Has blank motor board. As illustrated above, specially priced at.....

\$6.95

Also blank table cabinets of walnut veneer in the following sizes, with speaker opening on left front side: (*Note: *7 has center speaker grill.)
 # 1 — 8 1/4" L x 5 1/2" H x 4" D \$1.95
 # 2 — 10 1/4" L x 6 3/8" H x 5" D \$2.95
 # 3 — 13 1/2" L x 7 5/8" H x 6 1/2" D \$3.95
 # 7 — 10 3/4" L x 7" H x 5 1/2" D \$2.50
 *Speaker Opening in center of front side.

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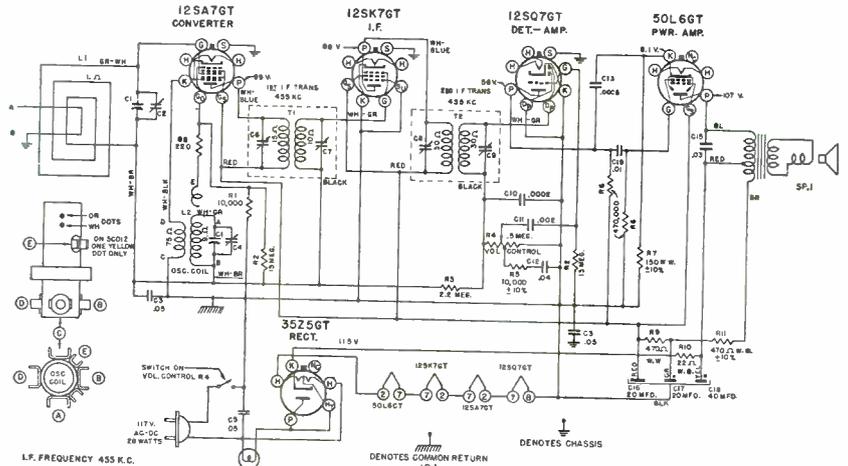


CIRCUIT PAGE

(FOR PARTS LISTS SEE PAGE 76)

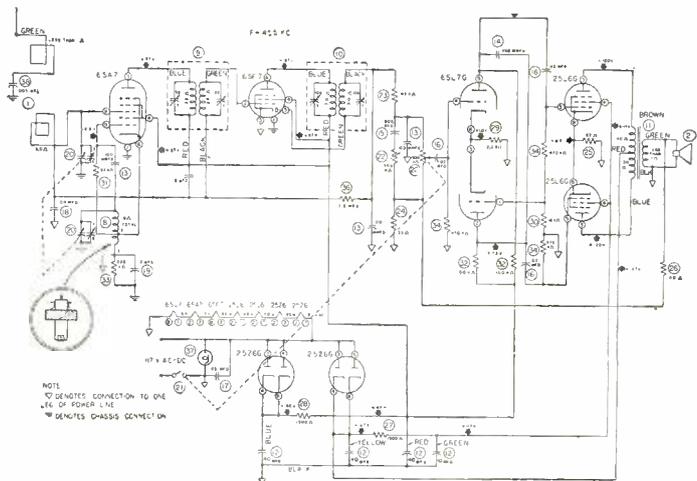
RADIO NEWS, FEBRUARY, 1947

ZENITH MODELS 5D011-5D027



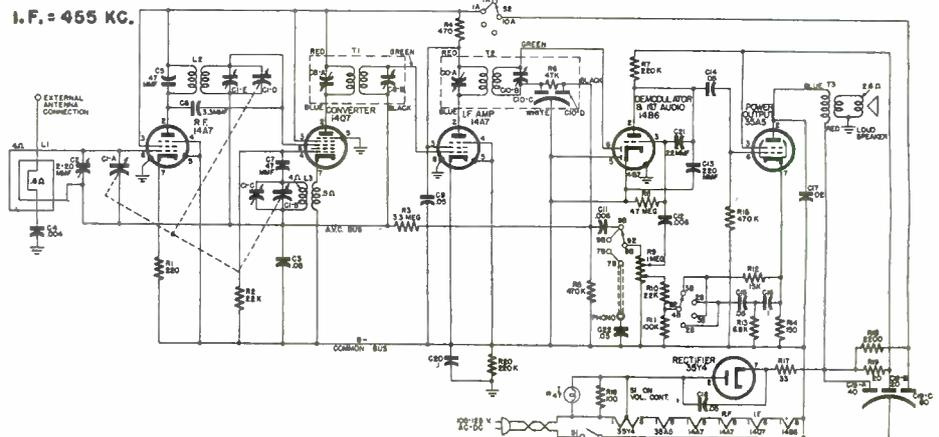
RADIO NEWS, FEBRUARY, 1947

ECA MODEL 108



RADIO NEWS, FEBRUARY, 1947

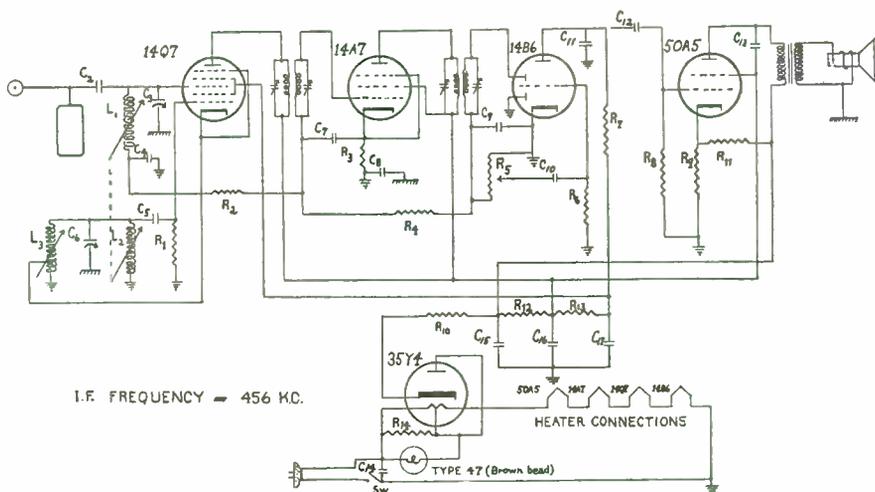
BENDIX MODELS 636A, C, D



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.

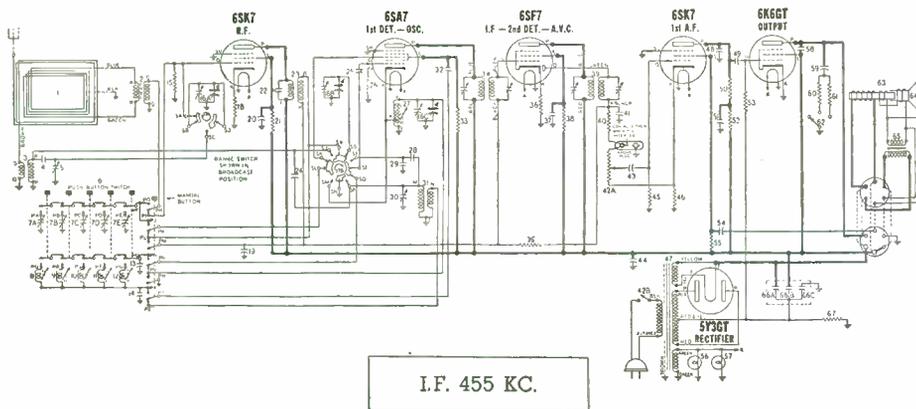
RADIO NEWS, FEBRUARY, 1947

CORONET MODEL C-2



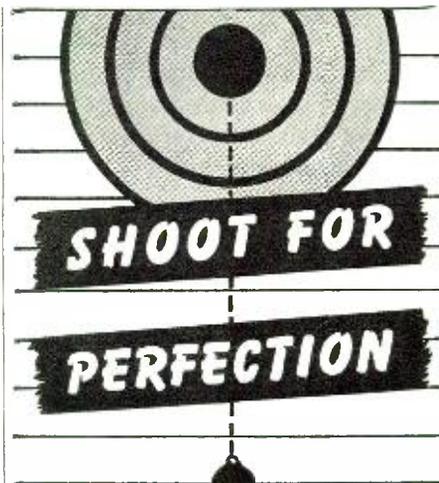
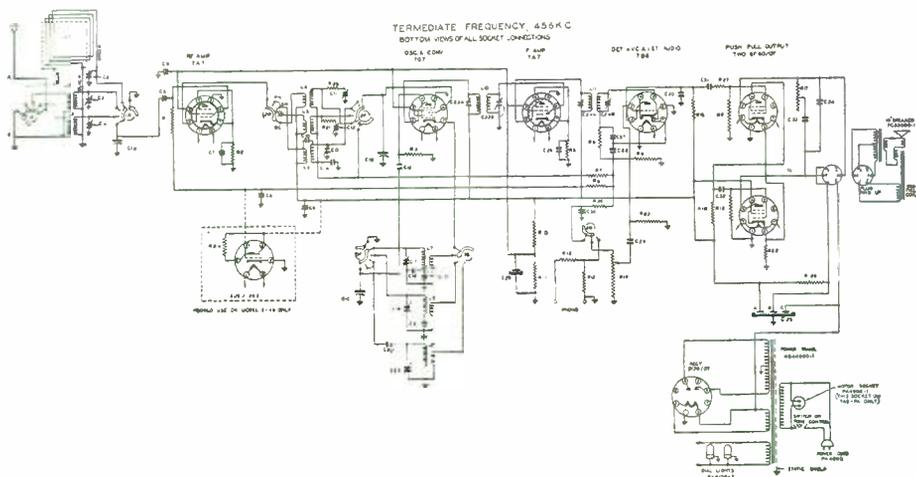
RADIO NEWS, FEBRUARY, 1947

STEWART-WARNER MODELS 9001-C, D, E, F



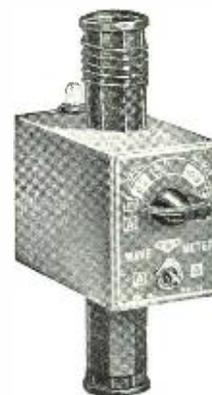
RADIO NEWS, FEBRUARY, 1947

SPARTON MODELS, 7-46, 7-46PA, 8-46, 8-46-PA



In amateur radio today perfection is an absolute necessity. The old days of hit-or-miss operation are gone forever. A good example of the need for perfection is the ever-present menace of the PINK TICKET. Today with frequency multipliers in practically all transmitters, it is easy to hit the wrong Harmonic. The positive way to tell which band you are on, is by using the BUD WM-78 wavemeter. *Shown on front cover.*

The BUD WM-78 covers all amateur bands from 160 to 5 meters . . . accomplishing this by bandswitching. Due to its sensitivity the BUD WM-78 can also be used as a neutralizing indicator.



\$8.25 your cost at your radio parts dealer.

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ALL YOUR NEEDS**

with the latest types of radio equipment including variable condensers, coils, chokes, dials, switches and a complete line of sheet-metalware.

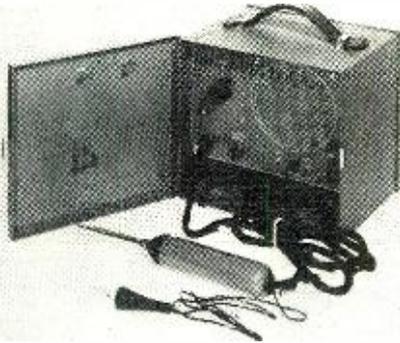


What's New in Radio

PORTABLE SIGNAL TRACER

A new portable, battery-operated signal tracer for the radio serviceman is now being distributed by radio parts jobbers for *Special Products Company* of Silver Spring, Maryland.

The new SPECO instrument is housed in a gray crackle finish steel



case which is equipped with a carrying handle. The unit weighs 4 pounds, 10 ounces, and the over-all size is 5 1/4" x 6 1/4" x 6 1/8".

Low drain tubes have been used in the construction of this unit in order to assure longer battery life. A safety feature has been incorporated which prevents the closing of the cover when the power switch is on. An extra long probe and long test leads make this unit suitable for all types of radio servicing including auto radios.

Special Products Company, Silver Spring, Maryland is the manufacturer.

SERVICING TOOL

Angelus Tool Manufacturing Co. of Los Angeles, California has announced a servicing tool which should be of interest to the radio man.

Known as the "Flex-o-claw," this tool which is made of all steel wire, is particularly adapted for installing or removing small parts, nuts, screws, etc. from otherwise inaccessible places on the radio chassis.

This unit is 1/4" in diameter and is available in lengths of 12, 15, 18 and 22 inches. A simple plunger arrangement at the end of the flexible tubing oper-



ates the jaws of the unit to permit firm gripping of parts.

Angelus Tool Manufacturing Co., 3060 W. Pico Blvd., Los Angeles 6, California will supply prices and de-

livery dates on this item to those requesting this information.

WIRE RECORDER

Peirce Wire Recorder Corporation of Evanston, Illinois has recently announced production on two postwar model wire recorders, one for heavy duty office work and the other a portable model for field work.

The heavy duty business unit features remote controls which permit dictation to the recorder from 50 to 100 feet distant in addition to a button control for the use of the typist in transcribing. The light weight reel which carries the thin stainless steel "thread" weighs only a few ounces and is capable of recording from 66 minutes to over two hours. Messages may be played back as many as 100,000 times without loss of volume or tone quality.

Recordings may be erased automatically in the process of dictating a correction or using the wire for new recording.

Full details on either the heavy



duty or portable model wire recorder will be furnished by *Peirce Wire Recorder Corporation*, 1328 Sherman Avenue, Evanston, Illinois.

SYNCHROSCOPE

The *Electronics Division* of *Sylvania Electric Products Inc.* has recently announced the availability of a new synchroscope specially designed for the visual examination of the fine structure of periodic waveforms in television, pulse time modulation, sonic depthfinders, geophysical exploration and loran equipment.

The instrument includes a five inch cathode ray oscilloscope; trigger generator for synchronization; space for the addition of a video amplifier and r.f. envelope viewer; adjustable time delay phasing circuits; and seven input connectors and a selector switch for rapid viewing of separate external circuits.

Television applications include study of the shape, amplitude and duration of video pulses ranging from a fraction to several hundred microseconds. Used with the video amplifier and an r.f. envelope viewer it provides a

RADIO NEWS

ALLIED
Sound for '47!
New 30 WATT DeLuxe
PORTABLE P. A. SYSTEM

Here's a preview of ALLIED Sound for 1947 in this smoothly-styled, brilliantly engineered 30 Watt De Luxe Portable System. New stabilized inverse feedback circuit delivers high output, usable right up to its peak. Flexible operation is provided by two microphone and one phono channels, each with separate control. Has bass-treble tone control. Amplifier and speakers are safety-fused. Amplifier gain on microphone is 128 db; on phono, 80 db. Frequency response: 50-10,000 CPS. System covers up to 4,000 persons, or up to 20,000 square feet.

Complete 30 Watt System includes: 30-Watt De Luxe Amplifier with tubes; 2-12" Safused Dynamic Speakers, with 30-ft. cables and plugs; 1-Cardax Unidirectional Microphone with floor stand and 20-ft. cord and plug. Complete in handsome luggage-type split portable carrying case, 22"x20"x15". Carrying wt., 60 lbs. For 110 volts, 60 cycles A.C. (Less phono top and volume level meter which are optional.)

Complete System (approximate price) Only **\$9950**

.....

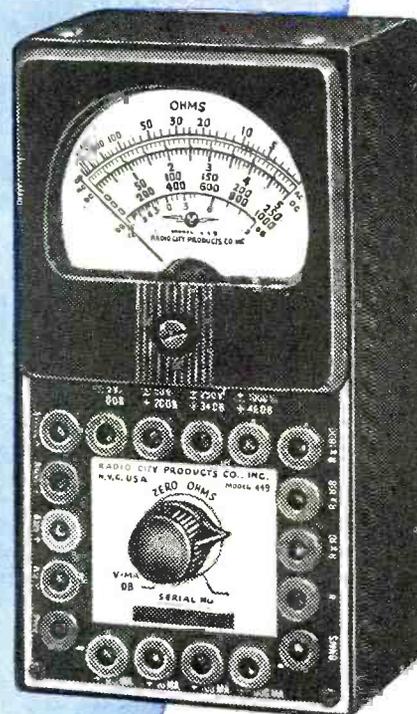
ALLIED
For Everything
in Radio and
Sound

See your ALLIED Catalog No. 111 for the world's largest and most complete stocks of quality radio and sound equipment—at today's lowest prices! Count on ALLIED for fast service, expert help. If you haven't a copy of Catalog No. 111—send for it now—it's FREE for the asking.

ALLIED RADIO
ALLIED RADIO CORP.
833 W. Jackson Blvd., Dept., 1-B-7, Chicago 7, Ill.
 Ship 30-Watt Portable System described above. S..... enclosed.
 Send full details on ALLIED Sound.
 Send FREE Radio Catalog No. 111.
Name.....
Address.....
City.....Zone.....State.....

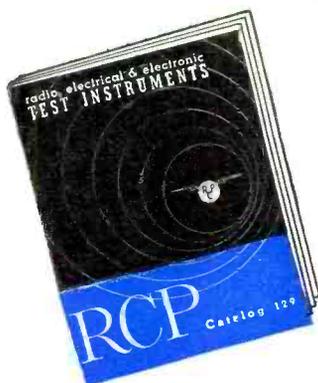
NO OTHER INSTRUMENT OFFERS SO MUCH FOR SO LITTLE

Ruggedness of a pocket portable . . . high sensitivity of a bench model . . . RCP's Model 449 gives you both . . . at a price way down among the lowest. When you take this fine instrument along on your service calls you're taking a *complete* testing unit in your coat pocket. With its 5000-ohms-per-volt DC sensitivity you can check voltage of high-resistance circuits . . . and its wide resistance range will measure up to two megohms with *self-contained batteries*. There's hardly a service problem that can't be solved with the Model 449 Multitester. Call your jobber now . . . tell him to send one out TODAY. Complete with self-contained battery—**PRICE \$24.50.**



IMMEDIATE DELIVERY

RCP's 5000-ohms-per-volt
**POCKET MULTITESTER
MODEL 449**



Write today for your copy of RCP's new Catalog No. 129. In addition to all the RCP instruments it contains the famous Reiner line. Complete descriptions and handsome illustrations of America's leading high-quality testing instruments.

FEATURES:

- Germanium-crystal-diode rectifier eliminates temperature and frequency errors.
- The 3" square, high-visibility meter is accurate to 2% and has a sensitivity of 200 micro-amperes.
- Six instruments in one pocket-size unit.
- A-C voltmeter frequency response is flat from 30 cps to 50 kc.
- Spring-clip-mounted batteries are readily accessible.
- Metalized, matched voltage multipliers have a tolerance of one per cent. This is far closer match than in most instruments of this type.
- All-metal case offers complete shielding of instrument.
- All ratings are based on standard A.I.E.E. and R.M.A. specifications at full-scale deflection.
- Size only 3"W x 2 1/4"D x 6"H. Weight: 2 lbs.

RANGES:

D-C VOLTMETER:	0/5/50/250/1000 volts. First scale division—0.1 volt. (5,000 ohms per volt)
A-C VOLTMETER:	0/5/50/250/1,000 volts. First scale division—0.1 volt. (1,000 ohms per volt)
D-C MILLIAMMETER:	0/.5/10/100/1,000 ma. First scale division—.01 ma.
OHMMETER:	0/2,000/20,000 ohms; 0/0.2/2 megohms.
DECIBEL METER:	—6 to +10, +14 to +26, +28 to +40, +40 to +52. The db-scale calibration is based on a line impedance of 500 ohms, 6 milliwatts reference level. For other impedances correction charts are supplied.
OUTPUT VOLTMETER:	0/5/50/250/1,000 volts. First scale division—0.1 volt.

RCP INSTRUMENTS—BEST FOR EVERY TEST

RADIO CITY PRODUCTS COMPANY, INC.

127 West 26th Street,



New York 1, N. Y.

Unbelievable STAMINA



IS THE HERITAGE OF OXFORD SPEAKERS

1 OXFORD SPEAKERS, with their remarkable stamina assure that when used as replacements that they will not break down in normal or extended usage. The over a million units now in use as original installations are the very best guarantee of that statement.

2 OXFORD SPEAKERS have the new pressure-thread device, which holds the pole-piece against the magnet, increases sensitivity and prevents pole-piece decentering. This new development is but one of many improvements which assure the jobber of long and trouble-free installations meeting the most exacting type specification.

3 OXFORD SPEAKERS are designed for handling the maximum power input in relationship to their size, and further embody response curves which permit the speaker to be used in radio receivers of quality.

Until the war, the loudspeaker was comparatively undeveloped from the first ineffectual unit which made its appearance in the middle 1920's. By consistent research in this highly complicated field, OXFORD engineers have improved almost every part until there is little resemblance, except in exterior appearance, between the OXFORD SPEAKER of today and the pre-1942 unit.

It will be found that the OXFORD SPEAKER can withstand greater overloads for longer periods, and provide cleaner, better reproduction than was believed possible just a short five years ago.



OXFORD RADIO CORPORATION
3911 SOUTH MICHIGAN AVE., CHICAGO

CAREERS in RADIO

INTENSIVE COURSES—Thorough, technical education for progressive men and women.

Licensed by the State of New York

1. RADIO TECHNICIAN—The MRI General Course. Includes F.M. & Television. Prepares For FCC Broadcast Licenses.

2. RADIO & TELEVISION SERVICING—Prepares for employment as Repairman on Standard Broadcast, F.M. & Television Receivers.

3. RADIO COMMUNICATIONS—Prepares for FCC Operators' License. Leads to position as Merchant Marine or Flight Radio Officer, Commercial Operator.

4. FUNDAMENTAL RADIO MATHEMATICS—The MRI Preparatory Course. Required pre-training for students lacking a basic mathematical background.

MELVILLE RADIO INSTITUTE

45 W. 45th St., N. Y. 19, BR 9-5080

"The Radio School Managed By Radio Men"

MELVILLE RADIO INSTITUTE

45 West 45th St., New York 19, N. Y.

GENTLEMEN:

Send me FREE information about your school. RN

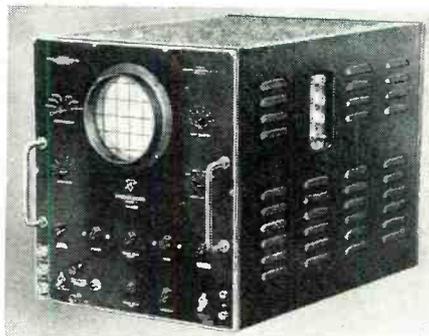
Name.....

Address.....

MAIL THIS COUPON NOW

means of visual examination of r.f. pulse envelopes or waveforms up to and including the microwave region.

Additional data on the Synchroscope



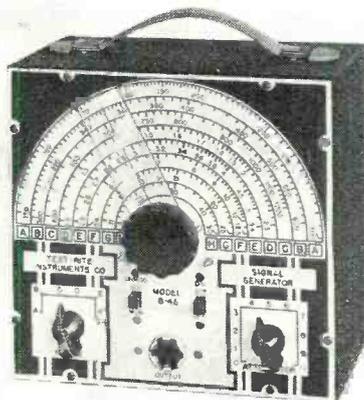
will be supplied by the *Electronics Division, Sylvania Electric Products Inc.*, 500 Fifth Avenue, New York, 18, N. Y.

SIGNAL GENERATOR

Metropolitan Electronic & Instrument Co. of New York are currently offering their Model B-45 Signal Generator for all types of radio servicing.

This model is a one-tube, self modulated unit which covers the range from 150 kc. to 50 mc. The range from 150 kc. to 12.5 mc. is covered on fundamentals and from 11 mc. to 50 mc. on harmonics. Pure r.f. is obtainable or can be modulated by a.f.

The Model B-45 may be used in servicing television and FM receivers as



well as all types of AM equipment. Modulation is accomplished by grid blocking action.

This signal generator is completely portable and self contained, requiring no external power supply.

Full details, including price, will be furnished by *Metropolitan Electronic & Instrument Co.*, 6 Murray Street, New York 7, New York.

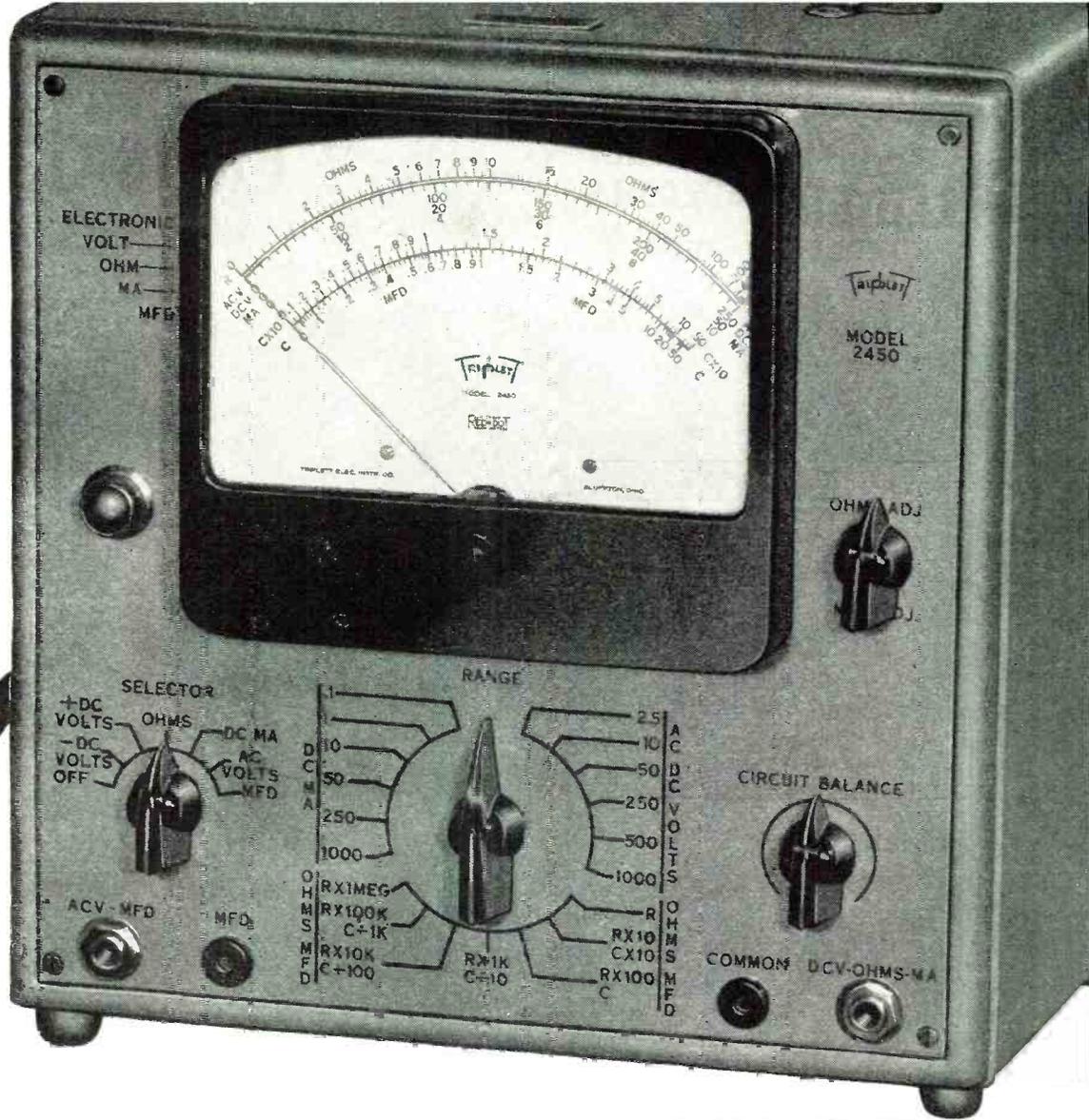
TUBE TESTER

The Triplett Electrical Instrument Co. of Bluffton, Ohio have recently placed on the market their new Model 2425 Transconductance Reading Tube Tester which features several innovations in the field.

Micromho readings and simplified testing are featured in this new unit. Transconductance readings are made possible through a simple measure-
(Continued on page 92)

RADIO NEWS

Model 2450 ELECTRONIC TESTER



There's never been a tester like this!

Here's a tester with dual voltage regulation of the power supply DC output (positive and negative), with line variation from 90 to 130 volts. That means calibration that stays "on the nose"! That means *broader service* from a tester that looks as good as the vastly improved service it provides. And, together with its many other new features—including our Hi-Precision Resistor which outmodes older types—it means higher performance levels wherever a tester is needed. Detailed catalog sheets on request.

Highlights:

- 42 RANGES: DC and AC. Volts: 0-2.5-10-50-250-500-1000. DC MILLIAMPS: 0-0.1-1.0-10-50-250-1000. OHMS: 0-1000-10,000-100,000. MEGOHMS: 0-1-10-100-1000. CAPACITY IN MFD: 0-.005-.05-.5-5-50.
- LOAD IMPEDANCE: 51 megohms on DC Volts.
- CIRCUIT LOADING: Low frequencies. Circuit loading equal to 8 megohms shunted by 35 mmfd. High frequency circuit loading equal to 8 megohms shunted by 5 mmfd.

*Precision first
...to last*



Triplet

ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO



LEOTONE MONTHLY SPECIALS

SURPLUS BARGAINS

SMALL MOTORS: G.E. 27V. DC. 145 RPM. 65 amp. 14 oz./in. 1 3/4"x4". Shpg. wt. 1 lb. \$1.49
 Shunt Wound 1/40 H.P. Reversible. 27V DC 3800 RPM. 1.4 amps. continuous duty. 3"x 4 3/8" shaft 7/8" long. Black crackle finish. 3.45
POWER RESISTORS: Heavy duty. Popular brands. 25 watt-6, 75, 130, 175, 277, 500, or 1800 ohms -2, 4, 40, 250, 300, 3K, 7500 or 10K ohms 1.29
SPECIAL: 50 watt-15 ohm rheostat 1.29
 Dual 50 watt-200 ohm rheostat 1.79
SHUNTS-MULTIPLIERS: 1% precision, wire-wound. Ohmmages: 25, 35, 42, 24.5, 405, 840, 1740, 2500, 3300, 3390, 6290, 7600, 30K, 50K or 400K .35

ALNICO MAGNETS

#1 Bar, 3/4"x1/2"x1/8" short lengths per inch	50.39
#2 Face 1 1/2"x1 3/4"x1/8" high	.12
#3 Heavy duty bar, 2 1/2"x1 3/4"x5/16" thick	.98
#4 Face 3/4"x5/8"x3/8" high	.39
#5 Polished face 7/8"x3/16"x3/8" high	.38
#6 Polished bar 9/8"x3/16"x1/8" .20 for 1.00	
#7 Face 1/2"x1/2"x3/8" high	.20
#8-ALNICO v.h. shoe, poles 9/16" sq.	.75
#9-ALNICO v.h. shoe, poles 9/16" sq.; 1 1/4" high	.98
#10-ALNICO v.h. shoe, poles 1"x1 1/2" high	2.54
#11-Horseshoe, pole 1 1/16" O.D.	1.29
#12-Similar to #5 3/4"x3/8"x7/16" high	.35

SPECIAL SIZES IN QUANTITY, CUT TO ORDER

TUBES: Perfect condition, but not in sealed cartons. Guaranteed for 90 days. #26, 27, or 56-29c; #24, 42, 77, 89, 6D6, 6B6, or 6K7-39c; #50, 75, 78, or 6A3 \$0.59
 Brand new R.C.A. UX-200 tubes in sealed cartons. Ideal detector. 8 for 1.00
HEADPHONES-Signal Corps HS-33 2000 ohms. Leather covered, adj. forks. With PL-54 plug. With sponge sponge rubber phone cushions. 1.45
MEADBANDS only (as above), with PL-54 and cord. .39
PL-54 plug and 13" tipped double phone cord .19
4 TUBE AMPLIFIER (2-7C5, 7F7, 7Y4). Used as electronic supercharger control. 110V, 400 cycle. Contains: power trans., condensers (mica and oil), 7 resistors, 4 socket sockets plus other components worth several times the price. Black crackle finish; fitted slide-in chassis. 8 3/4"x4 1/2"x3 3/4". Less tubes 1.49
Frequency meter Tech. Manual (Navy) Theory & Operation. 59 illustrations & diagrams; 58 pp. 1.15
EXPERIMENTAL TUBES. An assortment of 20, filament tested, including most sizes & base types 1.00
RADIOMAN'S HARDWARE TREASURE. Over 1000 nuts, screws, nuts, washers, etc. PLUS handy 36 compartment cardboard kit box. 59
16" N.B.C. RECORDINGS. Each contains 2 complete 15 minute "voice of the colony" dramatic programs with music. Over 60 different titles, such as: Whistling Willie, Case History, Philippine Return, etc. 30 3/4" R.P.M. 3 asstd. records 1.49
32mfd/450WV tubular electrolytics, 2 1/2"x4 1/2" 20mfd/200WV tubular electrolytics, 6 for 1.00
5 TUBE AMPLIFIER (Bendix), 4-6N6, 3-6SN7 Orig. used with remote indicator. 27V. DC-110V, 400 cycle. Black crackle shock-mtd. case & fitted chassis. 7 3/4"x5 1/2"x4 1/2" Shpg. wt. 7 lb. Less tubes 2.49
Victor Power Transformer for models R-32, 45, 52 or 75. Unshielded. 5.95
BAKELITE PANELS: 1 1/2" glossy brown. 7"x10" 2" Meter Case & Housing (round). Complete with glass & adjust. screw. 1" deep .39

SERVICEMEN'S KITS

- #1-R.F. Antenna & Osc. coils, 10 asstd. \$0.98
- #2-Speaker Cones; 12 asstd. 4" to 12" moulded & free-edge (magnetic incl.). Less voice coil 2.00
- #3-BAKELITE MICA CONDENSERS; 50 asstd. .00005 to 2 mfd, 200-600WV. Clearly marked 2.95
- #4-TUBULAR BY-PASS CONDENSERS; 50 asstd. .0005 to .25 mfd. 200 to 600WV. Standard brands 2.49
- #5-Dial Scales; 25 asstd. airplane & slide rule (acetate & glass included) 2.98
- #6-Escutcheon Plates; 25 airplane, slide-rule & full-vision types 2.95
- #7-Knobs; 25 asstd. wood & bakelite, including setscrew & push-on types 1.00
- #8-Wafer Sockets; 12 asstd. 4 to 7 prong .25
- #9-Voltage Dividers; 10 asstd. standard multi-tapped, high wattages included 1.98
- #10-Shield Cans; 15 asstd. for coils, tubes, transformers, etc. 1.00
- #11-Mica Padders & Trimmers; 15 asstd. incl. multiple & ceramic base types .69
- #12-Potentiometers & Controls; 10 asstd. wire-wound & composition. Less switches 1.49
- #13-Wire-Wound Resistors; 15 asstd. ohmmages. 5 to 20 watts .98

PROMPT SERVICE ON ALL SPEAKER & PHONO PICK-UP REPAIRS. Minimum order \$2.00-20% deposit required on orders. Please add sufficient postage. WRITE DEPT. RN-2.

LEOTONE RADIO CO.
 MAKERS OF CONES AND FIELD COILS
 65-67 DEY STREET, NEW YORK 7, N.Y.
 WORTH 2-0284-5
 12,000 SQ. FT. OF RADIO PARTS

Parts Lists

(FOR CIRCUIT DIAGRAMS APPEARING ON PAGES 70 AND 71)

STEWART-WARNER MODELS 9001-C, D, E, F

Part No.	Code and Description
502468	15-4.7 megohm, 1/4 w. res.
502127	18-560 ohm, 1/4 w. res.
502132	21-100,000 ohm, 1/4 w. res.
502130	26-22,000 ohm, 1/4 w. res.
502466	33-33,000 ohm, 1 w. res.
502135	35-2.2 megohm, 1/4 w. res.
502264	36-47 ohm, 1/4 w. res.
502467	38-68,000 ohm, 1/2 w. res.
502131	40-47,000 ohm, 1/4 w. res.
502148	42A, 42B-500,000 ohm vol. control & sw.

502468	45-4.7 megohm, 1/4 w. res.
502128	46-2200 ohm, 1/4 w. res.
502133	50-220,000 ohm, 1/4 w. res.
502132	52-100,000 ohm, 1/4 w. res.
502134	53-470,000 ohm, 1/4 w. res.
502135	55-2.2 megohm, 1/4 w. res.
502291	60-4700 ohm, 1/4 w. res.
502127	61-560 ohm, 1/4 w. res.
502137	67-330 ohm, 2 w. w. res.
502202	4 -150 µfd., 500 v. cond.
502172	5 -25-100 µfd. trimmer
502910	7A to E-Trimmer assembly for P-B tuner

502161	13-270 µfd., 500 v. cond.
502165	14-1000 µfd., 500 v. cond.
502122	16A, 16B, 16C-Variable gang
502155	19-.1 µfd., 200 v. cond.
502157	20-.05 µfd., 400 v. cond.
502295	22-10 µfd., 500 v. cond.
502411	24-2 µfd., 500 v. cond.
502159	25-50 µfd., 500 v. cond.
502201	28-130 µfd., 500 v. cond.
502182	29-39 µfd., 500 v. cond.
502171	30-5-35 µfd., trimmer
502151	32-.01 µfd., 400 v. cond.
502157	37, 44-.05 µfd., 400 v. cond.
502271	41-260 µfd., 500 v. cond.
502150	43-.004 µfd., 600 v. cond.
502160	48-110 µfd., 500 v. cond.
502152	49-.02 µfd., 400 v. cond.
502410	51-.1 µfd., 400 v. cond.
502405	54-.25 µfd., 400 v. cond.
502150	58-.004 µfd., 600 v. cond.
502154	59-.05 µfd., 600 v. cond.
502207	66A, 66B, 66C-20/10/20 µfd., 400/400/25 v. elec. cond.

ZENITH MODELS 5D011, 5D027

Part No.	Code and Description
63-589	R1-10,000 ohm, 1/4 w. res.
63-976	R2-15 megohm, 1/4 w. res.
63-600	R3-2.2 megohm, 1/4 w. res.
63-1337	R4-5 megohm vol. control
63-641	R5-10,000 ohm, 1/4 w. res.
63-597	R6-470,000 ohm, 1/4 w. res.
63-686	R7-150 ohm, 1/2 w. wire wound res.

63-579	R8-220 ohm, 1/4 w. res.
63-1449	R9-470 ohm, 1 w. wire wound res.
63-1450	R10-22 ohm, 1 w. wire wound res.
63-1222	R11-470 ohm, 1 w. wire wound res.

22-1356	C1-2-gang var. cond.
---------	----------------------

22-829	C2-Broadcast ant. trimmer (part of C1)
22-1017	C3-.05 µfd., 200 v. cond.
	C4-Broadcast osc. trimmer (part of C1)
	C5-.05 µfd., 200 v. cond.
	C6-First i.f. trans. pri. trimmer (on T1)
	C7-First i.f. trans. sec. trimmer (on T1)
	C8-Second i.f. trans. pri. trimmer (on T2)
	C9-Second i.f. trans. sec. trimmer (on T2)

22-953	C10-.0002 µfd., 600 v. cond.
22-492	C11-.002 µfd., 600 v. cond.
22-1202	C12-.04 µfd., 200 v. cond.
22-854	C13-.0005 µfd., 600 v. cond.
22-243	C14-.01 µfd., 400 v. cond.
22-1049	C15-.03 µfd., 400 v. cond.
22-1519 or 22-1551	C16, C17, C18-20/20/40 µfd., 150/150/150 v. elec. cond.
22-196	C19-.01 µfd., 600 v. cond.

22-492	L1-Wavemagnet assembly
22-1202	L2-Osc. coil
22-854	T1-First i.f. trans.
22-243	T2-Second i.f. trans.

22-953	C10-.0002 µfd., 600 v. cond.
22-492	C11-.002 µfd., 600 v. cond.
22-1202	C12-.04 µfd., 200 v. cond.
22-854	C13-.0005 µfd., 600 v. cond.
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22-243	T2-Second i.f. trans.

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22-1202	C12-.04 µfd., 200 v. cond.
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22-243	C14-.01 µfd., 400 v. cond.
22-1049	C15-.03 µfd., 400 v. cond.
22-1519 or 22-1551	C16, C17, C18-20/20/40 µfd., 150/150/150 v. elec. cond.
22-196	C19-.01 µfd., 600 v. cond.

RC1H54

R7, R20-220,000 ohm, 1/4 w. res.

RC1H70

R5-4.7 megohm, 1/4 w. res.

RV4S00

R0, S1-1 megohm pot.

RC1H51

R11-100,000 ohm, 1/4 w. res.

RC1H38

R12-15,000 ohm, 1/4 w. res.

RC1H34

R18-6800 ohm, 1/4 w. res.

RW1B14

R14-150 ohm, 1 w. wire wound res.

RW1A06

R19-100 ohm, 1 w. wire wound res.

RC4G28

R17-33 ohm, 1/4 w. res.

RC1H32

R18-2200 ohm, 2 w. res.

CV0C00

R19-4700 ohm, 1/4 w. res.

CP6T16

C1A, C1B, C1C, C1D, C1E-Var. cond.

CM5A14

C2-2.20 µfd. trimmer

CC9A16

C3, C9, C14, C15, C18, C22-.05 µfd., 400 v. cond.

CP4T20

C4-.004 µfd., 600 v. cond.

CM5A05

C5, C7-47 µfd. mica cond.

CP2T51

C6-3.3 µfd. cond.

CP4T34

C8A, C8B-Part of T1 assembly

CE3A00

C10A, C10B-Part of T2 assembly

CP4T51

C11, C12-.006 µfd., 400 v. cond.

TIOCO1

C18-220 µfd. mica cond.

TIOD01

C19-.1 µfd., 200 v. cond.

TA0001

C17-.02 µfd., 400 v. cond.

TR6L00

C19A, C19B, C19C-20/40/50 µfd., 150/150/150 v. elec. cond.

LO6B00

C20-.1 µfd., 440 v. cond.

Part No.

C21-22 µfd. cond.

TIOCO1

T1-First i.f. trans.

TIOD01

T2-Second i.f. trans.

TA0001

T3-Audio output trans.

TR6L00

L5-R.f. interstage trans.

LO6B00

L5-Osc. coil



Listen
... IT'S A
Jensen
SPEAKER!

MODEL VH-91 *Hypex** PROJECTOR

This latest addition to the famous JENSEN Hypex line meets a real need for paging and intercommunication applications. Particularly efficient in the voice frequency range, it delivers clear, intelligible speech with maximum "punch" to override high noise levels.

By reason of an extremely clever mounting bracket, this projector can be pointed in any direction and securely locked into position with a single wing nut. Two holes in the bracket are provided for mounting on table, wall, ceiling or a post.

The diaphragm is cloth base, phenolic impregnated. Nominal voice coil impedance, 8 ohms; power handling capacity, 15 watts maximum speech signal input. Two-wire RC cable is provided for connections. Mounting facilities are also provided on the bracket for a $\frac{3}{8}$ " x $\frac{3}{4}$ " core or smaller transformer. Because of the Hypex flare formula, useful output is attained for a 100° total angle.

This new Hypex projector is now in production; deliveries are expected early in 1947 and literature will be available shortly.

JENSEN MANUFACTURING COMPANY

6617 S. LARAMIE AVE., CHICAGO 38, U.S.A.

In Canada: Copper Wire Products Ltd., 11 King St. W., Toronto, Ont.

*Trade Mark Registered



Jensen
SPEAKERS WITH **ALNICO 5**

Designers and Manufacturers of Fine Acoustic Equipment

famous for

GREAT VALUES

RADIO KITS

Five Tube Superheterodyne Kit

Small Bakelite cabinet, size 9" x 5" x 6", complete parts (except wire and solder) for the construction of a standard superheterodyne receiver using 50L6, 35Z5, 12SA7, 12SQ7, and 12SK7. All parts properly matched to chassis base. Price not including tubes..... **\$10.75**

Five Tube Superheterodyne Kit

In a Walnut Veneer Wood Cabinet (size 12" x 8" x 6") contains complete parts for a 5 Tube superhet kit (less wire and solder) but including tubes (6SK7, 6SQ7, 6SA7, 12SN7, 25L6). Price, each..... **\$13.95**

Six Tube Two Band Superheterodyne Kit

In a solid color wood cabinet (green, red), contains all parts (except wire and solder) to construct a high grade 2 band superheterodyne receiver covering regular broadcast and short wave bands. Tubes consisting of 2-6SK7, 1-6SQ7, 1-12SN7, and 25L6 included. Price..... **\$17.75**

3 Tube Phono Amplifier

Complete with tone and volume control. Price..... **\$2.95**

All prices are F.O.B. New York City.

Write for our new catalogue showing new test equipment, tubes and a large variety of new replacement parts. We ship anywhere promptly.

Six Tube Superheterodyne Receiver

House in an exceptionally artistic designed walnut cabinet. The engineering on this receiver is such as to provide good reception in the most critical locations. Built-in loop antenna of special design. Broadcast band 540 to 1620 KC. 30 Watts input. Price..... **\$23.65**

Intercommunication System

A low priced two-way system for executives, professionals and home use. Consists of a master and one remote. Your Price..... **\$17.25**

Phono Oscillator

Wireless phono oscillator transmits recordings for crystal pickup or voice from carbon mike to radio without wires. Price..... **\$3.45**

Mallory Line Filter—useful in eliminating noises from offending electric appliances by installing the filter at source. Compares favorably with filters listing at \$10.00. Your cost.. **\$3.45**

Speaker Repair Kit (Coldpatch). Eliminates the use of messy cements. Price, ea. **75c**

RADIO DEALERS SUPPLY COMPANY

135 LIBERTY ST., NEW YORK 6, N.Y.

PA4356-2
PA4356-2
MC60F-510
AB3503-36
AB3503-36
PA4357-1
PA4357-1
PA4354-2
PA4354-1
AB43500-44
AB43500-55
PA4303-1
MC60F-101

PC40GK-203
PC40GL-503
PC40GM-203
PC50GM-202
PA4300-1

C₁₂—Police det. trimmer
C₁₈—Short-wave det. trimmer
C₁₅—51 μfd. mica cond.
C₁₇—Broadcast osc. trimmer
C₁₈—Broadcast osc. padder
C₁₉—Police osc. trimmer
C₂₀—Short-wave osc. trimmer
C₂₁—1680 μfd. mica cond.
C₂₂—3320 μfd. mica cond.
C_{23A}, C_{23B}—First i.f. trimmer
C_{24A}, C_{24B}—Second i.f. trimmer
C₂₅—4 μfd., 400 v. elec. cond.
C₂₇, C₂₈, C₃₀, C₃₀—100 μfd. mica cond.
C₃₀—02 μfd., 200 v. cond.
C₃₁, C₃₂—05 μfd., 400 v. cond.
C₃₃—02 μfd., 600 v. cond.
C₃₄—002 μfd., 600 v. cond.
C_{35A}, C_{35B}, C_{35C}—15/10/15 μfd., 450/450/450 v. elec. cond.

Part No.
C-ZQ-522
S-QL-105E
S-LR-120
S-LR-127
S-LR-128
S-TA-116
S-CE-126M
CM-103E
CM-112E
CP-122E
CP-104E
CP-105E
CP-105D
CP-133D
S-ZQ-500
S-SR-137
S-RV-174-1
RS-186B
RS-220B
RS-221D
RS-114B
RS-195C
RS-195E
RS-185B
RS-222B
RS-197B
RS-120B
RS-190B
RS-189B
RS-223B
IP-115
CP-116D

ECA MODEL 108
Code and Description
1 —Loop antenna
2 —Speaker
8 —Osc. coil
9 —Input i.f. trans.
10 —Output i.f. trans.
11 —Output trans.
12 —Elec. cond.
13 —100 μfd. mica cond.
14 —250 μfd. mica cond.
15 —.002 μfd., 400 v. cond.
16 —.02 μfd., paper cond.
17 —.05 μfd., paper cond.
18 —.05 μfd., 200 v. cond.
19 —.2 μfd., 200 v. cond.
20 —Variable capacitor and drum
21 —Sw.
22 —500,000 ohm vol. control
23 —47,000 ohm, 1/4 w. res.
24 —33 ohm, 1/4 w. res.
25 —82 ohm, 1 w. res.
26 —100 ohm, 1/4 w. res.
27 —1500 ohm, 1/2 w. res.
28 —1500 ohm, 2 w. res.
29 —2200 ohm, 1/4 w. res.
30 —18,000 ohm, 1/4 w. res.
31 —22,000 ohm, 1/4 w. res.
32 —100,000 ohm, 1/4 w. res.
33 —220,000 ohm, 1/4 w. res.
34 —470,000 ohm, 1/4 w. res.
36 —2.2 megohm, res.
37 —Pilot light
38 —.005 μfd., 200 v. cond.

4-Element Array
(Continued from page 47)

6 2" beehive metal-base standoff insulators.

8 3/4" thinwall conduit connectors.
1 section 5' long, 1 1/4" dia. thinwall conduit.

The 10 foot section of 1 1/4" tubing is laid out on a flat surface, and marked at intervals of 3' 4". Two of the 1" dia. ten foot sections are placed, respectively, at the first and second marks from one end of the boom and carefully brazed, making sure they are at exact center and at 90 degree angles with the boom itself. Next, the five foot section of 1 1/4" tubing is similarly affixed to the boom at the next mark, but on the opposite side from the previous sections. A study of the diagram will show the method of assembly at this point. After this joint has cooled sufficiently, braze another of the ten foot sections of 1" tubing, on the same side of the boom as the other ten foot lengths and in exactly the same manner, at the final mark, making sure that all angles are 90 degrees, and that the tubing element lengths are brazed at the exact center. Failure to observe this will entail trouble in tuning the beam later, and will give power loss and a distorted pattern.

The remaining length of 1" tubing is then cut at its exact center; this is the dipole proper (when the tuning stubs in each end are added). These two 5' sections are then mounted with a two-

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RN-2 TERMINAL TOWER CLEVELAND 13, OHIO

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RN-2 Terminal Tower, Cleveland 13, Ohio
Gentlemen: Please send your FREE Booklet, "How to Pass FCC License Examinations."
(NOTE: This booklet does not cover examinations for Amateur Licenses.)

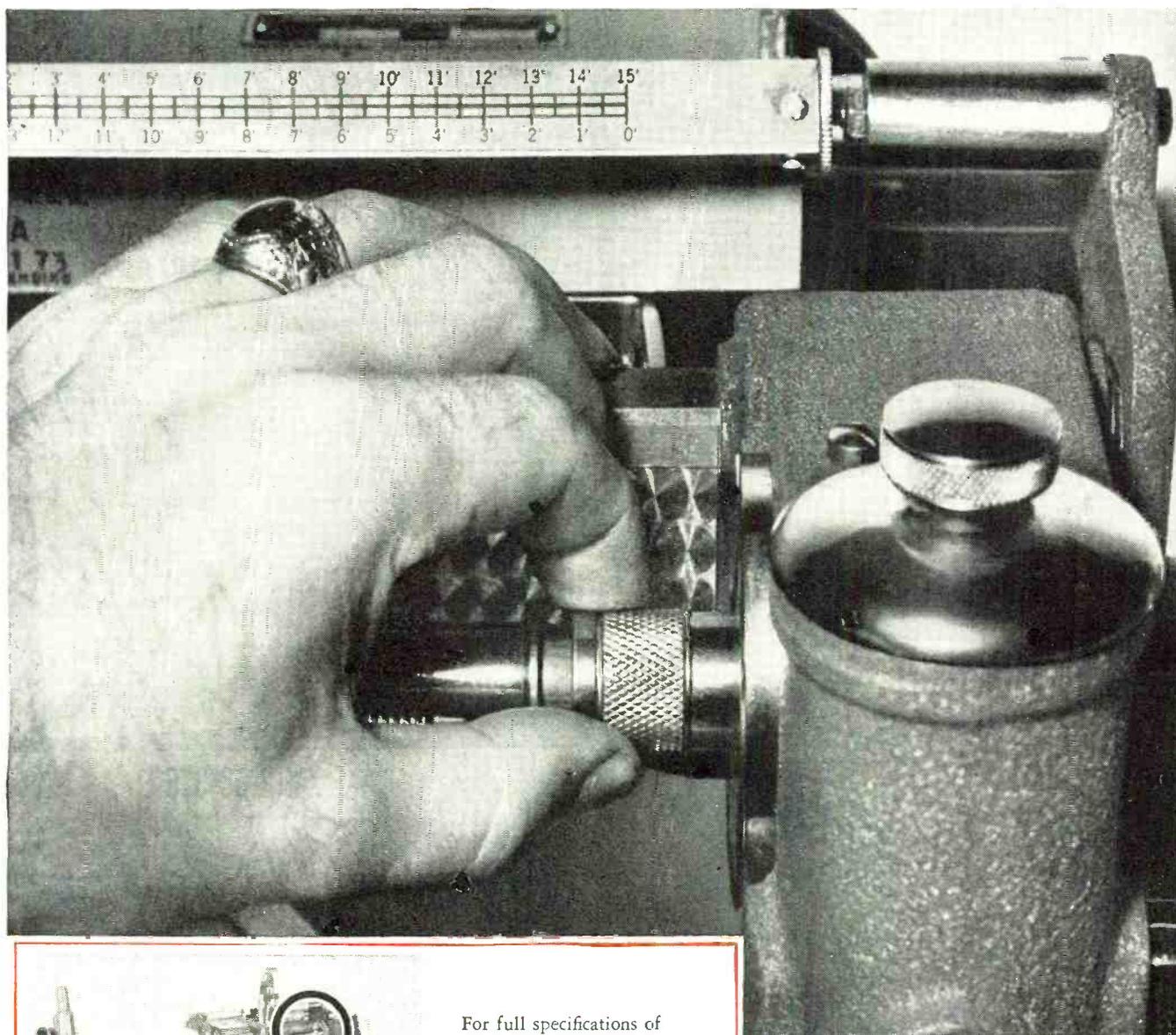
Name _____
Address _____
City _____ Zone _____ State _____

If a Veteran check here

change pitch and direction almost
instantaneously with the improved
Presto 8-D Recorder

The Improved Presto 8-D Recorder is equipped with a reversing device for the feed screw. Result: Six feed pitches, inside-out and outside-in, using only one feed screw. This feed screw need never be removed from the recorder. Thus, changes in pitch and direction are accomplished within a matter of seconds.

The Presto 8-D Recorder is the easiest and most convenient machine to operate because of the arrangement of its controls and the cantilever overhead which saves lost motion in operation. Its unusually heavy construction assures high fidelity masters and instantaneous recordings.



For full specifications of the Presto 8-D please write Presto Recording Corporation, 242 West 55th Street, New York 19, N.Y. To insure future delivery within a reasonable time, we suggest you place your order now for immediate listing.

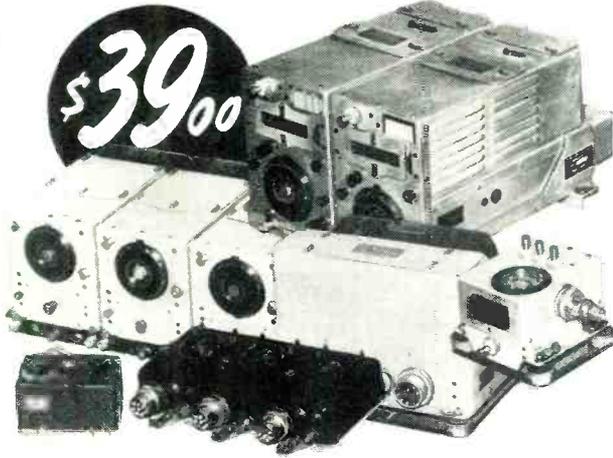
**PRESTO**

RECORDING CORPORATION
242 West 55th Street, New York 19, N. Y.
Walter P. Downs, Ltd., in Canada

World's Largest Manufacturer of Instantaneous Sound Recording Equipment

REAL SATISFACTION *is yours for years...*
with these superlative values in permanently usable gear brought you at amazing savings by the **RADIO SHACK!**

★★★ **SCR-274-N COMMAND SET**



consisting of

- 3 **RECEIVERS** — covering frequencies of 190-550 kc; 3 — 6 mc; and 6 — 9.1 mc; tubes included are: 12SK7 — RF amp; 12K8 — mixer; 12SK7 — 1st IF; 12SK7 — 2nd IF; 12SR7 — diode det & CW osc; 12A6 output or AF.
- 2 **XMTRS** — covering frequencies of 3 — 4 mc and 4 — 5.3 mc; tubes included are 1626 master oscillator driving two parallel 1625's; a 1629 magic eye tube and a calibrating crystal are also furnished

- 4 **DYNAMOTORS** — for 12-volt d-c service; each receiver has its own dynamotor and another dynamotor powers the transmitters and modulator.
- 1 **MODULATOR** — with carbon mike input to 1625 screen-grid modulator with 12J5GT side-tone oscillator and VR150-30 regulator.

- 29 **TUBES** — a complete set for each unit.
- 2 **TUNING CONTROL BOXES** — 1 **ANTENNA COUPLING BOX** with RF ammeter, antenna relay, and 5000 volt, 50 mmfd. W.E. vacuum condenser.

You'll find a myriad of uses for this stack of gear, the parts of which are in themselves worth many times the price at which the Radio Shack brings you the entire assembly. The receivers are great for stand-by use — effective on 40 and 80 meters — with ample bandwidth — usable on phone or CW — output at 8000 or 600 ohms. The amazingly low price is possible because the equipment is slightly used — but it's in first class shape ready to give you many years service. **DON'T MISS THIS TREMENDOUS BARGAIN!**

AAF HAND MIKE and PHONES
Type T-17 mike with push-to-talk switch, cord, and plug. This is a carbon mike. Only \$1.29.
Type HS-33 phones with head-band, rubber cushions, cord, and plug. Only \$1.95.
Used, but in A-1 condition.

★★★ **BC-221 FREQUENCY STANDARD**

Now it's easy to meet FCC Regulations par. 12.135 for regular measurement of your frequency. This extremely stable, heterodyne frequency meter readily checks up to 5th harmonic on most receivers and up to 125th harmonic on the better receivers.

Fundamental ranges 125-250 & 2000-4000 KC.

Stability better than .005%.

Works on 110 v. a-c, vibrapack, or batteries.
Can be used as a signal generator — and you'll be seeing articles telling how to make it into a VFO that can't be duplicated in today's market.

Furnished complete with tubes, original crystal and calibration charts. First quality — can hardly be told from new. Immediate express shipment.

★★★ **BC-348 RECEIVER**



"The best military receiver for amateur use" is what many wise hams say about this sensitive, smooth-operating, heavily-built, 6-band receiver. Check these features and you'll see why!

- 6-band switching—200-500 kc; 1.5 — 3.5 — 6 — 9.5 — 13.5 — 18 mc.
- Automatic noise compensator.

Constant sensitivity on all bands.
Temperature-compensated oscillator.
Crystal filter · AVC · MVC · BFO.
Output at 300 or 4000 ohms.

Smooth vernier tuning; 90 turns of tuning knob for each band.
Furnished complete with built-in dynamotor for 28-volt d-c use and detailed instructions for change-over to 110-volt a-c supply. **ORDER NOW** for immediate express shipment. Conversion kit available.

TUBE LINE-UP

- 1st RF — 6K7
- 2nd RF — 6K7
- RF Osc. — 6C5
- 1st Det. — 6J7
- 1st IF — 6K7
- 2nd IF } — 6F7
- CW Osc.
- 3rd IF } — 6B8
- 2nd Det.
- Aud. Out — 41
- V.R. — 991



★★★ **SCR-522 VHF XMTR-RCVR**

The **ALL-PURPOSE RIG** for your work in the **100-156 MC SPECTRUM**

4-CHANNEL PUSH-BUTTON OPERATION CRYSTAL-CONTROLLED AM PHONE MOBILE or FIXED STATION SERVICE. Ideal for AMATEUR, EXPERIMENTAL, AIRCRAFT, MARINE, RAILROAD, POLICE, and EXPERIMENTAL WORK.

Here's the set that is so good it was made standard equipment in all American or British planes — and now you can have it at only a few percent of its original cost.

THIS VERSATILE SET GIVES YOU

A 10-tube superheterodyne receiver that includes a squelch circuit with sensitive relay to kill background noise when no signal is being received; 3 microvolts sensitivity at 10 milliwatts output.

A 7-tube, temperature-stabilized Xmtr delivering 15 watts.

A remote control box giving push-button selection of four sending and receiving channels.

A 28-volt d-c dynamotor to power the entire outfit in mobile service.

Furnished with full set of tubes, connecting plugs, and detailed instructions, as published in Radio News, for like new; total weight — about 100 pounds. (Incidentally, there's no extra charge if you find eight crystals in your shipment).

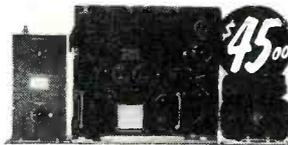
TUBE LINE-UP RECEIVER

- 9003 RF amp
- 9003 Mixer
- 9003 Harm. Gen.
- 9003 Harm. Amp.
- 12SC7 1st IF
- 12SC7 2nd IF
- 12SC7 3rd IF
- 12C8 Det, 1st IF and AVC
- 12J5GT 2nd AF
- 12AH7GT Osc and AF squelch

TRANSMITTER

- 6C6C Osc
- 12A6 1st harm. amp
- 832 2nd harm. amp
- 832 Pwr. amp
- 6SC7 Speech amp
- 2 — 12A6 PP mod

★★★ **AAF XMTR BC-375-E**



We're back again with more of these exceptional values in transmitting gear. Complete outfit includes seven of the tuning units, covering 200 kc to 12,000 kc (except broadcast band), plus antenna tuning unit BC-306-A with variometer and tap switch, plus dynamotor unit PE-73-C with relay, fuses, and filter. Power output is 30 to 75 watts, depending on frequency; RF meter reads antenna current; plate meter range is 0-500 milliamperes.

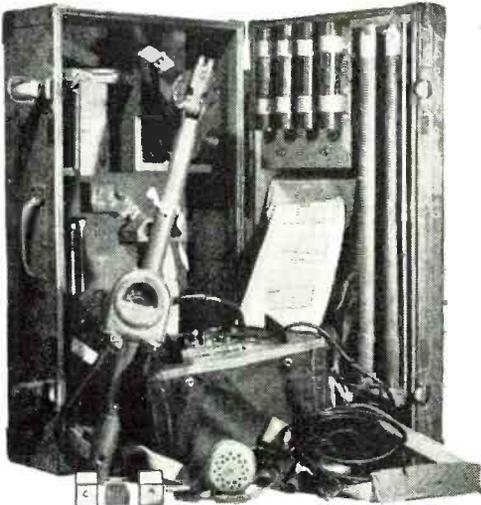
This brand new gear is furnished complete with five tubes — 211 master oscillator, 211 RF power amplifier, 10 speech amplifier or tone oscillator, 2 — 211's PP modulators. 100-page AAF Manual covers every detail of use and maintenance. **ORDER NOW!!**

The whole rig weighs over 400 pounds so it's shipped by freight.

Price, complete — only \$45.00. Remit in full — No C.O.D.'s.

The **RADIO SHACK**
★ 167 A WASHINGTON ST. ★
BOSTON, MASS., U.S.A. ★

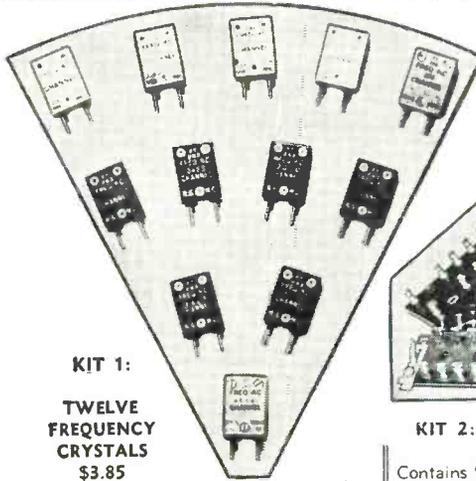
ESSE Specials!



AN/PRS-1 MINE DETECTOR

For detecting metallic and non-metallic substances by oral or visual indication. Used for locating pipes, treasure, etc. Complete as shown with spare tubes, carrying case and ready to operate by connection of batteries not included. Shipped in original overseas moisture-proof container.

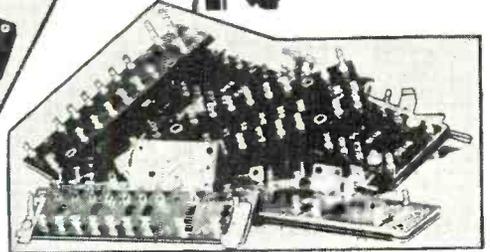
Price, brand new.....\$4.95
Weight, packed for shipment, 101 lbs.



KIT 1: TWELVE FREQUENCY CRYSTALS \$3.85

Contains assorted frequencies between 3,000 Kc. and 8,000 Kc. in FT 243 crystal holders. We pick at random from mixed supply and cannot select frequencies.

Complete Kit of 12 Crystals.....\$3.85

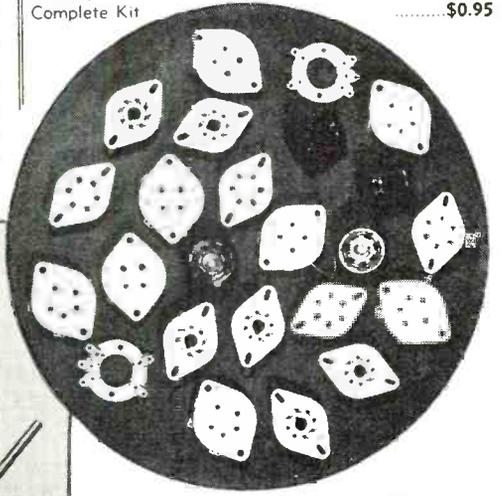


KIT 2: 25 RESISTOR MOUNTING STRIPS AND TERMINAL LUGS

Contains 9 bakelite resistor strips for mounting 2, 4, 9, 23, and 28 resistors which may be cut apart for any requirement. Also contains sixteen 1, 2, 3, and 5 lug terminal strips.

Complete Kit\$0.95

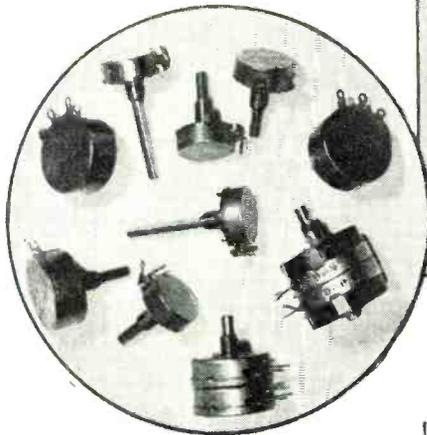
**ITEMS FOR THE RADIO AMATEUR,
EXPERIMENTER OR SERVICE MAN**
Available in kit form at a small fraction of their original cost—all brand new.



KIT 3: 24 TUBE SOCKETS

Containing the following new Ceramic lo-loss sockets: 2-Acorn, 6 octal Amphenol, 4-6 prong Milien, 4-5 prong wafer, 4-4 prong wafer, 2 molded bakelite, 2 octal female plugs and 2-7 prong tube tester sockets with center socket for checking pilot lamps.

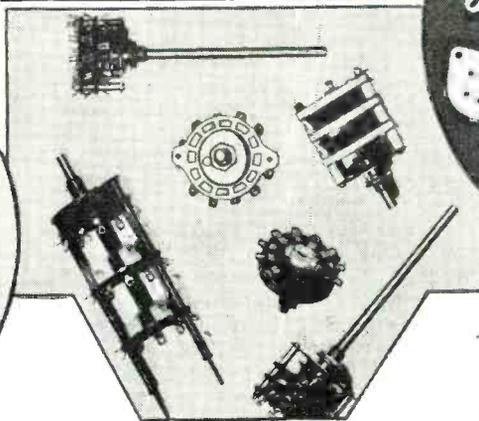
Complete Kit\$2.35



KIT 5: 10 POTENTIOMETERS

Contains 3-.5 meg. carbon with 5/8" length shaft, 2-3500 ohm carbon 1 3/8" shaft, 1-1000 ohm wire wound 5/8" shaft, 1-dual 25,000 ohm wire wound with 3/8" shaft, 1-dual 30,000 ohm wire wound with 3/8" shaft, 2-100 ohm wire wound with screw driver adjustment.

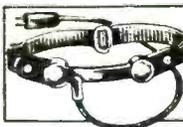
Complete Kit of 10 Potentiometers\$2.85



KIT 4: 6 ROTARY TAP SWITCHES

Contains: 1-3 pole 11 position non-shorting; 1-2 pole 5 position non-shorting; 1-6 pole 4 position non-shorting; 1-1 pole 9 position non-shorting power tap, 1 ceramic insulated special; 1-6 pole 4 position with double contact wipers on 4 poles and 2 positions on 5th pole.

Complete Kit of 6 Switches.....\$1.85



CARBON THROAT MICROPHONE

Ideal for plane, portable, or mobile operation, also for construction of lie detectors, toys, etc. You can't afford to be without a few at the price. Adjustable elastic strap fits any neck. Works into 200 ohm impedance input circuit. Used, but in good condition.

Price.....\$0.25 each

Plate and Filament Transformer:

650 v. Ct. 150 Ma.,
6.3 v. 7.5 Amp., 5 V.,
3 Amp. Secondaries, 110 V.
60 cycle AC Primary.
An excellent buy for the
set builder.
Brand New
\$1.95

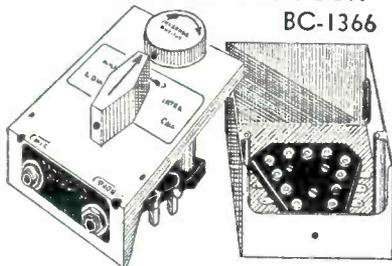
ESSE Radio Company

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Liberty Leads in

RADIO PARTS and EQUIPMENT

SIGNAL CORPS JACK BOX BC-1366



Cast aluminum box held together by 11 banana plugs; 2 jacks, 1 single and 1 double circuit, potentiometer, and double deck hand switch. Single unit 59c. Lots of 10 45c. Lots of 100 38c.

OIL-FILLED CONDENSERS

.1MFD.3000 V(Round can)	\$1.25
.25MFD.600 . . . . .	.10
.4MFD.600 . . . . .	.10
.5MFD.400 . . . . .	.10
.5MFD.600 . . . . .	.10
.6 x.6 x.6 MFD.90 60 cycle.	.75
.05x.05x.05 MFD.150 V. . . . .	.75
.22x.22x.22 MFD.300 V. . . . .	.75
1.0MFD.400 . . . . .	.60
1.0MFD.2000	1.50
1.2MFD.600 . . . . .	.75
2.0MFD.600 . . . . .	.75
2.0MFD.1000	1.00
2.0MFD.1500	1.25
2.0MFD.2000	1.50
4.0MFD.600 . . . . .	.60
4.0MFD.1000	1.00
5.0MFD.330 60 cycle.	.60
5.0MFD.150 500 cycle.	.50
5.0MFD.300 . . . . .	.50
5.0MFD.600 . . . . .	.50
6.0MFD.1500	1.50
7.0MFD.600 . . . . .	.75
8.0MFD.500 . . . . .	.60
9.0MFD.600 60 cycle.	.60
12.0MFD.330 60 cycle.	.50
14.0MFD.600 . . . . .	.75
15.0MFD.300 V. . . . .	.75
20.0MFD.330 V 60 cycle.	1.00
650.0 . . .MFD.80 W V (Cornell Dubilier).	1.00

SPECIAL PRICES ON LARGE QUANTITIES

RECORD CHANGERS

Detroit—late model \$16.50 net
Crescent—late model \$17.50 net

RADIO KITS

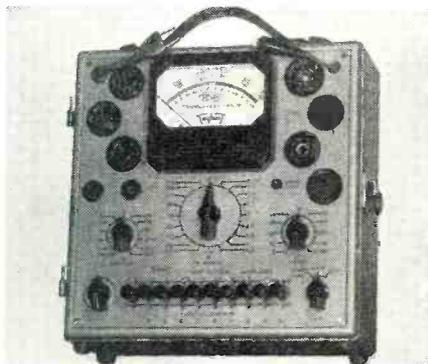
6 Tube "Super-Het" \$14.95
5 Tube "Super-Het" AC-DC . . . \$12.95
Special 5 Tube "Super-Het" with Slide Rule Dial \$19.95

25% Deposit with order, Minimum order \$2.00.

LIBERTY SALES CO., INC.
115 WEST BROADWAY · NEW YORK 13, N. Y.

What's New in Radio (Continued from page 74)

ment directly proportional to G_m and a properly measuring instrument. Short and open tests of every tube element are also possible. Gas tests may run on all tubes with this instrument.



The entire unit is housed in a 10" x 10" x 5 3/4" metal case of hammered enamel finish, tan with brown trim. An attached handle provides easy portability.

The Triplet Electrical Instrument Co. of Bluffton, Ohio will provide additional information on this unit upon request.

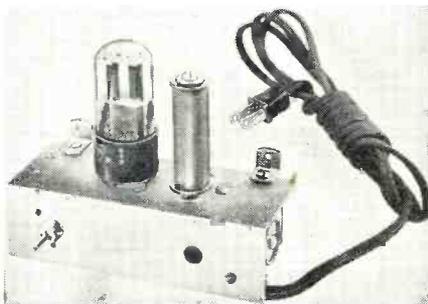
PHONO OSCILLATOR

D & M Manufacturing Company of Midland Park, New Jersey are introducing a new phono oscillator which may be used to link any record player or automatic record changer with any standard broadcast receiver.

With this unit no wire connections between the record player and the radio are required. An unusually strong signal completely blankets ordinary static or extraneous noise when the unit is located within 50 feet of the receiver.

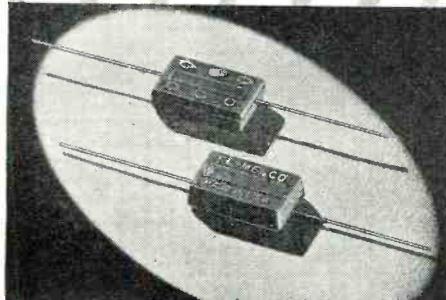
This oscillator, because of its small size, may be mounted in almost any record player. The unit weighs only 12 ounces including the tube. A dual purpose 12SL7 is used, the rectifier portion carries a load of less than 2 ma. which assures long tube life.

Transmitting frequency may be permeability tuned, by means of a slotted



screw, through a range from 550 to 1550 kc. Units are shipped tuned to 600 kc. Second harmonic transmission is equal in strength to transmission on the fundamental frequency so that in many cases the radio receiver can pick up the recorded music on

TOWARD NEW HORIZONS



Tested and proved in every important theatre of war, El-Menco Capacitors are now serving with equal merit in the products of peace. Insure the correctness of this important part of your product by specifying El-Menco Capacitors.

Write on your firm letterhead for our catalog. Foreign Radio and Electronic Manufacturers communicate direct with our export department, at Willimantic, Connecticut for information.



**THE ELECTRO
MOTIVE Mfg. Co., Inc.**
Willimantic, Connecticut

Phono-Bargains

1 Tube Phono Oscillator \$3.95
uses 117N7 GT tube (less tube)

Webster "56" Record Changer \$26.66
automatically stops after last record is played

AC-DC Phono-Amplifiers completely wired

1 TUBE uses 117L7 \$2.06
2 TUBE uses 50L6 & 35Z5 2.94
3 TUBE uses 50L6-12J5-35Z5 3.53
4 TUBE uses 12SL7-35Z5-35L6-35L6
(less tubes, speaker & volume control) . . . 5.29

Phono Motors with Turntables \$3.49

2 Post V.M. Record Changer \$17.95
3 for \$52.00

Portable Phonograph Case

Two-tone Leatherette finish, dimensions
15 3/4" L x 14 3/4" W x 8" H. \$9.95

Portable Automatic Phonograph Record-
Changer Case \$14.95

TEST EQUIPMENT

McMURDO-SILVER "VOMAX"
volt-ohmmeter \$59.85

McMURDO MODEL 905 "SPARX"
signal tracer \$39.90

All items subject to prior sale

20% with order, balance C.O.D. We prepay express on \$50.00 orders in U.S.A.

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Dept. A2

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RADIO COMPONENTS
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No. 22—5" SPEAKER Cabinet with black crackle finish with rear cover and posts for mounting. Shpg. wt. 5 lbs. only..... **75c**



No. 33 P.M. SPEAKERS

4" P.M. Alnico 5. Lots of 5..... **\$1.44** ea.
5" P.M. Alnico 5. Lots of 5..... **1.66** ea.
6" P.M. Alnico 5. Lots of 5..... **1.99** ea.



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20 ft. lengths (approx.) of 72 ohm coax **44c**
10 ft. lengths (approx.) of 7 conductor vinylite shielded cable..... **55c**
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We did it before and we are doing it again!
No. 866A **75c** No. 1625 **50c**
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100 MA—for use in AC-DC sets replacing rectifiers etc. Packed 12 to a box. Minimum sale 12.....ea. **90c**



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Complete with 6SJ7 and 6V6 tubes—easy conversion to a good power supply **\$4.95**

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RCA # 195A Volt Ohmyst	\$ 69.50
RCA # 182C Chanalyst	162.50
RCA # 167B Test Oscillator.....	63.75
WESTON # 697 V.O.M.....	76.52
WESTON # 779 Analyzer.....	78.26
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WESTON # 798 Mutual Conductance Tube Checker	187.09
HICKOK # 125 V.T.V.O.M.....	94.95
HICKOK # 191X Microvolt Generator.....	145.92
HICKOK # 203 Electronic V.T.V.M.....	79.80
HICKOK # 288X Signal Generator...	144.60
HICKOK # 534 Tube & Set Tester....	138.30

25% deposit, balance C. O. D.

Please include sufficient payment for transportation. Over payment will be refunded

Write to Dept. R-2

Standard Parts Corp.
235 MAIN ST. HEMPSTEAD, N. Y.

A New Synchronous Motor

By H. H. EVERETT

Eng., Fairchild Camera & Instrument Corp.

This smooth starting, low cost synchronous type phono motor reduces "flutter" and "wow."

WHEN the average customer considers a radio-phonograph combination, he usually looks for one that has a "good tone" and a handsome cabinet matching his living room furniture. Seldom does he ask what kind of a drive it has, whether it uses a crystal or a dynamic pickup, in general, offers. Usually he cares less about such purely technical factors.

But his ear is almost always keen enough to know one machine's "good tone" as against another's, even though he may not know the reason. Distracting hum, wobbling tone, turntable rumble, surface noise do not escape his attention. He tries to buy a machine that does not have, nor is likely to develop, such distractions.

Aside from this average consumer, there is a still small, but ever widening, section of the consumer public, able to afford the purchase of good equipment and fine record albums. These people love their music, and demand good playback equipment for it, even requiring standards of machine performance approaching professional quality. They are making it their business to learn more about the "insides" of their machines. They want to know the causes for the extraneous noises—"background hum,"

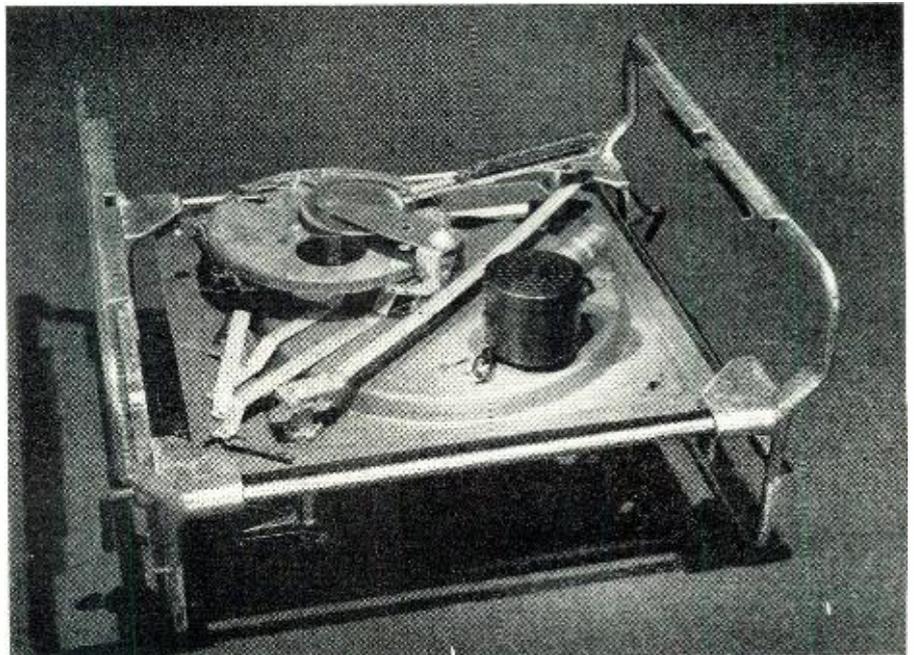
"wows," and the rest—that mar their listening enjoyment.

It may be argued that the layman should not be expected to be familiar with the mechanical workings of his playback machine. That is really the province of the manufacturer who builds it and of the dealer who markets it. They are the ones who should point out to customers its fine points, the reasons, why this may be good and that may be bad, and guide the customer's purchase accordingly.

Manufacturers and dealers have begun to do this. An education on some specific features has been increased through merchandising effort, the whole subject of quality basis is being more consciously impressed on all consumers. Thus, both manufacturers and consumers in turn are naturally becoming thoughtful about other quality features and so new components are beginning to come under wide general scrutiny.

With this growing spirit of criticism and inquiry, and the constant search for something better, manufacturers of high quality radio-phonograph equipment for the home are striving to satisfy the demand for better playback components. They know that consistent improvements in records

This new motor is designed for use in conventional record changers.



SPRAGUE TRADING POST

SWAP - BUY - SELL

SITUATION WANTED by married radio serviceman, 15 yrs. experience, 40, graduate B.S. physics, math and radio. Now taking course through F-M and Television. Desire position where training and knowledge count. J. C. Wunderlich, YMCA, Galesburg, Illinois.

SALE OR TRADE—Port. single-play phonograph with 3-tube amplifier, brown fabrikoid case; vol. and tone controls and 6" speaker; lightweight pickup. \$30 or equal value in multimeter. Barry Windsor, 212 W. Jamieson St., Flint 5, Mich.

WANTED—Hytron HY30Z plate transformer, Thordarson T19P56 or equivalent. Will swap new 1" hand reamer for a 1" taper reamer. I. D. Smith, 39 Prosepe St., Milford, Mass.

FOR SALE—No. 288x Hickok sig. generator crystal controlled, new, in original carton, \$140. 4" a-c voltmeter, \$15. 200 new tubes—what do you need? Testing machine to test tensile strength of wire. S. L. Malone, 2531 Sharon Ave., Dallas 11, Texas.

WANTED—Any schematic diagrams of phono-amplifiers or just plain amplifier circuits. Will trade, Stanley Schneider, 1041 Findlay Ave., Bronx 56, New York, N. Y.

WILL TRADE 2-meter RCUR and built-in code osc. plus speaker; surplus 814's, RK20, 837, 807's, 808, 5R4GY's. Want HK257B's, 866A's, 811's, 2A3's or 200-watt mod. xformer or beam indicator. Cash or what have you? Louis Gerbert, 815 Richmond St., Grand Rapids, Mich.

WANTED—RCA 8500 receiver in A-1 condition with coils for 5500-8900 kc. State price. Will trade or sell 5X16 speaker. R. G. Summers, 104 Herman St., Buffalo 12, N. Y.

WANTED—Good sig. generator and tube checker. Cash or what do you need? F. A. Thompson, 1316 West Division, Grand Island Nebraska.

FOR SALE OR TRADE—100-watt phone-cw transmitter complete ready to use on 10 meters. In 5 ft. rack. One Electro-Voice hi-impedance velocity mike and one hi-impedance dynamic mike. Both like new. Can use good camera. Bill L. Godden, 594 Norton St., Kansas City 1, Mo.

FOR SALE—Transmitter, receiver 3.5-7 bands. VFO. Phone/cw. 25 watts. 235 mc. Transceiver in same unit. 12 v. dynamotor, 15 tubes, phones, mikes, key, antenna, tuner spare parts. Mordecai Katz, 1399 Carroll St. Brooklyn, N. Y.

FOR SALE—Model C-E Solar Exam-eter, like new. Has AC-DC vac. tube voltmeter tests resistance to 10,000 meg., capacity to 2000 mf. \$45. John J. Marsh, 4624 No. 19th St., Milwaukee 9, Wis.

WANTED—U.S. Signal Corps "Sound Powered" telephone headset and microphone assembly consisting of 2 earphones on head-strap microphone with switch, wire harness. Rider Chanalyst. Cash. Chas. S. Brotzman, 173 Main St., Mexico, Maine.

FOR SALE—New 10-tube National 100 ASD receiver, perfect condition with real 8-meter and 8" speaker. 200-400 and 1300 to 30,000 kc. in 5 bands. Includes kit and instructions or converting to broadcast band. \$100. Howard E. Moore, 13 So. Dubuque St., Iowa City Iowa

FOR SALE—Masco 35-watt amplifier like new. \$65. Astatic T-3 mike with floor stand. \$28.50. Two new phono motors. \$5 ea., also many new and used tubes. What do you need? We want 25B8 tubes. Ben's Radio, North Tonawanda, N. Y.

WANTED—Bass reflex cabinet, D.B. 20, preselector, also good communication receiver. C. Horn, 325 E. 163 St., New York 56, N. Y.

FOR SALE OR TRADE—Westinghouse 6 mfd. 1000 v. oil-filled condensers. \$1.50 plus postage. Will trade for speech amplifier parts or Class B stage. Don Morris, 303 Home St., Fairmont, W. Va.

FOR SALE—117N7, 35Z5, 25Z5, 9002, 807 and many other tubes. What do you need? C. Gutman, 4415 Explanade Ave. Montreal, Que., Canada.

FOR SALE—30-watt phone and cw transmitter complete. 80-10 meters. Plus-in coils furnished for 10 meters. Also 1 crystal. New, std. size cabinet. \$85. M. J. Hill, 105 E. 46th St., Austin, Texas.

WANTED—All kinds of war surplus radio eqpt. Will pay cash or swap hard-to-get tubes, both receiving and transmitting types. W3QEM, 2036 Chalfant St., Wilkensburg, Pa.

FOR SALE—Hallcrafters SX-28A receiver complete with matching speaker. Excellent condition. \$185. Clair A. Rupert, R.D. No. 1, Sandy Lake, Pa.

FOR SALE OR TRADE—Triplet model 3212 tube tester, counter type. Will trade for any portable model and \$20 cash. Will sell for \$50 cash. This is new. Edward C. Punt, 397 Melrose St., Brooklyn 6, N. Y.

FOR SALE—New 6AC7 tubes, \$1 ea. in lots of 10 or more. Also Hallcrafters S-20-R absolutely new, \$50. Emanuel Wincor, 708 So. Homan Ave., Chicago 24, Ill.

FOR SALE—HRQ receiver with power, \$150. Extra coils, \$9.95. BC 375E transmitter, \$40. Dynamic mikes and earphones, \$5 ea. B19 Mark II transmitter, \$59. Want transmitter and E.C.O. A. Livingstone, 1201 Ellis Ave., Fair Lawn, N. J.

FOR SALE—Transceiver, 2 1/2 meters, 10 tubes including HY75, microphone, antenna; power pack 450 volts, 100 ma. Operates mobile on 6 v DC or fixed on 110 v AC. Parts cost \$125. Herb. Baumgartner, 8637 Litzinger, Brentwood 17, Mo.

FOR SALE—No. 802 R.C.P. tube and set tester with chart, \$35. No. 304 R.C.P. tube tester (no chart) \$15. Portable P.A. system complete with 1 horn, \$35. Harry Hollander, 2136 77th St., Jackson Heights, New York.

FOR SALE—Hallcrafters Sky Ranger S-39 receiver, \$67.50. Almost new. Rupert Radio Service, 708 F Street, Rupert, Idaho.

SELL OR TRADE—New 15-watt amplifier for sig. generator or tube tester. J. Bazewick, 3000 No. Christiana, Chicago 18, Ill.

URGENTLY NEEDED—One ribbon for replacement in RCA Jr. Velocity microphone Type 74-B. All inquiries answered. Western Auto Associate Store, Madison, N. C.

WANTED—A Meissner signal shifter. Will pay cash or trade. What do you need? Alex A. Pulityka, 248 Western Ave., Allegan, Mich.

FOR SALE—RCA No. 158 5" oscilloscope; Hickok 19XD crystal controlled sig. generator. Both like new. Also have Triplet 1210-A tube tester. T. Wojciechowski, 2837 Fulton St., Brooklyn 7, N. Y.

FOR SALE—Stancor 20P xmitter, \$50 with 75-meter coils. 40-meter 25-watt CW rig, \$49. 10-meter xtal, Bliley 29, 436 kc., \$5. Three HY69 tubes, new, \$3 ea. Two TU10B tuning units, \$4 ea., \$7.50 pair. Frank H. Carlson, New London, Iowa.

SWAP—Complete 1946 N.R.I. radio course incl. television and experimental ohmmeter. Would like a late model tube tester. W. T. Graham, 6624 Forest Ave., Brooklyn 27, N. Y.

FOR SALE—Astatic HP-16 phono pickup, \$14 postpaid. Want G.I. model D dual-speed phonomotor with turntable. Charles A. Idol, Madison, N. C.

FOR SALE—70 random copies of Electronics, (ST, Radio, FM, Radio News, Electrical Communications from 1936 to 1944. All perfect, all different. \$6 plus shipping. Philip Ross, 280 Wadsworth Ave., New York 33 N. Y.

FOR SALE—Kato rotary converter, 110 v DC to 110 v AC, 60 cycle. Used only one month. \$50. W. J. Donlay, 17 Hawthorne Ave., Buffalo, N. Y.

SELL OR TRADE—Triplet vac. tube voltmeter No. 1251, good condition. Want transmitter components, plate transformers, chokes, tubes, etc. or \$25 cash. R. E. Green, 703 N. County St., Waukegan, Ill.

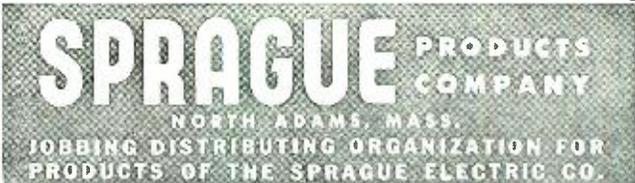


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Save Time...Earn More on Every Radio Repair Job!

There's nothing like the FEILER STETHOSCOPE for saving service time—solves the toughest repair problem in minutes. To isolate and locate trouble, you just "listen in" on or "look at" the signal as it progresses through the circuit. Traces trouble at First Grid, R.F., I.F., Audio; test parts; locates causes of mistracking, intermittance, distortion, etc. Features: 1" dia. aluminum probe with 3 ft. cable; Full 5" PM Speaker; R.F. vacuum tube voltmeter circuit provision for visual indication of R.F. voltages; Output meter provision; Headphone connection. In handsome brown-finished steel case with carrying handle; 8" x 11½" x 6"; wt., 10½ lbs. Operates on 105-125 volts. 50-60 cycles A.C. Complete with valuable Radio Service Guide.

MODEL TS-3 Signal Tracing STETHOSCOPE for A.C. operation. Complete with 2-1T4 (or 1L4); 1-6K6 (or 6F6), and 1-6X5 tubes.

ONLY **\$34⁹⁵**

MODEL TS-2. Battery operated (uses 2—Burgess M30); completely self-contained. Same professional performance and appearance as the TS-3. Complete with tubes (less batteries). ONLY.....

\$29⁹⁵

IMMEDIATE DELIVERY! Place your order with your regular parts jobber. If he can't supply you, write for name of nearest local jobber stocking the FEILER STETHOSCOPE—or send your order to us direct.



FEILER ENGINEERING CO. Dept. 1-B7
803 Milwaukee Ave., Chicago 22, Illinois

- Ship me one TS-3 STETHOSCOPE
- Ship me one TS-2 STETHOSCOPE
- \$.....enclosed.
- Send me FREE descriptive literature.
- Send name of local jobber stocking TS-3.

Name.....
Address.....
City.....Zone....State.....

will be largely lost through failure to reproduce them faithfully, and that the radio manufacturers will be blamed. They are giving their attention to the components on which the ultimate quality of sound-reproducing equipment depends; the drive mechanism for the record turntables, the pickup, the amplifier, and the speaker.

Of these several factors required in superior equipment, our concern here is with the drive motor, one of the most important contributions to smooth, "wow"-free turntable performance.

Unfortunately, up until now, too little serious attention has been given the special requirements of motors for sound equipment, even though two cardinal principles in the best quality sound reproducing apparatus driven by a motor are, (1) that the motor shall operate at constant speed without pulsations, regardless of changes in voltage supply to the motor, and changes in the load on the motor; and (2) that the motor's vibration noise level shall be below the level of audible reproduction, and not interfere with it in the slightest degree.

Every critical listener knows, whether or not he is conscious of the cause behind it, that any change in speed of the motor driving the apparatus while the record is being played, and any audible vibration noises ("background hum"), result in painful distortion and noise components that spoil listening pleasure. These annoyances can be exemplified by three specific effects contributing to inferior sound reproduction due to changes in driving turntable speed:

1. Changes in pitch—where speed changes are gradual, occurring from record to record, as the record changer turntable load increases from one to ten records;

2. "Flutter"—where speed changes are rapid, with resulting wobbling pitch variations, within a single revolution of the turntable;

3. "Wow"—where speed changes and resulting pitch changes occur at slower intervals (once or twice) within a single revolution of the turntable.

The cause of these annoyances can be found in the type of motors used in

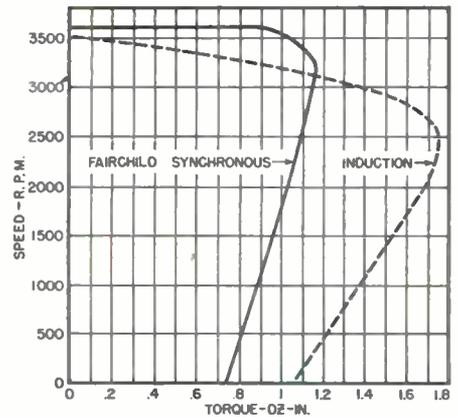


Fig. 1. Graphs show comparison of speed vs. torque characteristics at 117 volts, 60 c.p.s. Maximum efficiency of the synchronous motor is 24 per-cent as compared with 17 per-cent for an induction type.

non-professional record-playing equipment.

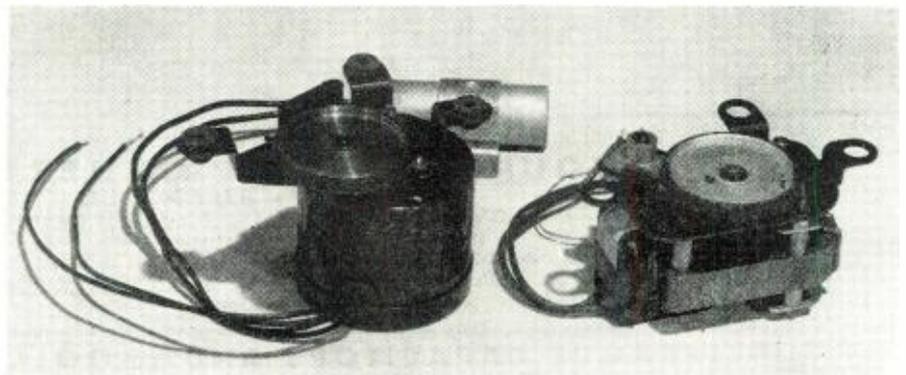
In the past, induction motors have been the most commonly used. Yet it is generally admitted that these shaded pole induction motors have poor speed stability, because speed variations with load and line voltage changes are inherent in them. The vibration noise level of these motors is by nature high due to greater torque pulsations, especially when price considerations have prohibited dynamic and magnetic balancing of the squirrel cage rotor for low-priced playback equipment.

Up to now manufacturers have chosen induction motors largely because there has been no economical low-cost synchronous motor (such as used in the best professional, expensive sound recording and transcription equipment). With the advent of a new low-priced synchronous motor, this situation changes for the better immediately.

A new synchronous motor has just been developed. Fairchild Camera and Instrument Corporation, well-known in the past fifteen years as manufacturers of professional sound recording and transcription turntable equipment, has introduced a new low-cost unit operating at synchronous speed of 3600 r.p.m. throughout its load range, on 117 volts/60 c.p.s. It is

(Continued on page 120)

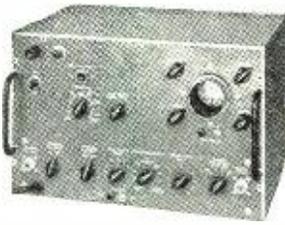
Synchronous motor compared with conventional shaded-pole induction motor.



RHS TELEVISION-SCOPE-POWER EQUIP'T

NAVY MODEL Q SYNCO-OSCILLOSCOPE

105 - 120v. - 60 cye. operation. Sweeps: 4, 15, 250, 1000 microsecond triggered sweeps. 25 to 3000 cps. saw - o - tooth sweeps. Trigger output: +150 or -75 volts. 100 to 3200 cps. Trigger input: ±10 to 150 volts. Sawtooth-output: 250v. at 25 to 3000 cps. Amplifier response: 30 cps. to 2.5 megacycles. Grey wrinkle enamel cabinet, 9 tubes including 2A1P scope tube. Used as a regular scope plus the advantage of observing high speed wave shapes as in pulse and television work. COMPLETE with tubes, cables and carrying case **\$89.50**



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ORDER SEPARATE OR COMPLETE KIT.....	Special	\$16.95

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G.E. Vacuum Capacitor			
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2400 mfd.—50WVDC.....	\$1.95
4000 mfd.—18WVDC.....	1.95
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6v or 12v dc Input. Delivers: 1.5vdc at 700ma; 1.5vdc at 700 ma; 7.5vdc at 300 ma; 90vdc at 45ma; 90vdc at 25 ma; 150vdc at 45ma. COMPLETE with VR90/30; CK1005; & Vibrator **\$14.95**

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Full Wave Bridge Types

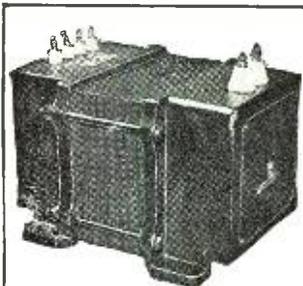
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18v ac.....12v dc	1-Amp.....	\$1.95
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Federal's New Midget Selenium 1.60 Immediate Delivery		

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6500v at 4 ma.....	\$9.95
6000v at 2 ma.....	7.95
3950v at 4 ma. tap at 1250v-1 ma.....	7.50
3710v at 10 ma.; 2.5v at 3A; 2.5v at 3A.....	9.95
2500v at 10 ma.....	6.50
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442-0-442v at 1000 ma.....	9.95
2.5v at 10 amps.....	3.25
6.3v at 6.6 amps.....	3.25
6.3v at 21.5 amp.; 2.5 at 2 amp.; 6.3 at 2 amp.....	6.95
2.5v at 3 amp.....	3.95
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10 Hy.—200 ma.....	\$2.25	12 Hy.—300 ma.....	\$3.95
4 Hy.—250 ma.....	3.95	15 Hy.—30 ma.....	1.95
10 Hy.—250 ma.....	3.25	20 Hy.—30 ma.....	2.25
12 Hy.—150 ma.....	2.95	75 Hy.—8 ma.....	1.95
4 Hy.—600 ma.....	5.95	15 Hy.—100 ma.....	2.35



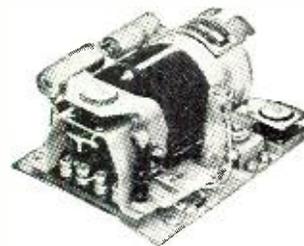
AMERTRAN HEAVY DUTY PLATE TRANSFORMER

For your dream rig. Pri. 105-115v, 60 cycle. Sec. 3100-0-3100, full voltage across sec. 6200v at 700Ma. Rated 2KVA. Our Price **\$39.95**

POWER SUPPLY FOR MARK 1-11-111 BC-19 OR OTHER EQUIPMENT

12 Amp-12v D.C. from 110v A.C. Unnecessary to tear set apart. Leave set portable. COMPLETE READY TO PLUG IN **\$32.50**

CARBON PILE REGULATOR



115V, 60 Cycles. 500 Watt LOAO, 750 W. AIR BLAST Uniform voltage to all equipment at any load to 500 watts. Regulates voltages to test bench and sets under test. Line voltage regulator for output of gas driven generators. Regulates line voltage from outlets in the average home. Used in rural areas where line voltage surges. Excellent Buy at **\$14.95**

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0-50 Ma.	0-3.5 K.V.w/shunt
0-100 Ma.	0-15Vac
0-350 Ma.	0-350Vdc
0-500 Ma.	0-150 Ma. R.F.
Frahm Freq. Meter 58-62 cycles	
Your choice any 3 1/2" METER... \$3.95	

0-150Vac.	-10+20db.
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WESTON SENSITROL RELAYS

110V—A.C. Reset—Model 705	
0-500 Microamps.	
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SPECIAL—YOUR CHOICE.....	\$12.95

NATIONAL DRIVE UNIT

PW-0 or NPW-0.....	Only \$2.95
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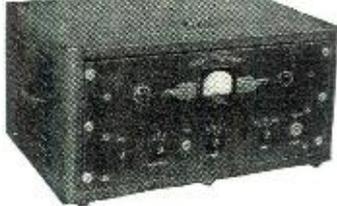
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TRANSMITTER KIT**



Field Reports Testify To Its Superior Performance

FROM SANDUSKY, OHIO—"May I congratulate you on turning out such a hot little rig as the "Globe Trotter." It's amazing the way this flea-power transmitter bucks the heaviest QRM." Jay Leibach

FROM BETHANY, W. VA.—"I am very well pleased with my WRL Globe Trotter (6L6-807). My first call resulted in a daytime report of 10db over R9 at 60 miles on 75 meter phone. The quality is excellent, and no hum is reported." J. S. V. Allen, W8UNS

FROM SANDY CITY, UTAH—"The particular feature of the "Globe Trotter" that appeals to me is its versatility. With a mere flip of a switch emission can be changed to any desired band, and to either CW or PHONE. For the money charged for these sets in these days of high prices for everything else, it really is a buy!" O. W. DeRemer, W7FST

IMMEDIATE DELIVERY!

Many other actual field reports of amateurs using the Globe Trotter testify to its excellent performance. It's the hottest ham equipment on the market today. The WRL Globe Trotter is capable of 40 watts input on C.W. and 25 watts input on phone on all bands from 1500 KC through 28 Megacycles. Incorporates the Tritet Oscillator using a 40 meter Xtal; Heising choke modulation; three bands, all pretuned; 10, 20, and 80 meters; two power supplies, one for 807 final and modulator tubes, one for speech amplifier and oscillator stage. **40 WATT INPUT** **\$69.95**
Cat. No. 70-300

Complete including all parts, chassis panel, streamlined cabinets, less tubes, coils and meter. No. 70-312 Same as above, wired by our engineers... **\$79.50**

1 Set Coils, Meter, Tubes... **\$15.15 Extra**



**New Type PHONO
OSCILLATOR**
Wired, less
tubes. Cat. **\$5.25**
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No aerial required Utilizes high quality loop both as part of oscillator circuit, and radiating medium Trimmer provided to adjust frequency to any portion of broadcast band between 1250 KC and 1700 KC Uses 35L6 and 3Z5 tubes

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Formerly Wholesale Radio Laboratories

Simple Code Practice OSCILLATOR

By RUFUS P. TURNER, W1AY

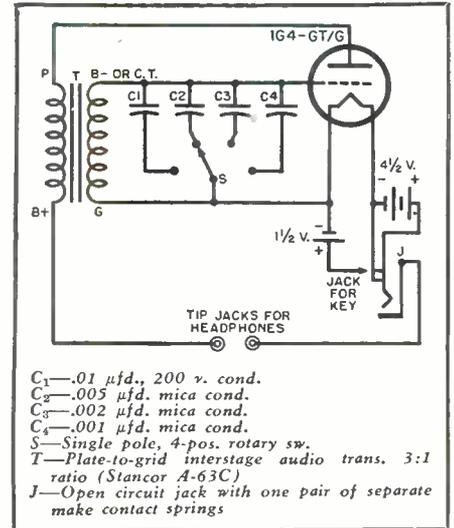
Consulting Eng., RADIO NEWS

This battery-operated, code practice oscillator can be constructed at a cost of only five dollars.

THERE is no reason why a one-student code practice oscillator should be complicated and expensive. The unit shown in the accompanying photographs and schematic gives a strong signal in a pair of earphones and is easy on its self-contained batteries. It is of neat appearance and can be used equally well with a key or code machine. It costs an even 5 dollars to build, but can be made even more cheaply by using less expensive parts and by using breadboard mounting.

The oscillator shown is built into a 6" x 6" x 6" wrinkle-finished steel "instrument box." A dime-store type of drawer pull is used as a handle. The two batteries are mounted on the back of one of the panels; all of the other circuit components on the back of the other panel. This complete construction may be seen in the second photograph, Fig. 3, in which the panels are shown removed from the case. Fig. 2 shows the external view of the assembled instrument.

Fig. 1 is the circuit schematic of the oscillator. The arrangement will be recognized as a simple tuned-grid, triode oscillator with inductive feedback. The feedback transformer, T, is an ordinary interstage audio unit with a turns ratio of 3 to 1. Primary and secondary polarities shown in Fig. 1 are correct for oscillation. The filament of the 1G4-GT/G tube is powered by a 1½-volt pen-size flashlight cell; the plate by a miniature, flat 4½-volt battery. A jack, J, is provided for the key or code machine.



- C₁—.01 μfd., 200 v. cond.
- C₂—.005 μfd. mica cond.
- C₃—.002 μfd. mica cond.
- C₄—.001 μfd. mica cond.
- S—Single pole, 4-pos. rotary sw.
- T—Plate-to-grid interstage audio trans. 3:1 ratio (Stancor A-63C)
- J—Open circuit jack with one pair of separate make contact springs

Fig. 1. Wiring diagram.

This is an open circuit jack with a pair of separate make-contact springs to close the filament circuit when the plug is inserted into jack J. Cord tip jacks are provided for the earphones. Oscillation frequency is controlled by the rotary switch, S, which cuts any one of the four grid capacitors into the circuit. The capacitances indicated in Fig. 1 for C₁ to C₄ give a good selection of tones. However, other values may be substituted to obtain other tones more pleasing to individual ears.

—30—

Fig. 2. Over-all view of completed code practice oscillator. Headphone and key shown connected in proper position.

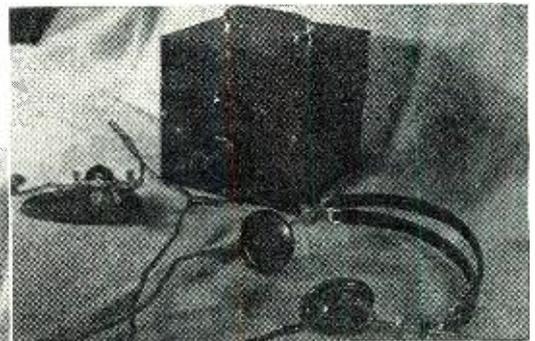
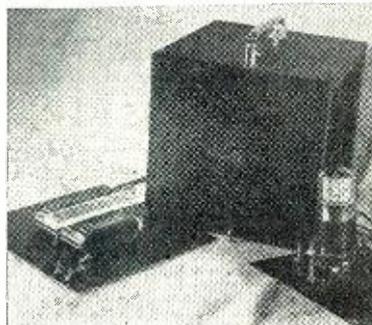
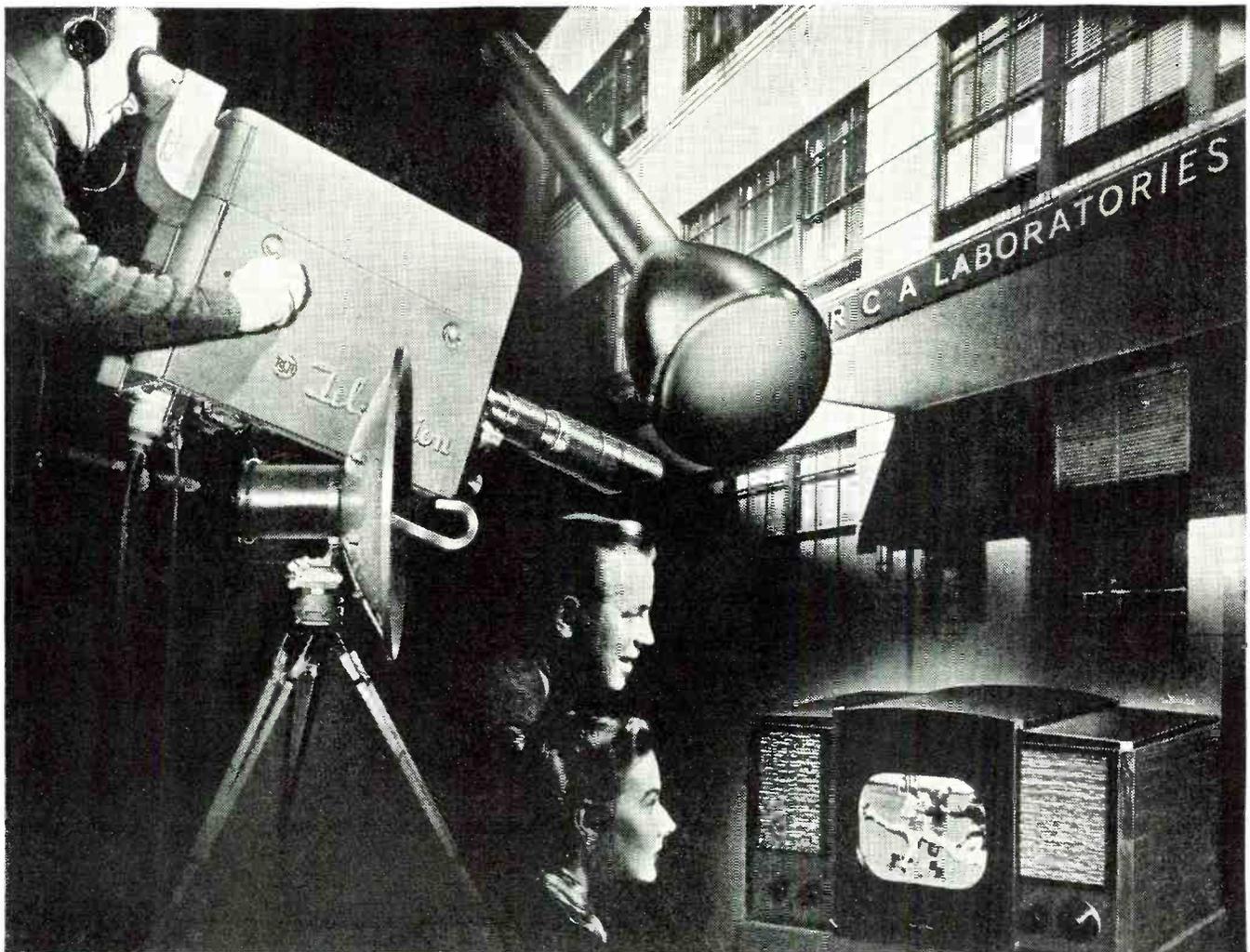


Fig. 3. Note that all circuit components are mounted on the front panel of metal case; both batteries are on the opposite panel.



Television camera, receiving tube, all-electronic receiver and radio relay equipment —are the result of pioneering and research at RCA Laboratories.

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*Radio Corporation of America, RCA Building, Radio City, New York 20 . . . Listen to The RCA Victor Show, Sundays, 2:00 P. M., Eastern Time, over NBC. *Victrola” T. M. Reg. U. S. Pat. Off.*



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SCR-522 100-156 Mc. RECEIVER AND TRANSMITTER

One of the most interesting and useful pieces of surplus equipment. Designed for plane and ground station use, this unit offers remote control of any four pre-selected crystal controlled frequencies in the spectrum of 100-156 Mc. This spectrum covers facsimile, air navigation aids, airport control, railroad, police, urban telephone, as well as the amateur band 144-148 Mc. October Radio News gives details for converting the SCR-522 receiver section, BC-624.

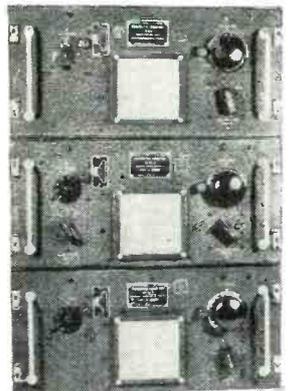
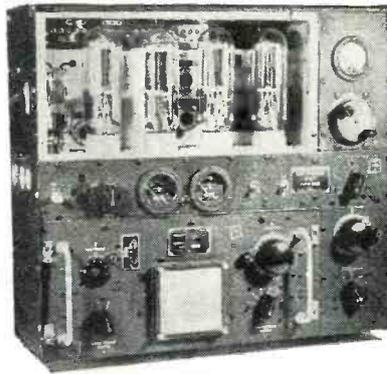
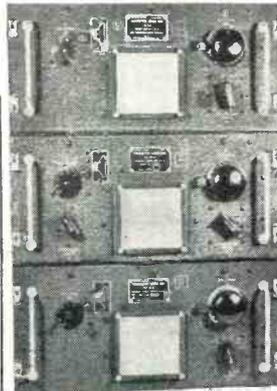
Transmitter section, BC-625, is voice amplitude modulated and has an output of 8-9 watts.

Tubes used and included: 2-832, 3-12AG, 1-6G6, 2-6517, 1-12J5GT, 3-12S67, 1-12CB, 1-9002, 3-9003, 1-12AH7GT.

These units were removed from planes but are guaranteed and are shipped in operating condition, including tubes, control head, and cable plugs ready to connect to dynamotor or other power supply.

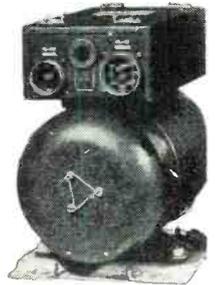
Weight, 49 lbs. Shipping weight approx. 65 lbs.

Price.....\$39.95 each



BC-375-E GENERAL ELECTRIC MOPA TRANSMITTER

Used as liaison transmitter in bombers and ground stations. Frequency range of 200-500 Kc. and 1,500-12,500 Kc. is covered by means of 7 plug-in tuning units furnished. By slight modification operation on 10 and 20 meters is possible. Oscillator is self-excited temperature compensated type. Power amp. is neutralized class "C" using 211 tube and is equipped with antenna coupling circuit to match practically any antenna. Modulator is class "B" using two 211 tubes. Power supply is 24 V. DC dynamotor which furnishes 1,000 V. at 350 M. A. However, transformer shown on this page is ideal for construction of 110 V. AC power supply. Transmitter output conservatively rated at 42.5 watts, phone 75 watts CW, but may be pushed to 150 watts. Complete as shown with tubes, dynamotor, seven tuning units, and cable connector plugs. Removed from bombers but checked and guaranteed.



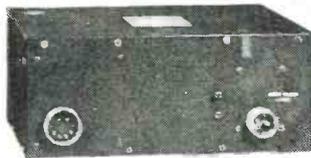
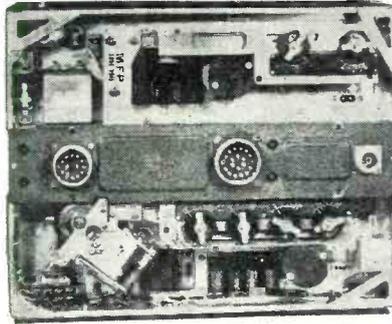
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Measures signals 100 Kc.-45,000 Kc., with check points at 10, 100, and 1,000 Kc. with a high degree of accuracy. Power supply is self-contained for operation from 110, 130, 150, 220, and 250 V. 25-60 cycles AC.

Complete with tubes, dual crystal, and instruction book.

Brand new, in original carton....\$24.95



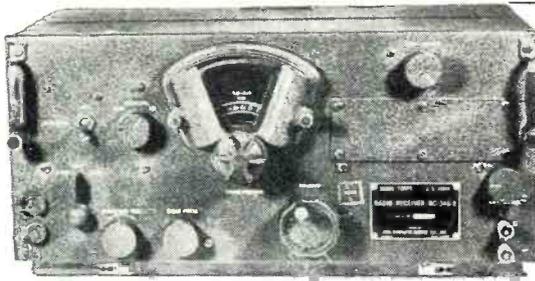
Dynamotor for 24 V. DC operation of SCR-522.....\$8.50. Wt., 39 lbs.



LS-3 LOUDSPEAKER

6" PM type, housed in heavy metal case. For use on BC-348 Receiver. Self-contained output transformer to match 4,000 ohm impedance. Used but guaranteed satisfactory.

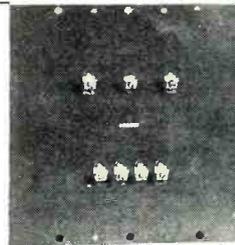
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BC-348 COMMUNICATIONS RECEIVER

Excellent selectivity, sensitivity and stability make this the most outstanding of any receiver yet available from government surplus. This receiver will give outstanding performance wherever used. Built to withstand vibration and features gear driven 100-1 ratio vernier tuning control. Six bands—200-500 Kc. and 1.5-18 Mc. Two stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. DC dynamotor. Easily converted to 110 V. AC operation. These receivers used, but can hardly be told from new. Guaranteed operation. Models N, M, P, and Q available—please specify.

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H. V. PLATE POWER TRANSFORMER

1425-0-1425 sec. at 750 ma. Pri. 110-115 V. 60-cycle, tapped for low and high power. These transformers were made for RCA equipment. Size, 10 1/4" x 10" x 8" Weight, 81 lbs.

Brand new.....\$17.50 each

3-10 Hy. 750 ma. Swinging Choke for filtering of power. 5,000 V. insulation. Size 6 1/2" x 7 1/4" x 8".

Weight, 38 lbs.

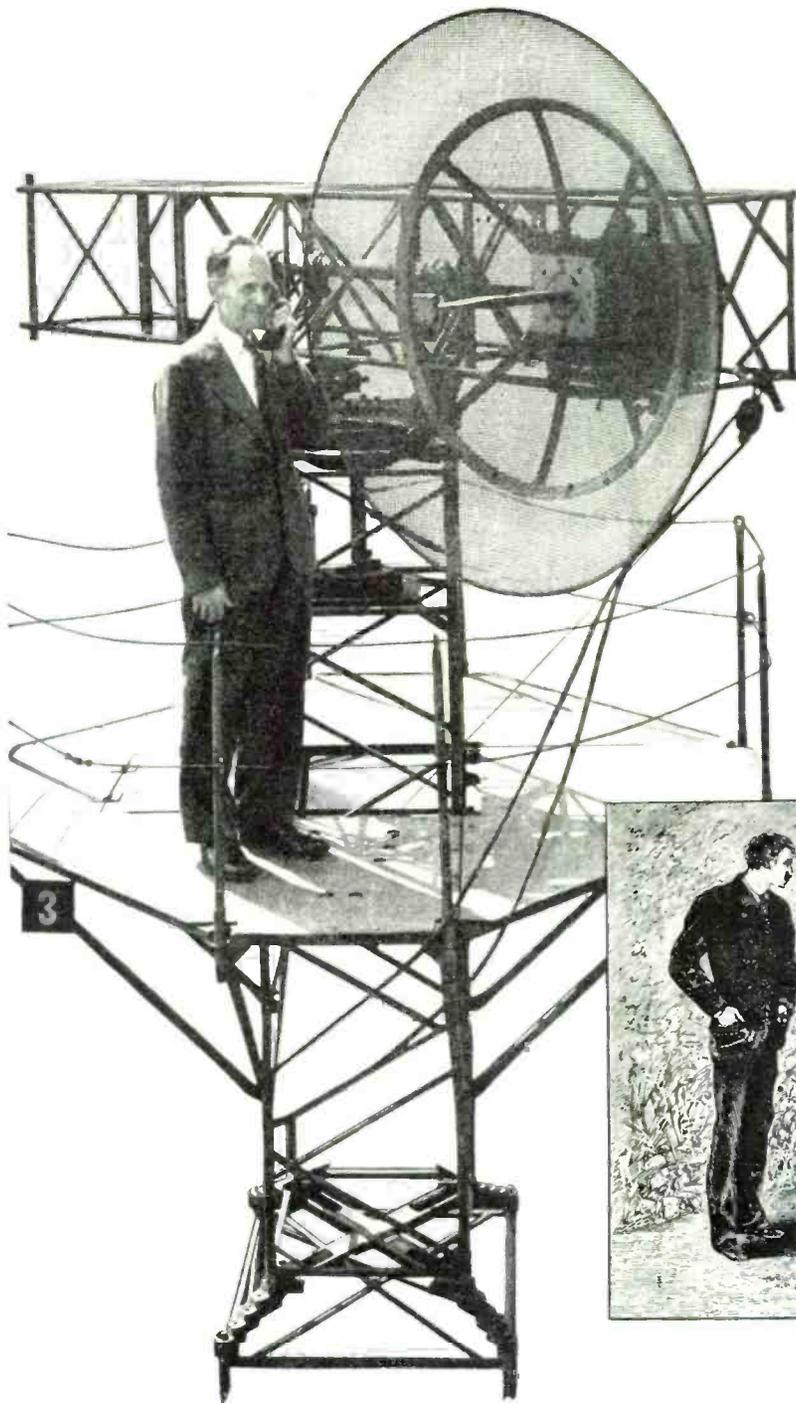
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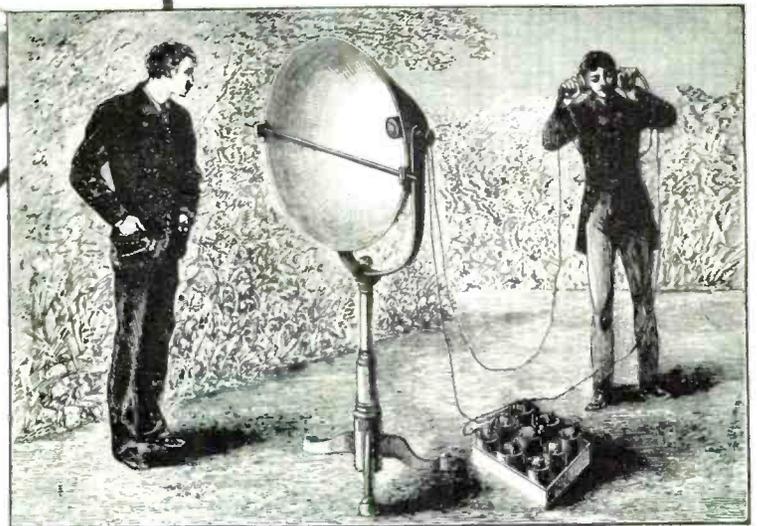
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Words that rode on a beam of light



If Alexander Graham Bell could look at the microwave antenna in the illustration, how quickly his mind would go back to his own experiments, 67 years ago!

For in 1880 the inventor of the telephone had another new idea. Speech could be carried by electric wires, as Bell had demonstrated to the world. Could it be carried also by a *light beam*?

He got together apparatus—a telephone transmitter, a parabolic reflector, a selenium cell connected to hand-phones—and “threw” a voice across

several hundred yards by waves of visible light, electromagnetic waves of high frequency.

Bell's early experiment with the parabolic antenna and the use of light beams as carriers was for many years only a scientific novelty. His idea was far ahead of its time.

Sixty years later communication by means of a beam of radiation was achieved in a new form—beamed

microwave radio. It was developed by Bell Telephone Laboratories for military communication and found important use in the European theater. In the Bell System it is giving service between places on the mainland and nearby islands and soon such beams will be put to work in the radio relay.

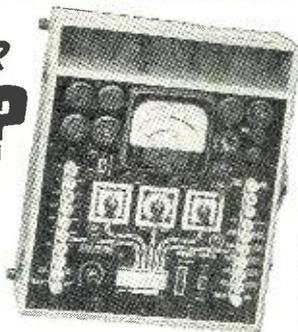
In retrospect, Bell's experiment illustrates once again the inquiring spirit of the Bell System.

BELL TELEPHONE LABORATORIES

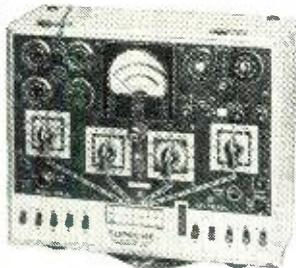


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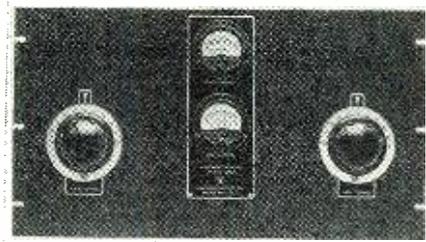
either of two settings without retuning the phono oscillator. The unit operates on 115 volts, a.c. or d.c., and includes a built-in scratch filter.

This oscillator is a product of the *D & M Manufacturing Company*, 51 Lincoln Avenue, Midland Park, New Jersey.

R.F. POWER AMPLIFIER

Of interest to the amateur is the new 500 watt r.f. power amplifier unit which has just been announced by the *James Millen Manufacturing Company* of Malden, Massachusetts.

This amplifier may be used as the basis of a high power amateur trans-



mitter or as a means for increasing the power output of an existing transmitter.

As shipped from the factory, the No. 90881 r.f. power amplifier is wired for use with *RCA* or *G.E.* 812 type tubes, but adequate instructions are furnished for readjusting for operation with other types of amateur transmitting tubes such as the *Taylor* TZ40, *Eimac* 35T, etc.

The amplifier is mounted on a 10½" relay rack panel. The panel contains the grid and plate tank tuning capacitor dials, as well as the grid and plate current milliameters. Plug-in inductors are furnished for operation on 10, 20, 40 or 80 meter amateur bands.

Additional details will be furnished by *James Millen Manufacturing Company*, Malden, Massachusetts.

PORTABLE PHONOGRAPH

Sonata Electronics Corporation of Chicago is currently offering their battery-operated, electrically amplified portable phonograph to the trade.



Known as the *TRELA* HW-301, this model plays records equally well indoors or out. The tilt-panel front and special battery amplification provide sufficient volume and clarity to permit it to be used on the beach or in a large

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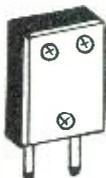
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30 mc oscillator-amplifier with 2 6AC7's. Uses 723ab, Waveguide input, xtal detector. With 6AC7's With 6AC7's and 723ab 10.00
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1/2 WAVE RECTIFICATION TRANSFORMER. 115v-60c/3200v @ 150 mill s. MADE BY KENYON \$7.25

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12hy-12 hy @ 150 ma. 15 amp. rating, each price \$4.25
15 hy @ 165 ma 200 ohms DCR. Price 2.00
55 hy @ 100 ma 850 ohms DCR. Price 2.00
2.6 hy @ 800 ma stud and terminals at bottom 5.95

NEW POWER SUPPLY for LM-18 freq. meter. Output: 290 v. at 20 ma; 13 v. at 600 ma. Input: 105-125v. at 60 cps; 260 ma; 27.6 W. type 84 rectifier tube; shock mounted. Complete with input and output cables; tube included **\$14.75**

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Model H	125 Ohms	25 Watt98
Model J	6 Ohms	50 Watt	1.25
Model J	1800 Ohms	50 Watt	1.25
Model K	3000 Ohms	100 Watt	.....	1.98
Model L	250 Ohms	150 Watt	.....	2.25
Model N	22 Ohms	300 Watt	.....	3.00
Model P	1200 Ohms	225 Watt	.....	2.75

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. **\$69.50**

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SONAR SOUND DETECTION UNIT!!!

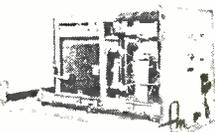
Ideal for detecting underwater sounds, such as fish swimming in schools, within a 15 mile area. Using a Rochelle salt crystal, which is about 1000 times more sensitive than quartz, as the active unit the sound is transmitted up a 60 ft. length of cable. It is completely enclosed in a solid rubber sheath. This sound detector was originally used in harbor defense. Coupled to an audio amplifier, this can be found to have many valuable applications. Ask for SD-1... **\$9.95**

PULSE AMPLIFIER



Signal Corps type BC109. 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—Variac 5 amps. General Radio type CU-200.
1—5 volt. 26 Amp. sil. transformer (for 304 TL).
1—2.5 volt. 10 Amp. sil. transformer (5000 volt insulation).
1—1 mfd. 1,000 volt. GE Pyranol.
1—2 mfd. 1,000 volt. GE Pyranol. **\$59.50**

RA-58-A HI-VOLTAGE POWER SUPPLY



Ideal for breakdown insulation testing, or as a source of power for a pulse transmitter. This unit supplies continuously variable voltages between 500 and 15,000 volts DC at 35 ma. A voltage doubler circuit using two 705A rectifiers and two 1 mf condensers is employed. RMS ripple voltage at maximum power is 6%. THIS UNIT OPERATES FROM 115 v/60c. Variable voltage is obtained by means of a Variac in the primary circuit of the high voltage transformer. Size is 21" x 17 1/2" x 29" deep. Net weight 314 lbs. This unit sells for the low price of. **\$116**

SPECIAL ITEMS

- Filament transformer 115v/60 cps Input; 6.3v @ 1.6 amps/6.3v @ 1.6 amps Output. 25,000v Air insulation. KS-8767 \$3.95
- Tube shields for 2AP198
- Transmitting key; 200 watt79
- Hook-up wire, stranded, 100 ft.95
- Mycalex strips, 1/4"x3/4"x14 1/2", ea.10
12 for \$1.00. Minimum order.60
- Hand generator type GN-45B. Output: 6v-3a/500v-.14a, rated speed 60 cps. 5.95
- Antenna loading coil, Heavy duty, with six (6) variable taps, 6 3/4" long x 3 3/4" dia. 2.95
- Visor for 5" scopes.75
- Broadcast band push-button tuning units. Inductive and capacity types. 1.98
- Matched pair precision resistors, 6.33 megs. 1.50
- Completely punched chassis for 2 inch scope, with some sockets 1.50

B-29 Computer Amplifier. containing 8 JAN6SN7 amplifier tubes, 1—6X5 GT 8—relays, 5—neon glow lamps, completely wired amplifier circuit with many components. This fine amplifier was designed for use with remote controlled guns. This buy sells for. **\$9.95**

Low Voltage Power Supply for AN/APS-10. using 3—6X5 GT's, and 1—600c. complete with 6 chokes, 1 power transformer, and filter condensers. **\$4.50**

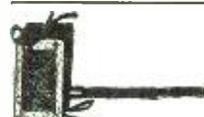
All merchandise guaranteed. Mail orders promptly filled. All prices F.O.B. New York City. Send Money Order or Check. Shipping charges sent C.O.D.

COMMUNICATIONS EQUIPMENT CO.

131-A Liberty St. New York City 7, N. Y.
Telephone WH 4-7658

A. C. RELAYS

DPDT 10a contacts. 115v/60 cps. coil Allied \$1.79
SPST 5a. ac. 115v cont. 115v/60 cps. 1.49
SPDT contacts; 5a coil rated 115v/60c 1.39
DPDT 115v/60c. cont. rating 5a @ 50v. 1.69
DPST Telephone type; 2p. 1 cl; 1 open; cont. rating. 5a @ 50v. coil rating 3.5 ma (@ 12K ohms) 1000 vdc. 1.05
DPDT Steatite insulated 10A Silvered Contacts. Made by Leach. 1.95



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

OIL-FILLED CONDENSERS

500 mf 200 vdc	.....	\$1.95
2000 mf 50 vdc	.....	2.00
4000 mf 30 vdc	.....	2.25
1 mf 300 vdc	.....	.25
2 mf 300 vdc	.....	.30
4 mf 300 vdc	.....	.35
1 mf 600 vdc	.....	.55
2 mf 600 vdc	.....	.40
3 mfd 600 vdc pyr.	.....	.65
4 mf 600 vdc pyr.	.....	.70
6 mf 600 vdc pyr.	.....	.95
10 mf 600 vdc pyr.	.....	1.49
15 mf 300 vdc	.....	1.49
1 mf 1000 vdc	.....	.90
2 mf 1000 vdc	.....	1.10
1 mf 1500 vdc	.....	1.20
4 mf 1500 vdc	.....	.30
1 mf 600 ac/1000 vdc.	.....	.85
2 mf 4000 vdc	.....	5.95
1-1 mf 7000 vdc	.....	4.95

G.E. Pyranol 23F47 2mf 4000v List \$30. \$5.95
G.E. Pyranol 23F49 1mf 5000v List \$27. 4.75
C-D TC-50010 1mf 5000v List \$30. 4.50
G.E. 14F191 .1mf 10000v List \$37. 6.75
G.E. Pyranol .06 mf 15,000 vdc. List \$25. 5.95
G.E. 14F136 Pyranol .75 mf 20 KV DC. 22.00

SANGAMO MICA CONDENSERS

F3L .0003 mfd 8000v list \$29. \$3.75
F3L .0015 mfd 8000v list \$31. 4.00
Solar type SX .0015 mf 3000v—list \$9.95. 7.75
Sangamo C-4 .004 mf 20kv (list \$110) \$25.50
Sangamo G-3 .006 mf 10kv (list \$87.50) 19.50

A. VHF Variable Condenser. 15-60 mmf. 3/4" air gap. 11 rotor plates. 6 stator. with feedback provision. Designed to operate in a tuned grid, tuned filament circuit. Listed at \$148. Our price. **\$10.95**

B. Split Stator. Cardwell PK-200-Q1; 30-200 mmf per section. Special Hi-Volt. Listed at \$60. **\$9.95**

C. Johnson Type 500D35. Maximum cap. 500 mmf. min 35 mmf. .08" spacing. 3500v. Listed at \$11.75. Lowered to... **\$4.75**

SILVER BUTTON MICA CONDENSERS
stud. mtk. (Eric/Centralab.) 175-180-185-245-335 mmfd 400 vdc, each. \$0.05
lots of 100 4.50

AUDIO TRANSFORMERS

Line to Voice coil transformer. Pri. 600 ohms. Sec. 6 ohms. 1200 Test volt. \$1.75
Audio output transformer Split pri. 1500 ohms each side. Secondary impedance 85 ohms center tapped—6:1 ratio. 100 Watts output 7.50
Modulation xfmr; typical for 211's CLA/50W 1.35
Modulation xfmr; 807 to pr 807's in parallel 1.00
Modulation xfmr; pr 811's to 813. 5.00

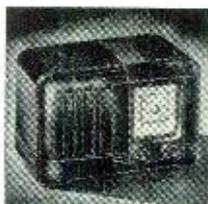
TUBE BUYS!

Tube Type	Approx. List	Your Cost
3BP1	\$15.00	\$ 3.95
3FP7	27.00	2.98
5BP1	20.00	4.95
5CP1	45.00	4.95
5CP7	48.00	6.00
5FP4	.....	4.95
5FP7	32.00	4.25
51P2	48.00	8.95
837	2.80	1.50
872A	7.50	3.50
705A	22.50	7.50
241B-WE	85.00	50.00
861	155.00	95.00
2C40	.....	5.35
2C43	.....	8.95
Sockets for 5CP1, 5BP1, 3BP1, 705a, 829, and 723 A/B tubes	.....	\$3.65 ea.

SELSYN MOTORS
Ideal for remote control, or for antenna rotation. Size 5G. 115 V/60 cps. Cost per pair **\$7.75**

BUILT-IN QUALITY
 Made Our Famous
RADIO & PHONO KITS
 A National Success!
 THE IDEAL KITS FOR
 STUDENTS • SCHOOLS
 HOSPITALS • SERVICEMEN
 AMATEURS

NEW!



Our Model S-5 uses the universally accepted superheterodyne circuit containing the following tubes: 12SA7, 12SK7, 12SQ7, 50L6, 35Z5 and tunes from 550 Kc to 1600 Kc. Model S-5 (illustrated)... Complete Kit including tubes, Bakelite cabinet and instructions.

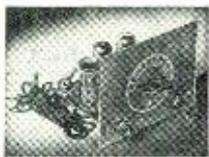
.....



Model S-6X, our latest, a 6-tube 2-band receiver kit, equipped for either 110 or 220 volts, AC or DC... covers the following ranges:

550 Kc
 1600 Kc
 6-16 Mc

Complete and ready for assembly



Our model R-3 is a 3 tube Receiver of the Regenerative type. This receiver is the 110 volt type and operates at a frequency of 550 Kc to 1500 Kc by means of a plug-in coil. The power supply is self contained in the receiver thus eliminating the need for a separate power pack. This kit comes completely disassembled.

.....

New! Sensational!
COMBINATION
RADIO &
PHONO KIT

- 5 tube superheterodyne radio
- Beautiful walnut finish cabinet
- 5" Alnico V Speaker
- Astatic L-72 pick-up

Ready for assembly.

.....

**All Kits Are Furnished Complete,
 Less Wire & Solder**

Direct Shipments to All Parts of the World! 25% Deposit on C.O.D. Orders
 Write for FREE Catalog.

RADIO KITS COMPANY

Dept. K
 120 Cedar Street, New York 6, N. Y.

hall. The model is hand-wound by means of a special disc and plays two records with one winding.

The cabinet is covered with leatherette and is equipped with a sturdy handle. The total weight of the unit is about 21 pounds.

Sonata Electronics Corporation, 624 South Michigan Avenue, Chicago, Illinois, will supply additional details on this item.

FEILER STETHOSCOPE

Feiler Engineering Co. of Chicago have introduced their new signal tracing "Stethoscope" which has been designed to facilitate servicing of radio receivers by cutting down time expended to located parts failures, inter-



mittents, noise, mistracking, low sensitivity causes and distorted tone.

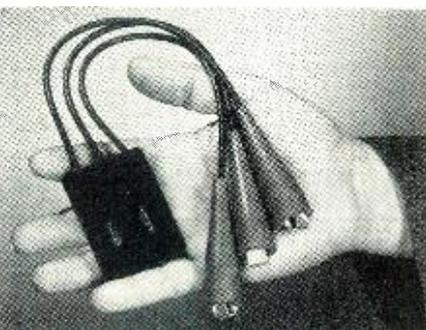
Available in two models, the TS-2 battery operated and the TS-3 a.c. operated, this unit is completely portable and utilizes low current drain miniature type vacuum tubes.

A new type probe, 1" in diameter and 4 3/4" long, is made of aluminum and houses a miniature tube, isolating network and associated circuits for the special detector-amplifier.

A data sheet covering both of these models will be forwarded upon request to Feiler Engineering Co., 803 Milwaukee Avenue, Chicago 22, Illinois.

POLYVOLTESTER

Fox Valley Instrument Company has announced a new pocket test instrument which distinguishes between directions of phase rotation; 220 and



110 volts, a.c. or d.c.; a.c. and d.c. and identifies positive and negative wires on d.c.

Known as the Polyvoltester, this unit is characterized by rugged construction and imperviousness to damage regardless of how the instrument

is connected to any of the systems mentioned above.

In operation, the unit features no switches to turn, no metal to touch, no meters to read and no moving parts to wear out.

Further details of this unit will be furnished by Fox Valley Instrument Company, Box 603, Ingleside, Illinois.

-30-

10-Meter Converter

(Continued from page 56)

If a standard 1500 kc. i.f. is available, one of its sections may be used for the primary of T_1 , with a jumble winding for the secondary.

The coils L_1 , L_2 , L_3 , L_4 are wound on one and one-half inch lengths of one-half inch outer diameter polystyrene tubing. Bakelite tubing would have served just as well. L_1 consists of twelve turns of No. 18 enameled wire, wound to a length of 3/4", with L_2 consisting of two turns of number 32 d.s.c. around the cold end. This primary is designed for use with a low impedance antenna, and if 300 ohm line or some similar feeder is to be used, L_2 should be increased to 4 turns.

L_3 is seven turns of number 18 enameled wire with a winding length of 1/2", with L_4 being three turns of number 32 d.s.c. It is important that L_4 be wound in the same direction as L_2 or the oscillator will not function.

In mounting the tube socket care should be taken to orient the socket so that pins number 3 and 4 are toward the front of the chassis. This will insure the shortest leads and greatest ease in wiring.

The trimmer condensers C_2 and C_3 are mounted under the chassis on either side of the tube socket. Placement of other parts may be seen from the photos.

For ease in tuning, a 2" diameter dial pulley from an old receiver was fastened to the shaft of the tuning condenser, and driven by a length of dial cable from a shaft and panel bearing assembly.

Switching from regular operation of the receiver to operation with the converter is accomplished by means of the d.p.d.t. switch, S_1 . A short length of coaxial cable runs from this switch, out through the back of the chassis for input to the antenna and ground terminals of the receiver. Input to the converter is through a standard microphone connector.

A pointer from a small radio is fastened to the condenser shaft in front of a piece of opaque celluloid to indicate the frequency.

The case for the complete converter is constructed from the same material as the chassis, and measures 4" wide, 3 1/4" high, and 4 1/4" deep. The rear cover is fastened permanently in place by means of small sheet metal screws, while the front cover is held to the chassis by means of locknuts on the switch and tuning shaft. This front cover has a 1/2" lip all around. The

McGEE'S MILLION DOLLAR WAR SURPLUS SALE

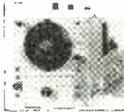
8000 PIECES IN STOCK—AIRCRAFT TRANSMITTERS—RECEIVERS—MODULATORS I.F.F., ETC.

McGee's Big 3 month clearance sale (Feb., Mar., April). Over a million dollar stock of war surplus (Gov't. cost). No priority needed; order now. Send 25% deposit; balance sent C.O.D. Canadian and American Possession customers send full remittance and ample postage. All prices F.O.B. Kansas City, Mo. Phone Victor 9091.

BIG SCOOP! WESTERN ELECTRIC AIRCRAFT SURPLUS

Aircraft Receivers

These Army surplus aircraft receivers may be operated from a 24 volt AC filament supply and any lowpower 250 volt B supply; or the tubes changed to the 6 volt type. There is plenty of room for a power transformer and rectifier tube in place of the dynamotor. This receiver is very selective and sensitive; has RF stage and BFO. Made by Western Electric and you never saw finer wiring. Offered complete with tubes; 12K8, 3-12SK7, 12SK7 and 12A6, but less 28 volt dynamotor. Specify the frequency you desire. We have about 1500 available.



- BC-454-B Superhet Receiver 3 to 6 MC. Your Cost\$9.95
- BC-453-B Superhet Receiver 200 to 500 KC. Your Cost\$9.95
- BC-455-B Superhet Receiver 6 to 9 MC. Your Cost\$9.95
- Very special: All 3 of the above receivers; with shock mounting rack.....\$27.95
- 28 volt dynamotor (snaps on receiver chassis) \$1.95 3 for.....\$5.50

This is the Ham's Delight—Army Aircraft Transmitters

BC-457-A 4 to 5.5 MC
BC-458-A 5.3 to 7.5 MC



This really fits the ham's dream. Ideal for a 55 watt transmitter with 575 volts at 250 MA plate supply, or VFO to drive a high power rig. It's a companion unit to the 454-455-453 series aircraft receivers. Made by Western Electric and really rugged. The oscillator will hold the frequency, even under rough operating conditions. Has 12J5 M. O. and 2-16Z5 (807) in parallel as final P. A.; or buffer to feed into a high power rig. Built in crystal dial calibration checker. Antenna loading inductance. Complete conversion data to VFO or FM oscillator is covered in CQ magazine; May '46 issue. Why not use this for your VFO? It's a real buy. 1000 to sell; at the ridiculous price of \$14.95; with tubes. BC-457-A Transmitter 4 to 5.5 MC. Complete with 4600 KC crystal. Your Cost \$14.95
BC-458-A Transmitter 5.3 to 7.5 MC. Complete with 6200 KC crystal. Your Cost \$14.95
Special. Both of above on shock mounting rack\$28.95
2" x 0 to 10 antenna current meter in case; ideal for loading above transmitter.Each \$2.95

BC-456-E Western Electric Modulator Unit

Companion unit of BC-457-A and BC-458-A. Complete with 12J5 and VR150 and 16Z5. Gives necessary output to modulate above transmitters. We have a few more modulators than transmitters and are offering them at a ridiculously low price. You can salvage many parts from this modulator unit. Offered complete with tubes. Very special \$4.95. 3 for \$13.95. Dynamotor 28 volts input; 250 volts 100 MA output continuous. Snaps on modulator \$3.95 each; 3 for \$10.95.



COMPLETE RADIO KITS

5-TUBE AC RADIO KIT

superhet circuit using new permeability tuning unit. Covers broadcast 550 to 1700 KC. Beautiful walnut cabinet 12 7/8" x 6" x 5" PM speaker. Everything complete, includes 6SA7, 6SK7, 6SQ7, 6K6 and 5Y3 and diagram Model K-5A. Net \$16.95



KIT K-7A 7 tube AC superhet 550 to 1700 KC. Has push-pull audio stage with tone control and 6 1/2" alnico 5 PM speaker. Conventional circuit with AVC. Similar in appearance to model K-5A except has slightly larger cabinet. Everything complete including diagram and tubes 6SA7, 6SK7, 6H6, 6SN7, 2-6G6, 5Y3. A real value.....Net \$19.95

OUR LEADER KIT \$9.95.

2 gang cond. AC-DC 4 tube TRF kit 550 to 1600 KC Kit K-4R, a TRF job with a walnut cabinet and 5" alnico 5 PM speaker. All parts furnished; including tubes and diagram. Has direct drive dial and a very simple standard circuit. An ideal kit for the student or experimenter. Just a few hundred to sell. Very Special at only \$9.95



NEW PLASTIC CABINET AC-DC SUPERHET KIT.

Cabinet size 7x9 1/2x10 1/2". Attractive slide rule dial. Positive drive permeability tuner. Receives broadcast 550 to 1650 KC. Has latest Alnico 5 PM speaker. Loop antenna; all parts simplified diagram and tubes 12SA7, 12SK7, 12SQ7, 50L6 and 35Z5 furnished.....Kit P-48 Net \$12.95



4 TUBE 1 1/2-90 VOLT FARM RADIO KIT. Offered in same cabinet as the above Kit Model P-48. The same high gain broadcast superhet circuit. Complete with 4 tubes; 1R5, 1T4, 1N5, 3S4 and diagram. Less battery pack. Kit model PB-48. Your Cost \$10.95



JAN OR REGULAR BRAND TUBES CARTONED OR UNCARTONED

SPECIAL AT .49			SPECIAL AT .69		
39/44	42	6D6	1J6	7A7	6G6
76	41	6C6	1D5	7A4	6C5
37	15	12S5	30	7H7	12Z3
3Y4G	26	1T4	30	5U4	4V
5Y3GT	6H6	384	7A6	5T4	
8C8G	6AC7	1L4	7C5	6X6	
6F8Q	6SH7	3A4	14B6	6P6	
1633	56	1R5	7Z4	6Y6	
1634	6B4G		724	12SQ7	
12SN7	80		523	12SK7	
6SN7	6K7		6SA7GT	46	
6SD7	62J5		6SK7GT	38	
			6SQ7GT	68J7	

VERY SPECIAL JAN 6L6M .99

LOCTAL 1 1/2 Volt Tubes: 1LN5, 1LH4, 1LD5, 1LB4, 1LA6. Special\$1.49

NAVY RBZ PORTABLE MINIATURE RECEIVER. Same as we advertised in November '46 Radio News; except it covers 2 to 5.5 megacycles. Weighs only 5 lbs. complete with battery. 200 to sell. Net \$14.90 Navy RBZ 5 to 13 megacycles complete with battery. Net \$14.95

ARMY BC-645 I.F.F.



ARMY BC-645 I.F.F. UNIT. Net \$16.95. Early in the war, when radar picked up a plane, there was no way of knowing whether it was friendly or not. That was before BC-645 was invented. BC-645 sent out a signal that identified the plane as American. It probably saved more lives than any other piece of electronic equipment made. With some modifications the set can be used for 2-way communication, voice or code, on the following bands: ham band 420-450 mc., citizens radio 460-470 mc., fixed and mobile 450-460 mc., television experimental 470-500 mc. Equipment capable of operating for hundreds and hundreds of dollars. The 15 tubes alone are worth more than the sale price. 4-7F7, 4-7H17, 2-7E6, 2-6P6, 2-955 and 1-We316A. It now covers 460 to 490 mc. Each BC-645 is shipped with a Belmont factory printed conversion diagram, showing how to make AC power supply modulator and how to make Transmitter and Receiver changes. Most Hams and experimenters already have the few parts necessary. New BC-645 with tubes less power Supply.....\$16.95

SENSATIONAL SURPLUS BUY.

BC-654-A Transmitter-Receiver 12 watts CW. 8 watts phone. 3800 to 5800 KC \$19.95. Used but in apparently good order. Offered with 3-307A tubes but less receiver tubes. The 7 tube superhet receiver has 2 RF stages. Designed for 1 1/2 volt octal tubes. Could be converted to heater tubes. Has built in 200 KC crystal calibrator. The 200 KC crystal and 0-3 RF thermocouple ammeter and 3-307A tubes are worth the price we are asking for the whole unit. First come first served. BC-654-A transmitter-receiver less power supplyNet \$19.95
BC-654-A Complete with all tubes and spare tubes. Net \$24.95. 2 for \$47.50.

RADIO-PHONO COMB. KIT

Build this beautiful portable combination radio phonograph. We furnish everything. Beautiful two tone portable case, latest rim drive phonomotor, Astatic crystal pick-up. All parts to build high quality 5 tube AC-DC radio. Tuning broadcast 550 to 1650 KC. Has tone control, loop antenna, 6" Alnico 5 PM speaker. Tubes 12SA7, 12SK7, 12SQ7, 50L6 and 35Z5. Simple diagram furnished. Kit Model RP-12.....Your Cost \$29.95

Beautifully made, highly polished walnut cabinet with hinged lid. Plays 10" records with lid closed. Latest rim drive phonomotor and high output Astatic crystal pick-up. High power JT-5, push-pull 3 tube AC-DC phono amplifier (wired and tested). Heavy duty 5" Alnico 5 PM Speaker. Single record player kit Model WL-3.....Your Cost \$19.95

Snyder top quality auto antennas all have 36" shielded lead in. Individually packed.
3 Section Side Cowl 68" C-3L.....Net \$1.79
4 Section Side Cowl 100" C-4.....Net \$2.49
3 Section Fender Cowl Only 8" closed, 55" extended FC-4.....Net \$3.95
4 Section Deluxe swing angle.....Net \$2.69
Teeny Weeny I.F. Trans. 456 KC 2 1/2 x 2 1/2" double slug tuned. Both 1st and 2nd.....\$1.49 per set
Teeny Weeny 500,000 ohm volume control. D.P.D.T. Sw. 3/8" Dia. 1 1/2" shaft.....Net \$8.00
Pillow speaker; very thin; easily attached to radio. Made by Carron. Very Special.....Net \$2.95
Auto Antenna; full 66" 3 section side cowl. Shipped with 30" separate lead. Red Hot Special \$1.00. Each 10 for \$9.90

Two-Tube Phono Oscillator, \$3.69

COMPLETE. WIRED AND TESTED. 600 to 1500 KC. Model B-4. Has audio gain stage for proper power output. Complete with tubes ready to operate. \$3.69.

Mike Oscillator model C-4 is similar to model B-4 except has added gain stage for crystal mike. Complete with 3 tubes and fader control \$4.95. Crystal mike \$4.90 extra.

Write for latest bargain flyer of radios, parts kits, tubes and war surplus.

McGEE RADIO CO.
1225 McGee St., KANSAS CITY, MO.

LATEST IN PHONO-KITS

High Power Push-Pull Amps

You can save money by assembling your own record players. All the kits listed below are complete; nothing else to buy. In 15 or 20 minutes any of these kits will be ready to sell to your customers.
*The model JT-5 high power push-pull 3 tube AC-DC amplifier is furnished with all record player kits complete; wired and tested and furnished with tubes and speaker. The push-pull circuit assures good base response even at low volume. For servicing convenience and connecting to pick-up, a schematic diagram is furnished.

KIT J-15 SINGLE RECORD PLAYER. Attractive ready cut walnut finished cabinet with latest 78 RPM phono motor and light weight crystal pick-up and *JT-5 push-pull AC-DC amplifier and 4" alnico 5 PM speaker. This player will surprise you in appearance and performance. Kit J-15 Dealers.....Net \$15.95 complete



KIT J-16 AUTOMATIC RECORD PLAYER. Beautiful walnut finished, made to fit cabinet; latest single post automatic record changer and *JT-5 high power push-pull AC-DC amplifier (wired and tested) and heavy duty 5" alnico 5 PM speaker. This kit makes a deluxe home record player. Kit J-16 Dealers.....Net \$29.95 complete
KIT J-16A. Same as J-16 except with leatherette base instead of walnut. Dealers.....Net \$26.95 complete

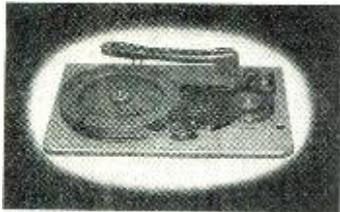


KIT J-18 PORTABLE AUTOMATIC RECORD PLAYER. Beautiful portable leatherette case and latest single post automatic record changer and *JT-5 3 tube AC-110 push-pull amplifier (wired and tested) and heavy duty 6" alnico 5 PM speaker. We have sold hundreds of these to our dealers and they keep coming back for more. A real value. Kit J-18 Dealers.....Net \$33.95 complete



KIT J-19 SINGLE RECORD ATTACHMENT. Attractive walnut finished base with motor cut out, latest 78 RPM rim drive phono motor and light weight, high output crystal pick-up. Easily attached to any radio or amplifier. Kit J-19 Dealers.....Net \$9.95 complete
Model B-4 phono oscillator (fits under base). Dealers.....Net \$3.69





MAGNETIC WIRE RECORDER

One full hour of recording. Full range fidelity in recording and reproduction. Records from standard phonograph records and radio. Home or office recordings made with microphone. ALL YOU NEED IS A RADIO OR AMPLIFIER.

MAGNETIC WIRE RECORDER (as illustrated) with Crystal Microphone, Crystal Phono Pick-Up Arm, Spool of Wire, 40 K.C. Oscillator, Schematic Diagrams, Instruction Manual.
 Price F.O.B. Staten Island, N. Y. \$97.50
 Additional Spools of Wire..... 5.50
 Limit: One to a purchaser. No Radio Mfrs. C.O.D. orders honored with \$50.00 deposit.

SOUND MIRROR

The Brush Magnetic Tape Recorder. Records 1/2 hour on metallic impregnated paper tape. Extra reels available. Erase and record countless times. Complete unit housed in beautiful wooden cabinet, contains amplifier, speaker, 3 motors and non-directional crystal mike. Simply plug into 60 cycle, 110 volt, AC line. Write for additional information and price.

BRUSH MAIL-A-VOICE

Model BK-501. Records magnetically on ferrous coated paper discs. Supplied with self-contained amplifier and microphone, for 110 volt, AC 60 cycle use. Compact carrying case. Ready to record and playback. MAIL-A-VOICE recording discs may be folded and mailed..... \$49.50



M-110 Western Electric Sound Powered Microphones. Complete with chestplate and 20' of high grade microphone cable, \$6.50; with 50' length of wire \$7.50

CONDENSERS

Cat. No.
 C-120—1 mfd. @ 400v, oil fill, rec. 30c, or 6 for \$1.50
 C-121—Aerovox. 1860 Mica. 000025 @ 10,000v. 2.00
 C-124—1 mfd. 1000v, oil fill C.D. @ 80c, 4 for 2.50
 C-125—Sprague bathtub 3x.1 mfd. 600v, d.c.25

FILTER CHOKES

F-102—Raytheon 25hy @ 65ma. 111-volt Ins. \$1.15
 F-105—Raytheon Shy @ 60ma. Herm. Seal.60

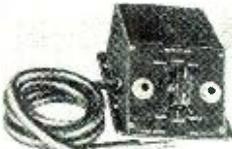
TRANSFORMERS

A-111—Line match. Var. line imped. Tap. pri. \$1.00
 A-130—Television & Scope. Pri. 115-230v. 50-60 cps. Secondaries 355 @ 250ma. 740v @ 200ma. 1420v @ 170ma. 385v @ 20ma. 550v @ 2ma. Half case. Mounts 18 color coded leads. 7"x6 1/2"x5".....10.00

MISCELLANEOUS

M-105—5-inch P.M. Speaker.....\$ 1.75
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 X-314—Teletaph Keys. Excellent for amateurs .75
 T-103—Delta T Pads Centralab. 500 ohm carbon. Screw-slot shaft. Excellent for amp. & recording50
 T-150—25000 ohm 9 watt wire wound Rheostat .30
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chassis is held in the case by the two screws which may be seen protruding from the rear of the chassis.

Two leads are run through shielding for the hot "A" lead and "B" plus, with the shielding being used for the negative "B" and grounded "A" lead.

A semicircular hole is cut in the front cover, and covered with green celluloid to permit viewing the dial. Illumination is supplied by a 6 volt pilot light located behind the dial.

No provision has been made for the turning off of the unit when not in use, as most operation at this station is on the ten meter band, but a switch could be provided in the hot "A" lead for this purpose.

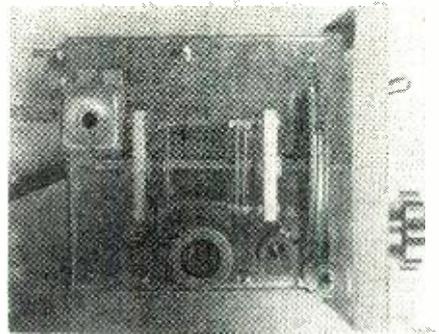
Several published articles on converters using 6J6s as mixers have shown a 50 ohm resistor for the cathode bias. In order to operate efficiently as a detector, it is necessary that the tube be operated on the straight portion of its curve, and high bias is necessary. Accordingly a 1200 ohm resistor is used for cathode biasing in this application. The oscillator grid leak is returned directly to the cathode so that only the grid bias developed across this resistor is applied to the oscillator grid.

It was decided that the frequency range of the converter should be from 27 to 29.7 mc. to cover both the new "QRM" band and the entire 28 to 29.7 band. The oscillator operates on the low side of the signal frequency, and as the i.f. frequency was chosen in the vicinity of 1600 kc. the fundamental range of the oscillator is 25.4 to 28.1 mc.

When construction has been completed, the proper voltages should be applied, with a 25 ma. meter connected in series with the "B" lead. Oscillation will be indicated by an increase in the plate current when the stator plates of the oscillator condenser are touched with the finger. If this indication is not observed, it is probable that the tickler winding, L_4 , is reversed.

If all is well in the oscillator section, the frequency of the oscillator should be checked by means of an accurately calibrated receiver. The first step is to set the high frequency end with the tuning condenser at minimum capacity by adjusting the trimmer C_1 . The tuning condenser should then be turned to maximum and the frequency again checked. If the frequency is too low, the turns of the coil L_3 should be spread slightly and the high frequency end again realigned. In the event that the oscillator does not reach a low enough frequency at maximum tuning capacity, the turns of L_3 should be pushed together and the procedure repeated.

When the oscillator range is within limits, the output of the converter should be connected to a receiver tuned to the vicinity of 1600 kc. This frequency need not be exact but should be in an interference free spot near this point. The trimmer condenser in the output transformer T_1 should then be peaked for maximum noise in the receiver.



Top view of completed converter shows placement of various parts.

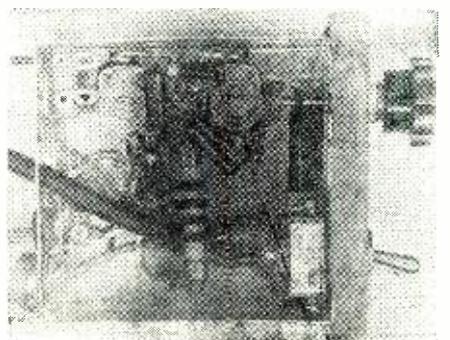
An antenna may now be connected to the converter, and the converter slowly tuned over the band in search of signals. If a signal generator is available, this problem is much simplified. The trimmer condenser C_2 should be adjusted for maximum response. At least two points in the band should be checked for tracking between the oscillator and mixer portions. When all adjustments are proper the point of maximum response of the trimmer condenser C_2 will be the same at either end of the band. The same procedure followed on the oscillator coil may be followed here for adjustment of the range.

The receiver usually used at this station is provided with an antenna input circuit of 75 ohms impedance. Accordingly, the tap on the secondary of the output transformer T_1 is used for an accurate match between the converter and receiver. Most of the standard communications receivers in use by amateurs, however, are designed for an antenna of approximately 300 ohms, and if this type of receiver is used the entire secondary should be used.

When the converter is used with an auto radio the tap is used as this type of receiver has a very low input impedance. The antenna which normally goes to the auto radio should be connected to the input of the converter and either unit is then ready for instant use simply by flipping the switch S_1 .

The small current drain of the converter, only six milliamperes at 100 volts, may be easily obtained from almost any receiver using the normal plate supply of 200-250 volts, by means

Under chassis view indicates the simplicity of final wiring.



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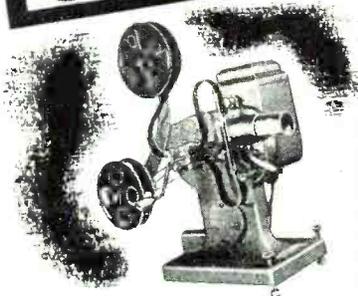
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of a dropping resistor of 12,000 to 17,000 ohms in series with the "B" lead of the converter. A resistor of the 2 watt size will be ample in any case. The voltage at the converter should be measured by means of a high resistance voltmeter to insure that the voltage does not exceed 125 volts under any conditions.

-50-

Airborne Television

(Continued from page 59)

operation. This overcomes a serious limitation of the smaller, unattended *Block* system.

Basic operation of the *Ring* equipment (Fig. 8) is somewhat similar to the *Block* equipment previously described, with the important addition of a large Control and Switching Unit and related monitoring facilities.

One camera is mounted in the nose of the plane (Fig. 7), and a second camera is generally mounted in the waist (Fig. 6). The output video signals of both cameras are fed to the Control Unit. There the video signals are amplified and combined with appropriate sync and shading signals. The output of one camera is selected by a switching arrangement.

The combined output, video plus sync and shading signals, then passes through a modulator stage, and the amplified signal is used to grid-modulate the power output stage of the transmitter. Also, much as in the *Block* system, a sync signal is used to plate-modulate the final stage of the transmitter. Thus the power output stage combines both grid and plate sync modulation, maintaining constant the percentage of sync modulation.

The scanning system of the *Ring* equipment uses 567 lines, 40 fields, interlaced to form 20 frames per second.

Interlaced scanning is preferable to sequential scanning (used in the *Block* system) in order to reduce the problem of adjacent-line halation. This also acts to cut down the bandwidth, because of the resulting half number of frames—as compared with sequential scanning.

The video pass band is from 20 cycles to about 8 megacycles, and about 6 db. down at 10 megacycles.

Peak power output of the transmitter is slightly more than 1 kilowatt. And the transmitter operates (temporarily) in the 90 to 102 megacycle band.

The *Ring* system of airborne television is, of course, superior to the *Block* system. But the *Ring* equipment was purposely designed for much greater range and much greater picture fidelity. Chief advantage of the *Ring* system over its cousin-televisor, is that the *Ring* equipment permits optimum utilization of every variable component of the complete television system; optimum lens aperture settings, in accordance with sky, light, and terrain conditions; optimum focus

conditions; optimum shading; maximum video gain; continuous control of percentage modulation of the video transmitter; and continuous operational or tactical control of cameras to permit viewing of the target at all times with maximum clarity.

A typical image televised by the *Ring* equipment is shown in Fig. 5.

Public Recognition

The relative effectiveness of the *Block* and *Ring* airborne television systems was demonstrated to the public for the first time recently by engineers of the *RCA, NBC*, and the *U. S. Navy*.

Naval authorities assigned to the demonstration a fast, high-flying *JM-1 Marauder* (B-26) carrying *Ring* equipment. The plane cruised over Baltimore and Annapolis, picking up scenes and action along the way and transmitting the images directly to a bank of television receivers at the Anacostia Naval Air Station.

Then proceeding to a rendezvous, miles away, the *Marauder* trained its *Ring* cameras on mock combat scenes that involved dive-bombing, smoke-screen laying, strafing, and dog-fights. The receivers at Anacostia faithfully portrayed the action, eye-witnesses of events far beyond the horizon.

Two smaller planes were equipped with lightweight short-range *Block* equipment. These planes cruised above the Potomac relaying their televised images back to the receivers at the Naval Air Station.

Thus typical wartime uses of airborne television became a grim, factual, visual reality.

But there were still other uses of the equipment during actual wartime.

These same television systems were used to direct pilotless, over-age bombers or "crash" boats laden with explosives against enemy concentrations. These television systems were also used for the observation of gunfire, and reconnaissance in connection with amphibious landings. They were used in observation planes for artillery spotting, gun control, map-making, and other urgent reconnaissance functions. They were used to transmit maps and charts between ships and aircraft. They were used to observe dangerous operations from protected or remote positions. They were used to guide free-falling, radio-controlled aerial bombs, flying torpedoes, and assault drones.

Airborne television systems were used to direct explosive-laden gliders against land and sea targets. They were used for obtaining eye-witness information under conditions of space, speed, or peril which would preclude the gathering of required information by personal or any other means.

Many of these applications had specific and historic codes names. A *Block*-equipped Navy glider was known as a "Glomb"; a Navy crash boat with television eyes was "Campbell"; and use of *Block* gear in over-age bombers was termed "War

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The moral was plain to most. Here was a new, easy way to save; one as well suited to the future as to the past. Result: Today, millions of Americans are continuing to buy, through their Payroll Savings Plan, not War Bonds, but their peacetime equivalent—U. S. Savings Bonds.



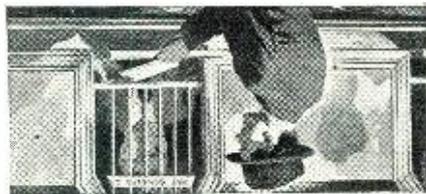
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From war to peace! War Bonds are now known as U. S. Savings Bonds, bring the same high return—\$25 for every \$18.75 at maturity.



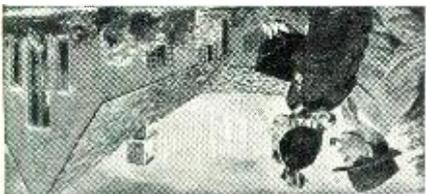
Weekly Savings	In 1 Year	In 10 Years
\$ 3.75	\$195.00	\$2,163.45
6.25	325.00	3,607.54
7.50	390.00	4,229.02
9.38	487.76	5,416.97
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15.00	780.00	8,660.42
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Savings chart. Plan above shows how even modest weekly savings can grow into big figures. Moral: Join your Payroll Savings Plan next payday.

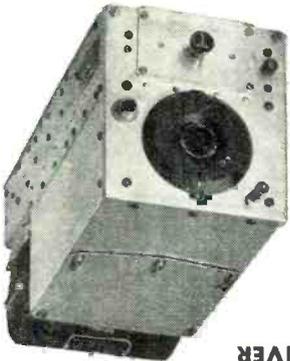
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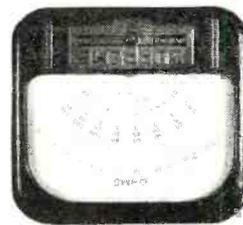
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inch spacing between the split ends, by means of the standoffs, to the respective ends of the five foot section of 1 1/4" tubing, giving an insulated but rigid and light antenna, and thus making possible either split feed methods, or, by joining the dipole sections with a jumper, delta-match, T-match, etc.

Next, the 1 1/2" pipe flange is brazed at the exact center of the boom, and on the same side as the single five-foot length of 1 1/4" tubing which supports the antenna. This flange is to enable the whole assembly to be mounted on top of a jointed length of galvanized pipe at the desired height which been determined to be optimum for your particular locality.

The eight 3/4" conduit couplers are then filed out so that 3/4" tubing will slide freely through them, and with one nut and lock ring removed from each coupler, it will be found they will fit snugly inside the 1" pipe, where they are brazed securely as shown in the diagram. This makes a highly satisfactory, efficient and simple means of adjusting and locking the tunable end-lengths of the elements. These tunable sections are obtained by cutting, exactly in the center, each of the four ten-foot sections of 3/4" thinwall tubing. The remaining nut and lock ring of the brazed couplers allow the elements to be quickly and securely locked at any length for the ten-meter band.

The method of mounting used by the author involves the use of the familiar eave-bearing and thrust-bearing base and suitable lengths of galvanized iron pipe to attain the desired height, but individual preference and facilities vary so widely, no particular information will be given, other than to recommend the abovementioned method of mount for simplicity and low cost.

The preferred feed method tried at W6RTP consisted of a feed line of 70 ohm coax, in conjunction with a stub made of four lengths of 70 ohm coax paralleled, and cut to the length given by the formula for coaxial stubs. With this arrangement, and a reversible motor drive, rotation is a simple and fool-proof matter. However, any feed method involving open lines and conventional stub match, delta, T, or other similar systems, with slip-ring feed, is applicable to the particular way in which the antenna is designed, and allows plenty of room for individual preference and experimentation.

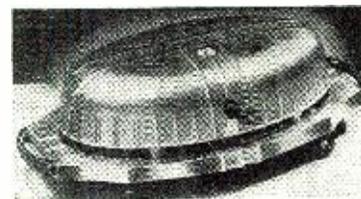
The highly important matter of tuning and adjusting is covered thoroughly in the *Handbook*, and rigid and careful adherence to this method is recommended. Remember, a beam is not a beam until tuning has made it such, and no general rules will hold true for all locations, so careful and detailed attention to this matter is highly advisable, following the rules laid down in the chapter on rotatable arrays in the *Handbook*.

With the tuning, as such, accomplished to the erector's satisfaction, next comes the matter of determining one of the most important, if not the most important, details of getting a

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Ideal for all servicemen. 19 different bottles and chemicals in hvy. steel rack which is FREE. Perfect chemical set-up for servicing.

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RADIO DIVISION DEPT. H

GENERAL CEMENT Mfg. Co., Rockford, Ill., U. S. A.

Manufacturers of over 3,000 products • Sales offices in principal cities

NEW SOLDERING GUN with adjustable tip FOR TOUGH JOBS

HEATS IN
5 SECONDS



TIP ADVANTAGES

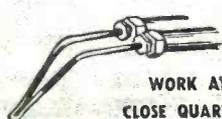
STAYS TINNED—
NO BURNING



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WORK AT
CLOSE QUARTERS



High heat produced in loop type tip by induction principle gives speed and flexibility to soldering with the new gun type Speed Iron. Ideal for intermittent operation on maintenance and radio service work.

Available at your radio parts distributor or write direct for descriptive bulletin.

- ★ 115 Volt 60 Cycle 100 Watts
- ★ Built-In Light Weight Transformer
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810 PACKER STREET

WELLER MFG. CO. • Easton, Pa.

Export Dept.—25 Warren Street, New York 7, N. Y.

In Canada—Atlas Radio Corp., Ltd., 560 King Street N. W., Toronto, Ont.

beam to work satisfactorily other than by sheer luck. As is well known, the gain achieved by a beam is primarily due to the lowered angle of radiation in a vertical plane. At ten meters, it is apparently optimum to secure an angle of approximately 10 degrees from the horizon, and height is highly important in achieving this. Accordingly, it is highly recommended that the system, completely tuned and adjusted, be fed power and raised in two-foot steps, through the range from thirty to forty feet above ground level. The ingenuity of the individual comes in here, depending on the mounting structure involved, but if the pipe support system is used, as shown in the photos, two or three huskies can do it quite nicely, by raising and lowering the supporting pipe up from a hole (dug directly under the structure by garden-hose hydraulic pressure.) This convenient three or four inch diameter vertical shaft in the ground also is a great aid in the erection of the affair itself, and is easily done. With a small amount of power fed to the system, and a receiver 'S' meter some distance away used as a reference, it will be found that the emitted signal will take a decided hop upward at some point in the aforementioned thirty to forty foot range, and at this point the array should be secured and left.

If this performance is not desired, and the builder is satisfied with a less efficient arrangement, heights of sixteen or twenty-two feet will be found to be quite satisfactory. The array was used for a time at W6RTP (a flat, coastal location) at sixteen feet elevation, and marked directivity characteristics were evident. The signal got to the Philippines, Guam, Australia, Hawaiian Islands, Tinian, Saipan, Peru, Guatemala, the Galapagos Islands, etc., as well as the usual continental contacts, with "S" reading that compared equally favorably with other W6's at the time, using an 829B with 60 watts input, and during the definite early summer slump of the band. It can be seen accordingly that results are quite gratifying, even if one cannot achieve the optimum height for the system. However, it is highly recommended, if at all possible, that the proper height be determined and used with the beam, since the results to be obtained, used thus, will leave nothing to be desired.

In receiving, the array has shown very good characteristics, depending, as usual, on power, direction, distance, and the all important conditions. Generally speaking, there is about four to six "S" points front-to-back gain, with almost infinite attenuation off the sides, both receiving and transmitting. If a conscientious and thorough job is done by the builder, and the array is tuned and adjusted properly with the optimum height determined and used, results will more than gratify the ham who wants to "get out, and get heard," as well as hear the choice stuff that the returning ten meter season is sure to bring.

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THE Right Driver FOR EVERY JOB . . .

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Snap-on OCTO-GRIP screw drivers in particular are built for modern production needs . . . with nickel-molybdenum alloy steel blades . . . tested precision ground hard-tempered tips, non-slip shock-proof OCTO-GRIP plastic handles.

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February, 1947

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149	100 Asstd.	Ceramic Stand-off Insulators	1.00
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151	25 Asstd.	Midget Tube Shields	1.00
152	50 Asstd.	Shock Relays & Brackets	1.00
153	15 Asstd.	CO-X-Connectors	1.00
154	100 Ft.	Asstd. Vinolite etc. Tubing, 3 Ft. Lengths	1.00

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-5.25 MEG	Each	1.00
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No. 51B332-T2 30 to 40 MC	Each	1.00
No. T-5-R 2nd I.F. 4.55 KC.	Each	1.00
No. 50B090 100 KC.	Each	1.00
No. T-2-R 30 to 40 MC.	Each	1.00

15' 8 Conductor Cable with Male & Female Connectors Each \$1.00

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The Following Types of Tubes at \$1.00 Each.
 6H6, 6X5, 6SJ7, 5R4GY, 6J6, VR105, VR150, 6AC7, 6C4, 6SL7, 12SN7, 9006, 3B7, 6B4, 6AG7, 6AL5, 6AC5, 2D2D, 5Y3, 2X2, 6AG5, 2C26.

Filter Chokes, Type 363-H 8 Hv. 120 MA. D.C. 1500V Test Each \$1.00
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Time Delay Relay Set for Two Seconds. 50/70 Cycles. 115 Volts A.C., Calibrated at 60 Cycles. S.P.D.T. Switch, 10 Amps. W.D. 473, Type Galvin 50C48746. \$5.00 Each

Hallercrafter Power Transformer No. 52C084. Used in RDC1. Primary 1-2-3-4, 220 V. or 115 V. Secondary Voltage 9-10-11-270 V. at 180 MA., 6.3 V. Heater Taps (5,6), 4 Amps. 5 V. Heater Taps (7,8) 2 Amps. \$3.50 Each

Hallercrafter Dual Reactors No. 56C048. Used in RDC1. 865.4, 18 Henries, 150 Mils. 865.5, 3 Henry, 1.7 Amps. Each \$2.00

Oil Filled Capacitors in Metal Cans
 8.5-8.5 MFD 10-20% 1000 V. 5x3 1/2x2 .. \$2.00
 .03 MFD 7500 V.D.C. G.E. No. 25F403 .. 2.00
 .25 MFD Vitamin Q 3000 V.D.C. 334x1 3/4x1 .. 2.00
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 .5 MFD 600 V.D.C. Sprague 2x1 3/4x1 .. 1.00
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D'Italia, Rome, comes this data: "Immediately after the end of the war, the Radio Club D'Italia started its activity. It tries to gather the amateurs who are scattered all over the country, and we want to line them up and to give them such an organization that finally also the amateurs would have a personality, a real, genuine ego. At the present time, many new and old elements are united in the Radio Club D'Italia and we fight on all levels the perennial bureaucracy of this country. Indeed, at the end of May, 1946, the Allied Control Commission gave permission to the amateurs to start working but in five months the Italian authorities have failed in bringing out the necessary legal provisions, and for this reason, the amateurs are still in the same condition in which they were under the fascistic rule." (Letter was dated September, 1946, and since that time, I believe Italian "hams" have returned to the airwaves.)

"We had organized an exchange service QSL, which avails itself of the principal airlines of the world; we had established schools for radiotechnicians in which we wanted to train the great number of new and inexperienced amateurs; two great annual contests have been organized for the OM, open to all OM from all countries, with two cups being assigned as prizes. These contests will take place every year during January and February.

"Three categories of members are represented in the Radio Club D'Italia: Transmission amateurs; listeners; and students of theoretical radiotechnicians.

"Presidency of the Radio Group is held by KTA (Pietro Spriano), with two advisers—the TQ (Luigi Ivaldi) and the WR (Oscar Buglia Gianfigli). Headquarters is in Alessandria, Via Alessandro Sappa No. 1. Address of the Office for WSL movement is R.C.I., P.O.B. 147, Alessandria, and there is a

QSL exchange every other week." Official publication of the club is called "Radioschemi."

Spain—This information regarding officers of the R.C.E. (Radio Club Espanol) comes from Luis Diez Alonso:

President, Javier de la Fuente, Plaza de las Brisas, Sardinero, Santander; vice-president, Louis Diez Alonso, Daoiz y Velarde, 25, Santander; second vice-president, Luis Perez Alvear, EAJ32, Radio Santander, Santander; editor of club bulletin, Arturo Moreao, Stos. Martires, 5 Letr "B," Santander; secretary, Francisco Bercedo, Martillo, 13 segundo, Santander.

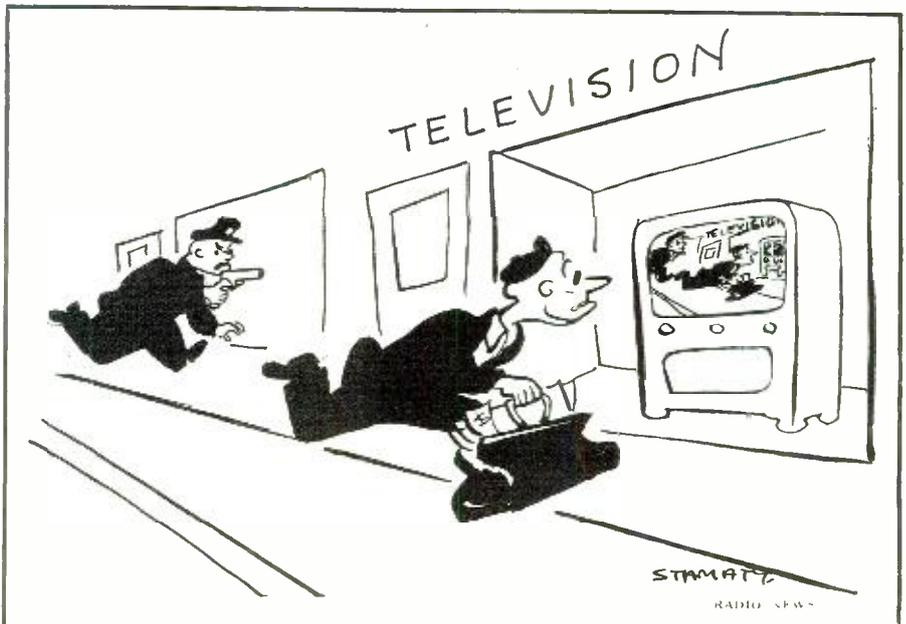
U.S.A.—Persons wishing sample bulletins of the URDXC are now requested to send along ten cents to cover cost of mailing out. Requests should be sent direct to Charles Norton, president, Universal Radio DX Club, 7507 Holly Street, Oakland 3, California, U.S.A.

Verifications

Radio SEAC, G.P.O., Colombo, Ceylon, is verifying widely now with a black and white, odd-size QSL card which is sent via airmail. (Cooley)

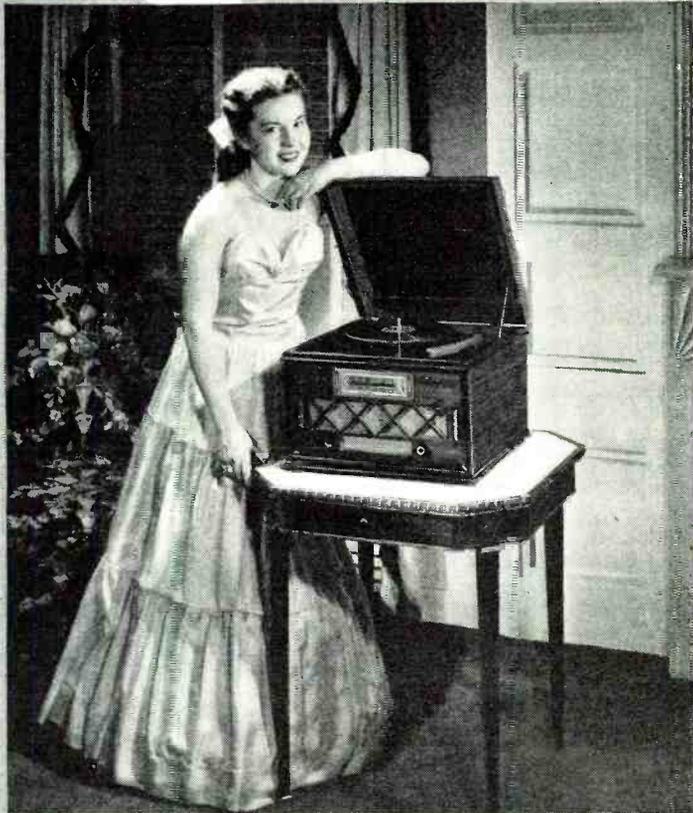
Mervyn P. Laubscher, South Africa, writes: "My airmail report on XGOY, 9.635, Chungking, of May, 1946, was verified by an airmail card which I received six weeks after mailing my report; it is a plain white card with 'The Voice of China,' address, and frequencies in black; in the left-hand corner is a drawing of a panda; verie was signed by the director of the station, Fung Chien." Reports for XGOY may be addressed simply to XGOY, The Voice of China, Central Broadcast Administration, Chungking, China; while they may not be required, it is suggested that an IRC accompany reports.

Gote Olsson, Sweden, reports that The Turkish Press Department, Radio Branch, Ankara, Turkey, is now sending out a new verification card; it has an attractive outline map of Turkey



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IMPROVED CLARI-TONE CHASSIS *

275% MORE POWER

GREATER SENSITIVITY

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In New Jersey... ...it's **VARIETY**

SUPERIOR Model 670 Super-Meter

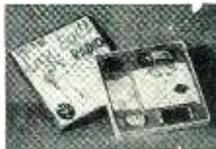
A Combination Volt-Ohm Milliammeter plus Capacity Reactance Inductance and Decibel Measurements.



Complete with test leads and instructions **\$28.40**

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Model No. 2 Kit. AC-DC. Electric Battery Kit with Cabinet complete with Tube, Special Variable Condenser, Earphones, Resistors, Hardware and Special Fittings. Completely Wired Tube Socket. Diagram on Mounting

Base—Ready Cut and Drilled. **\$5.01 each**

Model No. 2B. Battery operated, easy tuning, attractive wood finish cabinet. Complete with Tube, Coil, Battery, Headphone, Hardware and Base.

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6 or more. **.99c each**

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60 Cycles 115 Volts \$3.95

Suitable for every phonograph instrument where low cost and dependable performance are required.

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VOLUME CONTROLS WITH SWITCH

75c each 10 for **\$6.96**

5,000, 10,000, 25,000, 50,000, .1 meg, .25 meg, .35 meg, .35 meg 70,000 ohm tap, .5 meg, .5 meg 50% tap, 1 meg, 1 meg 50% tap, 2 meg 50% tap. Outside diam 1 1/2", shaft length 3", flat 1/4".

RESISTOR CABINETS

All wood construction. Six shelves, 24 compartments **\$3.89**

R.C.A.-T65 CABINET

Packed in original carton. Beautiful inlaid veneer with grill cloth. Speaker baffle for 5" speaker. Rubber feet. **\$4.95 each.** Three for **\$14.00**

Bargain! Guaranteed!

100 Assorted Bypass Condensers

10—.001—600v	10—.01—600v
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Value **\$11.00**

Special \$6.95

SPECIAL! 20 x 20 150 WV, Electrolytic condensers, Fresh stock, guaranteed. Value **10 for \$4.95**
\$8.75

Write Dept. N-2 for our FLYER. 20% Deposit with order required. Please add sufficient postage. Excess will be refunded.

Variety ELECTRIC CO., Inc.
601 Broad St., Newark 2, N. J.

with an antenna mast rising from Ankara. Other recent veries received by Mr. Olsson include those from VLH3 and VLR2, Australia (cards are slightly different for these respective calls, signed by same person); CXA19, Uruguay, which sent along a colorful brochure on Difusoras del Uruguay; and WNRX.

W. J. Arthur, West Virginia, reports that HH2S, Port-au-Prince, Haiti, verifies promptly; stated "actual" power is 300 watts, using an east-west bi-directional radiation; stated frequency as 5.943, but no schedules were furnished.

From the Directorate-General, All India Radio, New Delhi, we learn that they "send QSL cards in verification of reception reports from listeners; it is *not* necessary to send International Reply Coupons as we do not make use of them; all reception reports from foreign listeners are sent for verification and acknowledgment to Station Engineer, AIR, Delhi." (Reception of *all* AIR stations—including Madras, Bombay, Calcutta, and so on—should be reported to AIR, Delhi.)

Rex Gillett, Australia, reports a nice verie from H8SPD (*note official call sign*), Bangkok, Siam; this very colorful card with yellow background, features a map of Siam and below the map the skyline of Bangkok, both being in white; "the card is a worthy addition to any collection," Gillett states; his verie was marked, "Yours is our second report since the war." Frequency was given as 6.040 but is nearer 5.990, according to Mr. Gillett; power was given as 900 watts. H8SPD's schedule was stated to be 5-6:30 a.m.; the BCB station, HS7PJ, on 825 kcs. and H8SPD, however, were stated to be in parallel between 7-9:15 a.m.

On December 1, 1946, William Cooley, Fairchance, Pennsylvania, received verification from CBLX, 15,090, 7500 watts, Montreal, Quebec, Canada; it was stated that studios are in Montreal, transmitter at Vercheres, and operating time was listed as 7 a.m.-8 p.m. daily; card was signed by J. Marcotte who added the footnote, "This frequency has been in use only since October 23, and *you are the first one reporting reception of CBLX.*" simply address, CBLX, Montreal, Quebec, Canada.

A Swedish correspondent, Gunnar Persson, has received a letter verification from Sudwestfunk, Baden-Baden, Moltkestrabe 5, Kaiserin Elisabeth, French Zone of Germany; gave frequency of 6.321, with schedule of 2 a.m.-12:45 p.m., Sundays from 2 a.m. to 6 p.m. The same monitor has received a QSL card from Norway with picture of Oslo; this verified the Fredrikstad experimental short-wave transmitter on about 6.185, scheduled 12 noon-1:30 p.m. and 3:45-5 p.m. with 8 kw. power; address, Administration of Telegraphs Radio Department, Broadcast Division, Oslo, Norway (Norge). Also reported is "the new QSL card with map of Italy" from

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Electronic Voltmeter Ohmmeter

Gives you constant accuracy and guaranteed performance. A stable bridge circuit type vacuum tube meter for measuring AC-DC voltages and ohms. Actual tests establish its superiority. Simple to operate. Hand calibration and hand calibrated multiplier resistors assure constant accuracy and stability. Measures DC volts up to 600 with constant input resistance of 11 megohms. Resistor in the DC probe permits readings in signal-carrying circuits. Positive or negative indications through a reversal switch. Net price, \$75.00. Meter Ranges: DC 0-3; 0-30; 0-150; 0-300; 0-600. Multiply by 4 with external probe. AC 0-3; 0-30; 0-150; 0-300. Ohms 0-1000; 0-10M; 0-100M; 0-1 Meg.; 0-100 Meg.

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Model 201



\$69.50
COMPLETE

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TIME SAVING: No stabilizing warm-up period necessary. Frequencies required for receiver alignment instantly selected. No confused dial.
ACCURATE: All signals are crystal controlled—Accurate to .1 of 1%.
DEPENDABLE: Always in adjustment. No variable condensers to wear. No coils to age. Dependable as the ageless crystal itself.
COMPACT: Occupies a minimum of bench space. As light and portable as a Kodak.
ATTENUATION: Efficient attenuator provided. Maximum output approximately 10 volts. Continuous attenuation through two ranges.
COMPLETE COVERAGE: Twenty-three direct crystal controlled frequencies from 175 to 8700 KC. Harmonics as high as 140 MC.
MODULATION: Frequencies on dial and their harmonics may be modulated with a 400-cycle (crystal controlled) tone.
AC OPERATION: 50-60 cycles, 110-120 volts. Electrically shielded isolation power transformer. Send in your name for our mailing list.

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RADIO NEWS

Radio Italiana, Via Arsenale 21, Torino, Italy (Italia). And from Spain came a letter verifying reception of Radio S.E.U., Station EDV10, Diego de Leon, 48, Madrid, Spain (Espana).

Buddy Giles, Texas, recently received verification from JLU-2 and JVU-2, Tokyo, Japan, signed by Major Carl E. Frisby; address, Technical Supervisor, Japanese Radio Systems, Headquarters, 8th U.S. Army Signal Office, Tokyo Communications Center, A.P.O. No. 181, c/o Postmaster, San Francisco, California, U.S.A.

* * *

This Month's Schedules

Alaska—A letter verie from WXF3G gives power as 600 watts; said is beamed to Seattle. Uses a frequency of around 12.255 and can be heard usually around 10 p.m.-1 a.m., irregularly. (Rice)

Albania—ZAA, 7.852, *Radio Tirana*, has *English* news between 4-4:15 p.m. daily now. (Hughes)

Andorra—*Radio Andorra*, 5.985 (varying), has a *daily English* period between 3:30-4 p.m., produced by Freemantle Overseas Radio Network, London; is good level in England. (Rowden) This station is heard well in the eastern U.S., mostly in Spanish, to around 7 p.m. closedown.

Australia—VLC9, 17.84, to Eastern North America evenings, has been dropped; only VLA9, 21.600 is used, 7:15-8:30 p.m. The special DX program continues to be given at 8:10 p.m. Saturday, immediately following the 8 p.m. newscast. The West Coast beam, 11:45 p.m.-12:45 a.m., is heard over VLA4, 11.77; VLB9, 9.615; VLC4, 15.32; and VLG7, 15.16; the special DX program on Sunday is at 12:30 a.m. (Balbi)

For the 11 a.m.-12 noon beam to West Coast, currently in use are VLA8, 11.76; VLC6 (or VLB9), 9.615; and VLG4, 11.84. (Balbi)

VLR2, 6.150, Melbourne, signs off at 9 a.m. (Dilg) Usually has a good signal here in West Virginia mornings; relays the BBC news from London at 8 a.m., followed by Australian news.

Here in the East, VLQ2, 7.215, Brisbane, has had improved signals lately; news is heard well at 8 a.m. VLW7, 9.52, Perth, which signs off at 11 a.m., is one of the best Australians this winter.

VLC10, 21.680, is being used again to Britain, 2-3:15 a.m., replacing VLA2, 9.615, which was used only a few days on this transmission. (Balbi) Is heard on West Coast, 4:15-6:30 p.m., to Forces in Pacific; opens rather weak but signal improves to fairly good during last hour; in this beam, the 19- and 25-m. band frequencies are inaudible on West Coast. (Dilg) All three—21.680, 11.77, and 15.200—are sometimes heard in the East in this transmission.

Bermuda—SFD2, 10.335, was heard recently at 8:58 a.m. contacting WOG2. (Ferguson) Call is probably "ZFD2."

British Somaliland—*Radio Somali*, 7.126, Hargeisa, is being heard again



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Smooth Power

The new die-cast bearing brackets on *Smooth Power* MX Phonomotors make them all 'round better motors. They allow more accurate centering of the motor in the field, which results in an even torque and aids in the elimination of vibration.

This improvement is typical of the advanced engineering that features our complete line of motors, recorders and combination record-changer recorders. Their quick pick-up to full, constant speed, their quietness and freedom from vibration and wow . . . all will delight you and your customers.

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LIGHT... COMPACT... EFFICIENT

A 3-inch oscilloscope for measuring AC and DC... Amplifiers for vertical and horizontal deflection as well as intensity... Linear time sweep from 4 cycles to 50 kc with blanking of return trace... Sensitivity up to 100mv/in... Fidelity up to 350 kc through amplifiers... Attenuators for AC as well as for DC... Push-pull amplifiers... Anti-astigmatic centering controls... Trace expansion for detail observations. Direct connections to deflecting plates and intensity grids accessible from rear... Retractable light shield... Detachable graph screen... Handle... Functional layout of controls.

Light weight: 8 3/4 lbs...
Portable size: 11"x 7"x 5"...

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Manufactured to meet rigorous U. S. Government specifications! Both types extremely sensitive and employ matching transformers for hi-impedance outputs. Each employs miniature phone units with Alnico magnets. The "MINIATURES" are a lightweight compact type with soft-rubber eartips, flexible rubber cord, rubber spring-clip and standard phone plug.

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Send check or money order for postpaid delivery. Dealer and Distributor inquiries invited on quantity.

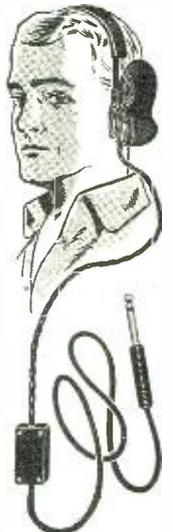
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MINIATURE



NOISE-PROOF

mornings on the West Coast, best around 9:15 a.m. (Dilg)

The BSWL reports that *Radio Somali* opened in 1942 in Harar (Abyssinia) as a local force station, using a homemade transmitter of about 200 watts made from captured enemy material; it moved from Harar to Hargeisa in 1943 and was taken over by the Government there, which had purchased a 600 watt American transmitter (amateur type), used as the *Radio Somali* station until November, 1943. Hargeisa is the temporary capital of British Somaliland, and is situated 110 miles southwest of Berbera, the chief seaport; QRA of *Radio Somali* is Information and Broadcasting Department, Hargeisa, British Somaliland.

Bulgaria—LZB, 7.460, *Radio Sofia*, is heard in England daily with an *English* program between 3:30-3:40 p.m. sign-off. (Hughes)

Burma—Official schedules received direct from *Radio Rangoon* list *English* transmissions as 8:15-8:45 p.m., with headline news at 8:30 p.m., on 9.543; 1:15-2 a.m., with news at 1:30 a.m., on 6.035; and 8:40-10:15 a.m., with news at 8:45 a.m., and headline news and summary of next day's programs at 10:10 a.m., on 9.543; those are "weekday" schedules, and for Mondays, *only* the last period is listed. Programs are heard *daily* between 6:15-7 a.m. in Hindustani, presumably on 6.035.

Canada—CKRZ, 6.060, is a new station added by the CBC's International Service in the Caribbean and Latin American beam, 6:20-7:35 p.m. daily; in this beam, CKRA, 11.76, is heard at the same time daily, *except* Sunday when it runs to 9:05 p.m. close-down. The European beam is radiated on CKNC, 17.82, 9:30 a.m.-12:45 p.m. daily, and 7 a.m.-12:45 p.m. Sunday; CKCX, 15.19, 9:30 a.m.-12 noon daily, and 7 a.m.-12 noon Sunday; CKCS, 15.32, 12:05-3 p.m. daily; CHOL, 11.72, 1-6 p.m. daily; and CKLO, 9.63, 3:15-6 p.m. daily. Incidentally, the CBC is sending out a fine monthly booklet entitled "*Canada Calling*," from the new address of the International Service, CBC, P.O. Box 7,000, Montreal, Quebec, Canada. (Flitcraft, Cooley)

CKRO, 6.150, Winnipeg, Manitoba, has "Night Final" news at 12 midnight; CKRX, 11.72, also Winnipeg, is heard as late as 12 midnight. CBRX, 6.160, Vancouver, British Columbia, has news at 2:45 a.m., usually is fair signal. (Reed) This latter one usually is heard well here in West Virginia with the news at 12 midnight.

Cape Verde Islands—CR4AA, 6.465, Praia, is correct call. (URDXC) *If this station is still on the air, your ISW Editor would welcome schedules.*

Celebes—*Radio Makassar's* 5.030 frequency recently has been a much better signal than its 9.260 (varying) outlet; peaks around 7 a.m. (Dilg)

Ceylon—*Radio SEAC*, 11.77, Colombo, is heard with very poor quality in its 7:30 a.m.-12 noon transmission, being QRM'd by G.V.U., London,

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226	500,000	7/8	1 1/2**	29c
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same frequency, in the BBC's European Service. (Beck) The opening of this transmission at 7:30 a.m. is with *English* news. On 15.120, *Radio SEAC* is a good signal at 6 a.m. when relaying the BBC news from London, also has BBC news relay at 8, 9:30 p.m.; in some locations, suffers bad interference from HCJB, Quito, Ecuador, 15.115, from 7:30 p.m. daily sign-on of Colombo.

Chile—CE1180, 11.997, Santiago, usually has a good signal around 7:30-9 p.m. (Ferguson)

China—XTPA, 11.650, is now sending a better signal to the Eastern U.S.; peaks around 7 a.m. (Ferguson) This station uses mostly Oriental languages, but can be heard here in West Virginia most mornings as late as 9 a.m. when it relays *English* news from Chungking's XGOY, good level but usually is marred by CWQRM.

As usual, on November 18, XGOY left the "summer" frequency of 9.635 and is now heard mornings on approximately 6.143. For the first week after moving to the 49-m band, XGOY opened at 6:35 a.m. on about 6.154/5, closed that transmission at 7:45 a.m., and opened again at 7:50 a.m. on about 6.143. Later on, however, they have been using the 6.143 frequency during both transmissions; first one is heard, 6:35-7:45 a.m.; second one, 7:50-10:30 a.m.; moves to about 11.918 between 10:45-11:45 a.m.; *English* news is heard at the regular times, 7 a.m., 9 a.m., and 11 a.m. on the respective frequencies; *English* press dictation (for America) is at 9:30 a.m. (Dilg, Balbi) XGOY uses 7.152 in parallel with its other stations during the entire period from 6:35-11:45 a.m.

Here in the East, XGOY's 6.143 frequency usually is a good signal, in the clear, at 7 a.m. when a woman reads the *English* news; it generally fades out around 8 a.m. here in West Virginia. On the 11.918 frequency, most mornings has a good to excellent signal from around 5 to 6:28 a.m. sign-off, all this transmission now appears to be in Chinese.

XMTA, 12.215, opens at 6 a.m. with the Chinese National Anthem; leaves the air normally at 8 a.m.; apparently uses only Oriental languages; location is believed to be Shanghai. ("Radio Call")

XORA, 11.695/8, Shanghai, has *English* news daily at 5 a.m. ("Radio Call") This station has not been reported as heard in the Eastern U.S. lately.

XLRA, 6.054, Hangchow, (not XRRA, Peiping!), is scheduled, 5:30-9:45 a.m., and relays the XGOY (Chungking) news at 9 a.m. (URDXC)

Rex Gillett, Australia, informs me that XGOE, 9.820, heard in Australia around 8 a.m., is located at Kweilien; has been heard announcing as "broadcasting for the Chinese Army and their Allies." This station has been heard also by Paul Dilg, Monrovia, California.

The projected Nanking station will likely take to the air soon, and can be

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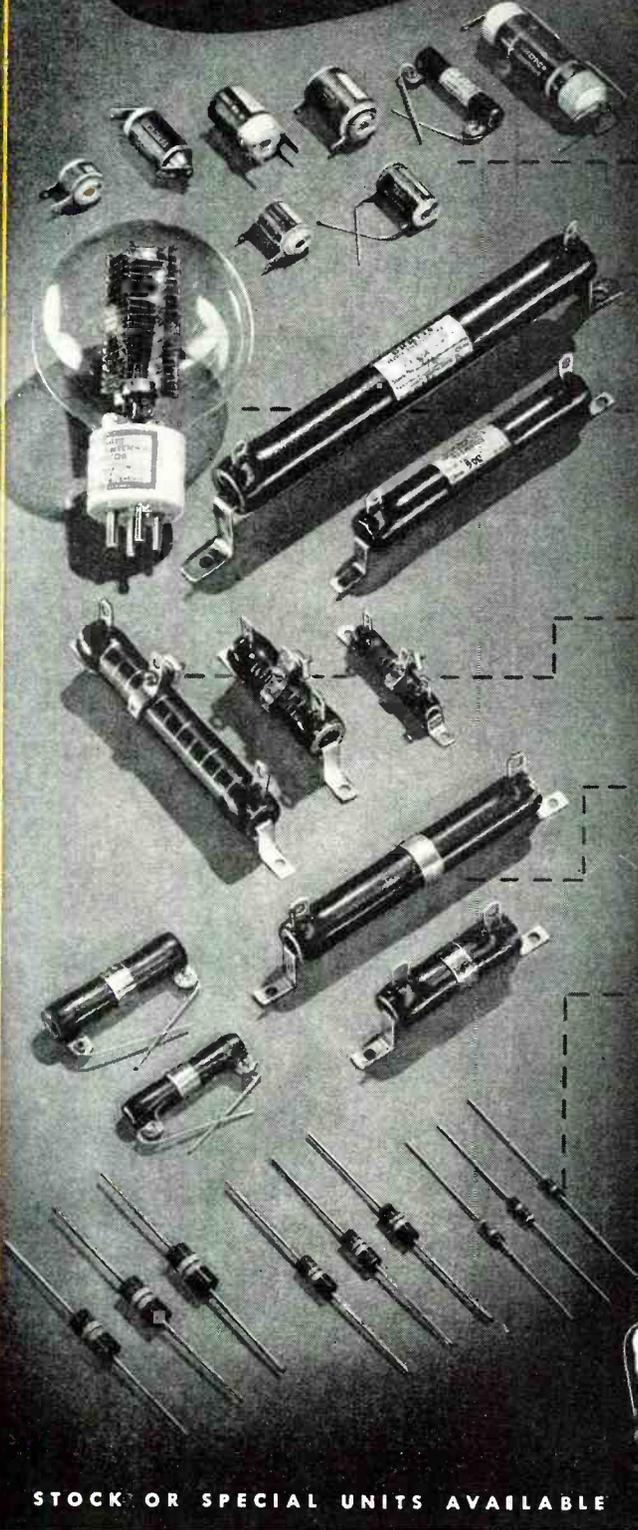
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"BROWN DEVIL" AND LUG-TYPE VITREOUS ENAMELED RESISTORS

Ohmite's dependable, general-purpose resistors. Available in ratings of 10 to 200 watts. Smaller sizes have tinned copper wire terminals; larger sizes have lug terminals.

"LITTLE DEVIL" INSULATED COMPOSITION RESISTORS

An extremely small, sturdy resistor. Three sizes— $\frac{1}{2}$, 1, and 2 watt, in 10 ohms to 22 megohms. Tolerance $\pm 10\%$. Light, compact, easy to install. Available only from Ohmite distributors.

Write for Catalog 18. Contains helpful information on rheostats, resistors, tap switches, chokes, and attenuators.



OHMITE MANUFACTURING CO.
4883 Flournoy St., Chicago 44, U.S.A.

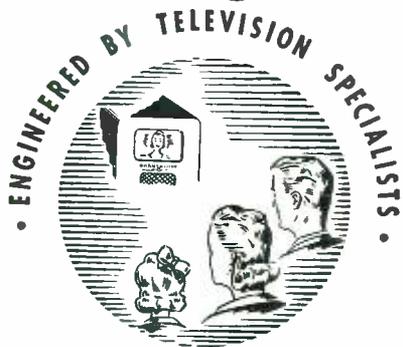
Be Right with

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RESISTORS • TAP SWITCHES

STOCK OR SPECIAL UNITS AVAILABLE

TRANSVISION



THIS NEW TELEVISION KIT

Offers you a High Quality
TELEVISION RECEIVER

ready for Easy,
Rapid Assembly



Easy-to-Assemble: No knowledge of television required. COMPLETE easy-to-follow INSTRUCTION SHEET gives you all the knowledge you need.

This Kit INCLUDES SOUND, all component parts, and the following:—

1. Specially designed Television Antenna.
2. A \$30.00 Lectrovision seven-inch Picture Tube . . . plus ALL other tubes.
3. Pre-tuned R-F unit.
4. Finished front panel.
5. All solder and wire . . . and sixty feet of low loss lead-in cable.

Operates on 110V.; 50-60 cycles A.C.

Price: complete with ALL tubes, \$159.50. Shipment will be made approximately 2 weeks after receipt of order. \$25.00 deposit required on all orders, balance C.O.D.

Trade Inquiries Invited

We believe that the comparative quality of this set is superior to other available sets. For full information write to:

TRANSVISION, INC.

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expected to use several frequencies.
Watch for it!

Czechoslovakia—Prague's *English* transmissions, aired from OLR4A, 11.840, 3:30 p.m. daily, consists of talks and news of topical interest, together
(Continued on page 153)

5-Tube Ham Super

(Continued from page 63)

is simple: the manual bias (r.f. gain) control R_{16} sets the initial bias desired, then with signal, the diode section of tube 6SF7 rectifies and passes, by means of the customary load resistance and filter circuits, a negative d.c. voltage in accordance with the strength of the received signal, which is applied to the grid of the i.f. tube. When S_2 is open, a.v.c. is applied and to use m.v.c. only, it is closed. The circuit has the desirable characteristic of allowing initial bias to be set at any convenient point by means of R_{16} and a.v.c. will have as a "take-off" point, this particular amount of initial bias, thus a.v.c. does not come in until signal input strength exceeds the initial bias, which all boiled down means your receiver does not, as is usual, lose sensitivity when on a.v.c.

The tuning gang shown in the photos is a re-vamped single section condenser, which has had the center plates of the stator deleted, leaving effectively a split stator condenser of about thirty-five $\mu\text{fd.}$ per section, with a solid shaft for the rotor drive. When the isolantite end-plates are bolted firmly to the chassis, this allows a solid, well-insulated tuning gang to be obtained very cheaply; it gives smooth no-backlash tuning and is recommended, but if desired two separate thirty-five $\mu\text{fd.}$ condensers can be ganged in its place, or a split-stator job can be purchased.

The power transformer used was a

80 METERS.

L_2 —20 t. closewound, C_{1b} tap 13 t. from gnd. Cathode tap 7 t. from gnd. C_3 is 75 $\mu\text{fd.}$ in coil form.

L_1 —40 t. closewound, C_{1a} tap 26 t. from gnd. Ant. tap 10 t. from gnd. C_2 is 25 $\mu\text{fd.}$ in coil form.

40 METERS.

L_2 —18 t; $1\frac{1}{2}$ " long, C_{1b} tap 6 t. from gnd. Cathode tap 5 t. from gnd. C_3 is 75 $\mu\text{fd.}$ in coil form.

L_1 —23 t; $1\frac{1}{2}$ " long, C_{1a} tap 8 t. from gnd. Ant. tap 6 t. from gnd. C_2 is 25 $\mu\text{fd.}$ in coil form.

20 METERS.

L_2 —9 t; $1\frac{1}{4}$ " long, C_{1b} tap 3 t. from gnd. Cathode tap $2\frac{1}{2}$ t. from gnd. C_3 is 75 $\mu\text{fd.}$ in coil form.

L_1 —12 t; $1\frac{1}{2}$ " long, C_{1a} tap 3 t. from gnd. Ant. tap $2\frac{1}{2}$ t. from gnd. C_2 is 15 $\mu\text{fd.}$ in coil form.

10 METERS

L_2 —3 t; $1\frac{1}{4}$ " long, C_{1b} tap 1 t. from gnd. Cathode tap $\frac{3}{4}$ t. from gnd. C_3 is 50 $\mu\text{fd.}$ in coil form.

L_1 —6 t; $1\frac{1}{2}$ " long, C_{1a} tap $1\frac{3}{4}$ t. from gnd. Ant. tap 1 t. from gnd. C_2 is 15 $\mu\text{fd.}$ in coil form.

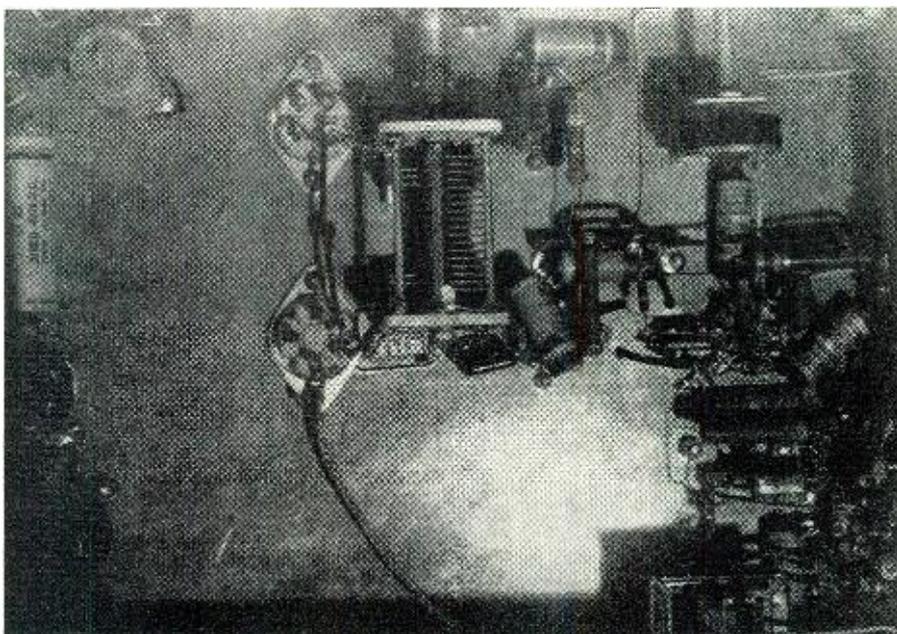
Note: Mica compression padders may be used for C_2 , C_3 with results equal to the air padders shown.

Winding specifications for coils covering 10, 20, 40, and 80 meter bands.

war surplus item, which accounts for the low H.V. secondary voltage. Most of the standard transformers available have either a 610 or 630 volt center tapped secondary. If it is necessary to use one of these, it would be advisable to place a resistor in series with the "B plus" lead to drop the output to 250 volts at the point indicated. A ten watt, 900 or 1000 watt resistor will be satisfactory in most cases.

Built as shown, it will be found the job is absolutely stone-quiet, with the r.f. and audio gain wide open, and antenna lead disconnected, a condition
(Continued on page 120)

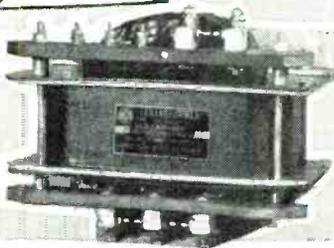
Under chassis view of home-built 5-tube superheterodyne short-wave receiver.



RADIO NEWS

HERSHEL'S MONEY SAVING VALUES

on Radio and Electronic Equipment



1 KW. MODULATION TRANS.

We have a real value in a modulation transformer. This item, made by RCA to broadcast specifications, is conservatively rated at 550 W audio to modulate that new KW rig. Primary impedance for class B tubes up to 10,000 ohms plate to plate, secondary rated at 450 ohms. 1:1 Ratio. Third winding modulates screens up to 80 MA current.

Really rugged construction, with flash-over traps on a Mycalex terminal board. Due to the fine lamination, this transformer will not talk back at 1 KW. Weight 19.5 lbs. \$19.95



1000 V PLATE SUPPLY

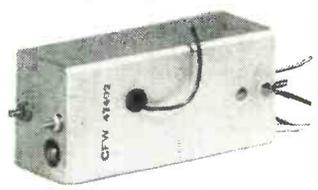
Thordarson plate transformer T47105. 1195 V each side of center at 300 MA. Tapped at 300 V each side of center, also 215 V at 55 MA bias. 6" x 5" x 7 1/2" in square gray, CHT type case. \$9.95



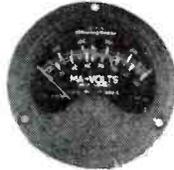
Thordarson T48003 2H-7H 550 MA swing choke, size 4 1/2" x 3 1/2" x 5 1/2", square black crackle case. \$5.95



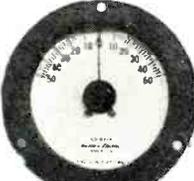
Hi-voltage condenser, 3 MFD, 4000 V, hermetically sealed in aluminum can. \$4.95



IF transformer, mounted in aluminum shield can, 1500 KC, with air trimmer, impedance coupled type. \$95c



Westinghouse meter, 0-1 MA movement, 2" round case, scale calibrated at 0-140 and 0-500. Includes mounting hardware. \$2.95



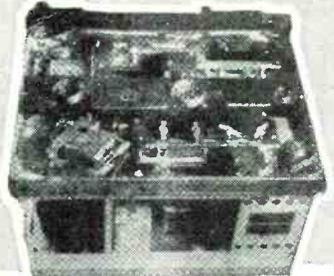
Western Electric meter, 4" round, zero center, 0-1/2 MA each side. \$3.95



Westinghouse meter, 0-1 RF amps, 2" round case, internal thermocouple, in original box. Includes mounting hardware. \$2.95



Tuning unit BC 375. Approx. 65 MMFD cond., coils, RF chokes, dials, asstd. mica condensers \$500 WVDC, over \$50.00 in parts. \$37.95



SCR 522-100-156 MC receiver and transmitter with 18 tubes.

Price New \$59.95 Price Used \$39.95

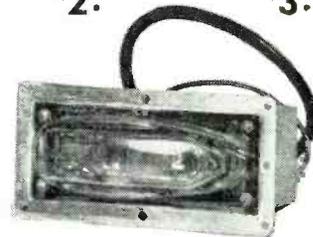


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High speed photo flash tube, 12,000,000 lumens light output. Stops all action. Ignition coil included on back of bulb. 10,000 flashes. Diagrams furnished on request. Your cost only. \$8.95

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The ideal way of indicating the position of rotary beams, wind indicator, etc. Line cord and instructions for 110 VAC operation furnished.

2 for \$3.95



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PRICED AT ONLY

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- Tests shorts and leakages
- Tests individual sections
- Works on 90-125 V 60 cycle AC
- Comes in portable cabinet complete with all operating instructions.

\$49.95



Transmitter and Receiver. Has been widely used on the 144 MC band. Shipping wt. 100 lbs. U. S. Govt. surplus. Your price, less tubes and power transformer. \$14.95



Dynamotor power supply—inputs 6 or 12 V, output 500 VDC at 160 MA, mounted on box with breakers, relays, interference filter and two 10 ft. cables. U. S. Govt. surplus. \$9.95



30 MC IF transformer in square aluminum can, silver slugged tuned. 29c
Mica capacitor .002 MFD 3000 WVDC 89c

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- Thordarson fil. trans., 110 V 60 cycle pri., two 10 V 10 A sec., CHT type case. \$4.95
- Thordarson fil. trans., 110 V 60 cycle pri., sec. No. 1 2.5 V 10 A CT, 3000 V ins., sec. No. 2 10 V 3.25 A, two 5 V 3 A, 6.3 V 1 A. \$1.49
- Thordarson fil. trans., pri. 110 V 60 cycle; sec. 6.3 V 6 A, CT. 69c
- 8-8 MFD 350 WVDC, 20 MFD 150 WVDC, round con. 49c
- 75,000 ohm 200 W bleeder. 49c
- 2500 ohm 100 W adj. 65c
- 955-9004 tubes. 24c
- Sockets for acorn tubes. 95c
- 6J4.....\$1.50 616..... 95c
- Lip mike and head band. \$1.49
- No. 60 A—6F6-5 General Universal A & B battery, 7.5 V 9V 90 V B....



368AS-tube. A real buy in a VHF door knob tube that will take 30 W input on all frequencies up to 1500 MC. No socket required. Priced at small fraction of original cost. \$4.95

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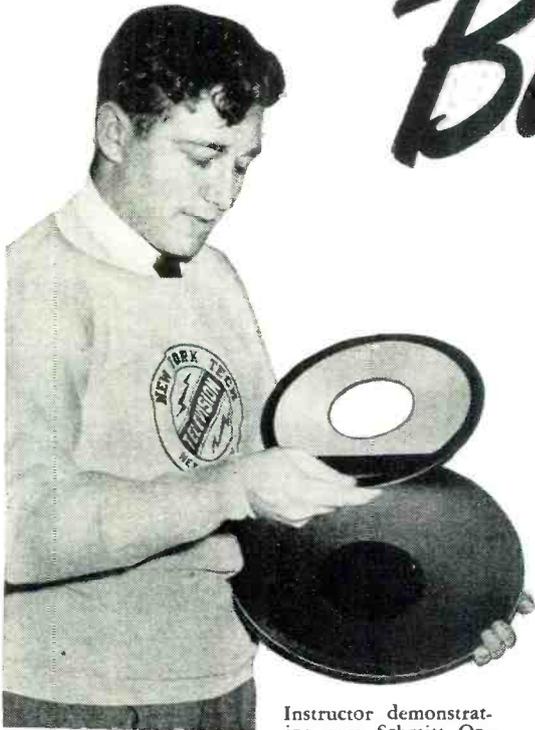
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20% DEPOSIT REQUIRED ON ALL C. O. D. ORDERS

Build a Television



Instructor demonstrating rare Schmitt Optical System, used in big picture, projection type, television receivers. This famous television school's location in the heart of the television industry, helps it to get such scarce scientific equipment. At N.Y.T.I. of N.J. all types of television receivers are available for student study.

To stimulate its radio and television training programs, this famous resident radio and television school is offering men interested in television this unusual opportunity.

If you are unable to leave home to go to a resident school, N.Y.T.I. of N.J. can supply you with parts to build a television chassis in your own home. You will be supplied with the same instructions and directions with which the school's resident students are equipped, when they reach the stage in their training that calls for television set construction. If you already have a sound radio background, with experience in building radio receivers, you will be surprised to find how much you can learn about television by building this set.

N.Y.T.I. of N.J. is one of America's leading resident schools for men seeking dependable, thorough, up-to-the-minute training in the various fields of radio and television.

The schooling offered by N.Y.T.I. of N.J. is particularly useful to those who recognize the high-earning possibilities of technical training in radio and television and are willing to tackle the class and laboratory work offered, regardless of their previous education.

No high-school diplomas are needed for entrance. But N.Y.T.I. of N.J. requires that a student be earnest, sincere, and radio-minded. Students without proper mathematical backgrounds are taught the radio and



You can build a direct viewing television chassis similar to the one pictured above, either in your own home or in the magnificently equipped shops and laboratories of this famous television

school, located square in the HEART of America's television manufacturing and broadcasting industry. Mail the coupon at the right to get full details.

Set Right in Your Own Home!

television mathematics they need. Several students with only grammar school educations have successfully completed advanced technical television courses.

A considerable number of out-of-state students attend the school because of its excellent, practical type of radio and television courses, so difficult to get anywhere else in the world today. Living quarters are obtainable by single students.

You Put Into Practice Everything You Learn

Students at N.Y.T.I. of N.J. particularly like the way the school puts into practice what it teaches. You may actually build a 17-tube television chassis. You also help build as many as 7 radio receivers of different types, a total of 75 electronic educational devices. Class study, and laboratory study, in the proper combination, increase interest—and your hands get as smart as your head.

A 17-tube, experimental, television chassis may be built by all resident students of television, and may be kept as their own property, if they so choose.

Located in the Heart of the Electronic Industry

The New York Technical Institute of New Jersey is in Newark, N. J., just across the river from New York City (only 20 minutes from Broadway by subway or train). The school is located in the heart of America's great radio and electronics industry. Such leading television, radio and electronics manufacturers as R.C.A., Western Electric, Du Mont, Federal and Edison are nearby. This means that the school offers numerous advantages, as it is in touch with the most recent developments in radio and television.

Highly qualified television and radio instructors are here in abundance. Equipment is easier to get. Television students are offered exceptional advantages in this great electronic center.

**MAIL THE COUPON
TO GET FULL
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The school issues a special Bulletin which illustrates and describes its truly exceptional facilities and equipment. This Bulletin also describes classes that may be attended, housing conditions, costs, hours, etc. If you are interested in Television—you will want to read this Bulletin. You can have it *free*, merely by mailing the coupon at right.

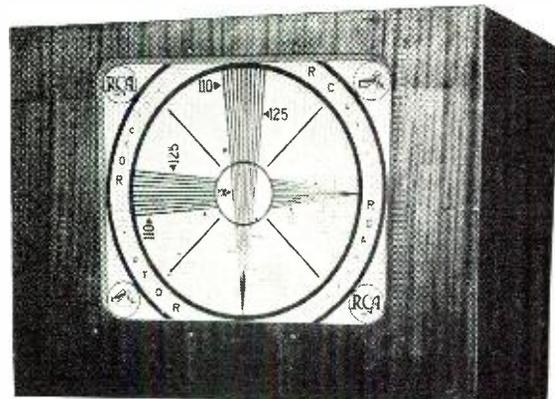
The school will also be happy to send you complete information about the television kits and directions which are now available to you if you desire to build your own television chassis at home.

Just fill out the coupon at right and mail it NOW to: *New York Technical Institute of New Jersey, Dept. 12, 158 Market Street, Newark, N. J.*



Instructor demonstrating theory of light in connection with study of optical systems used in projection type television receivers. This is just another one of the pieces of equipment which the New York Technical Institute of N.J. has available for resident student instruction.

Big picture television (16" x 21 1/4") in the flesh at N.Y.T.I. of N.J. When it comes to television receivers, N.Y.T.I. of N.J. has it! All types of television receivers are available for student use and instruction at the school.



Standard laboratory type test pattern used for determining picture perfection in all types of television transmitters and receivers. (You can see it at N.Y.T.I. of N.J.)

**New York Technical Institute of New Jersey, Dept. 12,
158 Market Street, Newark, New Jersey**

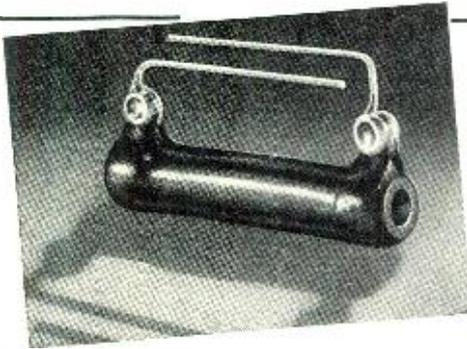
- Check here if you wish to receive the Special FREE Bulletin describing the resident school of the New York Technical Institute of New Jersey located in Newark, N. J.—including its facilities, equipment, courses offered, costs, hours, etc.
- Check here if you wish complete information about building a television chassis in your own home.
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LECTROHM RESISTORS

Lectrohm's method of manufacture has established an enviable reputation as providing a most dependable, lasting performance at rated resistance of any resistors made. They're solid—consistent performance—no variance over long hard usage. Resistance wire is silver soldered to the solder lugs by special process (not by torch method of brazing) for perfect electrical bond always. Wire and lugs are completely embedded in high temperature vitreous enamel. Write for complete data.



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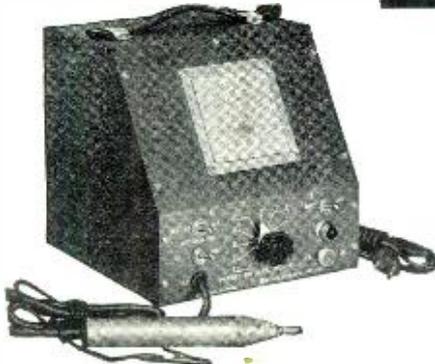
National Lock Washer Company, Newark, N. J.

very much to be desired in any receiver, and seldom to be found, especially in the cheaper products. Sensitivity is very good, especially if a 7V7 tube is used as a mixer; selectivity comes close to crystal filter; a.v.c. is adequate and simple, and does not impair weak signals; bandspread is more than adequate, and is adjustable; enough controls are provided to give complete control of the receiver; appearance is neat; the receiver is completely self-contained, excepting speaker only—no inconsiderable list of advantages for the builder's \$20-\$25 worth.

Reception, both fone and c.w., has been very gratifying on 80 meters. The b.f.o. gives a good beat note and the i.f. selectivity was found surprisingly good for this type of work. On fone the 5-tuber brings in house volume sigs, and most of the states have been copied on c.w. Alaska and Canada produced, in one evening's listening, good Q5/S7-8 sigs. There is no sense of flimsiness nor any annoying instability apparent when tuning the receiver, and all in all, it represents about as good a return for the time and money invested as can be imagined.

The author wishes to acknowledge, with thanks, the suggestions and advice on the a.v.c. circuit shown, made by Mr. Harold Harding, a veteran old-timer in receiver experimentation and construction.

-30-



NEW! *faster, easier* servicing by "listening in" with PRECISION ELECTRONICS SIGNAL TRACER

Real versatility! The "number one" instrument in any Service Man's equipment. Probe with Polystyrene tip (operates on frequencies up to 300MC), top quality parts throughout and exclusive engineering features. Outstanding "on-the-job" superiority!

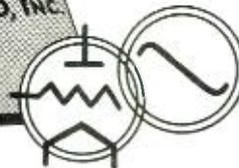
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COMPLETE
115 VOLTS

50-60 CYCLES

Checks signal stage by stage in R.F., I.F., and Audio sections. Speeds location of intermittents, opens, shorts, hums and noisy circuits with set hot or cold—checks coils, condensers, transformers, resistors, speakers, tubes! See your Jobber or write for descriptive literature. (Please address Dept. B)

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BILL'S RADIO REPAIR SHOPS

DEPT. R12 2038 WASHINGTON STREET BOSTON 19, MASS.

New Synchronous Motor (Continued from page 86)

encased in a light perforated can and is fan-cooled.

Embodying a number of new design principles, this new synchronous motor is exclusively different from any other type commercially available. For example, it is the smallest non-hunting synchronous motor for its power output and reliability at equivalent cost. Its high efficiency results in low temperature rise under continuous operation conditions (45° C. at 60 c.p.s., 55° C at 50 c.p.s.). Design-elimination of stator tunnel windage noise insures quiet operation. Finally, since the hysteresis rotor eliminates pulsations and is essentially in dynamic balance, it is actually the smoothest running motor that could be selected for driving record-changer equipment; and the inverted stator structure removes all tooth ripple.

In dimensions, its over-all length, including the can, is two inches, and its diameter approximately two and one-half inches. Total weight is slightly over one pound. Attached to the motor by flexible lead wires is a .55 μ fd. condenser for 60 cycle operation, which may be mounted in a convenient chassis location. A solid hysteresis rotor, ground from special alloy steel to extremely close tolerance on diameter, is mounted on a ground stainless steel shaft, which rotates in self-aligning oilite bearings.

The stator construction differs from conventional shaded pole record-changer motors in that four coils, each held within close resistance tolerance, are used.

Available in the near future to manufacturers and dealers in radio-phonograph combinations, the synchronous motor is now the only type that inherently operates at constant speed regardless of load and voltage changes, and with smoother torque of the hysteresis type rotor to insure low vibration noise level. A smooth-starting motor, it reaches synchronism immediately and, because it is synchronous, the speed of the turntable which it drives is not affected by changes in line voltages.

If we examine the way in which the introduction of this new motor allies itself with more discriminating consumer demand, we find several reasons. The average untrained human ear is critical to pitch changes caused by turntable speed variations of 1/2% or more. The demand for better quality equipment comes from a discerning public, who will no longer tolerate the more than 1% speed change found in induction motors now used to drive most automatic record changers and turntables.

Comparative tests show that this synchronous motor holds turntable speed constant at 78 r.p.m., whether one or ten records are loaded on the record-changer turntable. On the other hand, most induction motors show a 2 r.p.m. (more than 2%) drop in turntable speed as the corresponding record load increases. Fig. 1 shows actual curves obtained from these tests.

Other tests show that "flutter" and "wow" are held below the 1/2% tolerance in the Fairchild motor drive, a reduction of more than 50% below the induction drive. Further tests indicate that in this synchronous motor vibration noise level is more than 6 db. lower than the induction motor, measured on both the panel and turntable surface.

Engineers have found that when dynamic or magnetic pickups are desired in a record-changer, the type of motor drive used exerts a strong influence. With a synchronous motor, such improved pickups as the magnetic and dynamic types can be applied more readily than with the induction motor.

Up to now the crystal pickup has been widely used with induction motor drives, because it is inexpensive and offers generally satisfactory performance under ideal conditions. But recently the opinion has been expressed that the crystal type pickup is no longer as good as best quality records deserve, as it produces distortion and severe limitations of response. For use in climates where temperature and humidity are high, it has often been found unsatisfactory.

Through a combination of these factors, there has been a large demand recently for fine quality dynamic and magnetic types of pickups that can give

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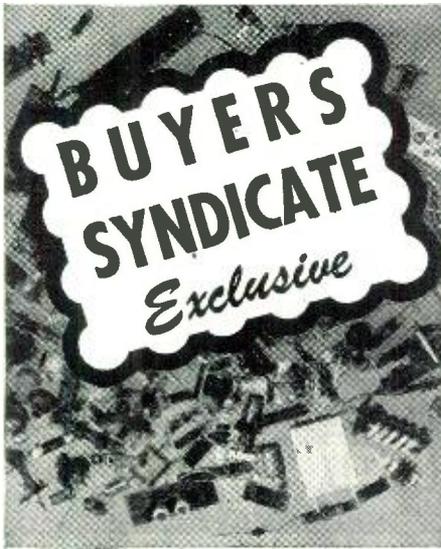
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Thousands of Applications in Each Kit**

Frequency ranges from 2 meters to 25 kilocycles. Both iron core types and air types included. Many units have mica condensers which can be salvaged for other purposes.

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and many other types in kit

With proper trimmers and associated parts every coil can be used. These KITS are perfect for amateurs, experimenters, servicemen, schools, laboratories, etc.

Priced at \$2.98

If these coils were to be purchased separately they would cost over \$75.00.

Almost any one of these coils is worth more than the price of the entire kit!

20% Deposit with Order. Balance C.O.D.

PHONO-KIT

**PORTABLE ELECTRIC PHONOGRAPH
A REAL QUALITY 110V AC PHONOGRAPH KIT**

- Handsome leatherette portable case
- High quality motor with 9" turntable
- Light weight crystal pickup
- 5" Alinco speaker with transformer
- Tone tested 2 tube amplifier with tubes
- Tone control and needle cup
- Nothing else to buy. Only 1 hour to assemble for play. Full instructions supplied.

SPECIAL YOUR COST **\$21.50**

LOTS OF TWO OR MORE **\$19.95**

WRITE FOR BARGAIN CATALOG

20% deposit with order. Balance C. O. D.
All materials sold on money back guarantee

BUYERS SYNDICATE

786 CAREW STREET, SPRINGFIELD, MASS.

more faithful and reliable results in playback operation.

How does this situation regarding pickups relate to the subject of motor drives? The answer lies in the motor design. The conventional induction motor's "open-type" construction permits a large magnetic leakage field to exist in space near the motor. This high leakage field, while not affecting a crystal pickup, does adversely affect a magnetic or dynamic pickup. A very audible 60-cycle hum is picked up and reproduced through amplifier and speaker when such a pickup is in proximity with the induction motor.

With the enclosed-type construction of the new synchronous motor, as compared to the open-type of the induction motor, there is a reduction of more than 10 db. in the magnetic leakage field hum reproduced by magnetic or dynamic pickups. It is for that reason that radio-phonograph manufacturers find it essential to use this new synchronous motor in equipment where other-than-crystal pickups are employed.

As for the replacement market, it is a simple matter for a radio serviceman to replace a damaged or unsatisfactory induction motor in a record-changer with a new synchronous motor. The discerning owner therefore is able to obtain improved performance from his present equipment until new consoles are on the market.

Thus, either as a replacement motor for existing radio-phonograph combinations with record-changer, or as a standard component in new equipment, the new synchronous motor is expected to eliminate several among the most annoying sources of dissatisfaction among critical listeners to fine quality records.

-30-

Service Associations

(Continued from page 49)

this committee. These include complaints filed with us by OPA, the Better Business Bureau, any dealer against any member in the service field, any customer who may complain about a dealer and complaints of servicemen and distributors.

Broadcast and Publicity Committee

—The group looks after the Association's relations with the broadcasting stations and the press.

The broad programs for mutual help and training which have been charted as prime postwar projects of PRSMA are designed to assist radio servicemen to become better technicians and better businessmen. It's our firm belief that the public can be better served at less cost for essential radio service by an organization of qualified, independent service businessmen than by any other type of service set up. Specifically, we plan to raise the standards of radio service in our areas and to secure local recognition of the independent service dealer as a businessman on a par with any other merchant.

It is lamentable but true, that the average service dealer before the war had no recognized standing in his community. To the banker he was anathema. He was held on a cash basis with his suppliers, and, in most cases, looked upon by his fellow businessmen as some jerk who tinkered with radios. Yet this radio service dealer, if he was a good technician, had to have a technical background superior to that required of most of his fellow businessmen, including the banker, and an aptitude for constant study of a dynamic field of activity

Charles R. Denny who was recently named chairman of the Federal Communications Commission takes time out to look over a new Hallicrafters Model SX-42 FM-AM amateur radio receiver. Prior to his new appointment Mr. Denny served as acting chairman of the Commission after Paul A. Porter resigned.



which was erupting more new ideas per month than the average businessman had to cope with in a year.

In a tangible way, the PRSMA helps to channel a large volume of radio service business into the stores of members of the association. To accomplish this a radio service merchandising program has been developed. As a part of this program we are using 15 spot announcements, two fifteen minute programs and six FM spots on radio service per week over Station WFIL in Philadelphia. These spot announcements and programs encourage the listener to phone the PRSMA for radio service. Calls originating from these announcements are turned over to the member dealer whose place of business is nearest the point where service is required. This radio program will be broadened as time goes on and will be supported by suitable advertising in the leading local papers and other media.

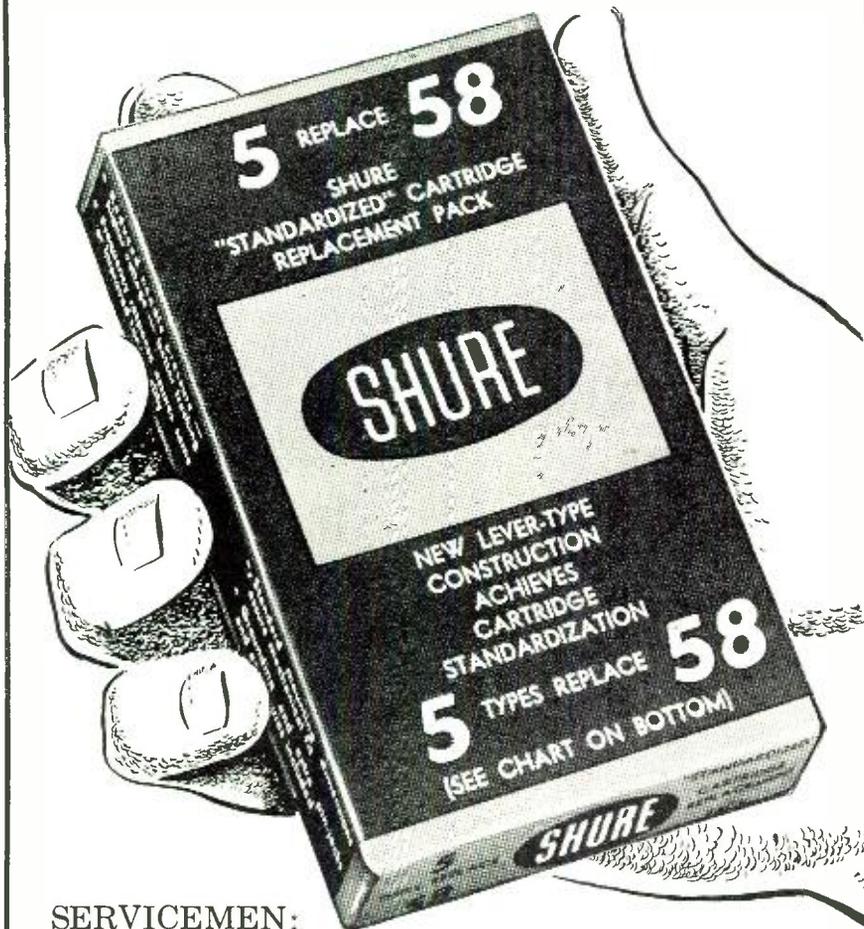
Another project of PRSMA is a complete course in basic television installation and servicing, which is being given in cooperation with Radio Station WFIL in Philadelphia. Other courses in AM, FM and television are being mutually sponsored with various educational institutions in the Philadelphia area.

The service dealer has unjustly been the butt of many thoughtless charges. In our area, television and FM are now a reality. The service dealer has been wrongly criticized for not becoming an expert on television service and installation. Those who level this sort of charge against the independent service dealer are either wholly ignorant of the basic functions of radio servicing or are using it as a smoke screen to mask some selfish plan or ambition.

Radio service dealers are concerned only with adjusting and repairing equipment that has been designed, manufactured and delivered to a dealer or end user. While an understanding of radio theory and circuit application is important, the prime need of a dealer is for full and complete information about the particular piece of equipment he is called on to install or service. What manufacturer to date has revealed to anyone outside of his own organization circuit details or other pertinent information on either television or FM receivers which he plans to produce? It is obvious that until the manufacturers supply the technical data necessary for installing and repairing their equipment, there is little the independent service dealer can do to equip himself with the specific information absolutely necessary for intelligent installation and servicing of the manufacturer's equipment.

Perhaps one of the most important parts of the PRSMA program is the plan to help the individual dealer become a better merchandiser and businessman. It is the purpose of this program to encourage the dealer to

NEW SHURE CARTRIDGE "PACK" HANDLES REPLACEMENTS FOR 58 CARTRIDGES!



SERVICEMEN:

Solves your service problems with phonographs and record changers . . . builds new profits! 5 crystal cartridges have been "standardized" to replace 58 different popular types of all makes—a feature made possible by the new, post-war Shure Lever System. The "Pack" contains the 5 Shure Lever-Type Cartridges, including Model W57AN with the sapphire-point needle. Specific cross-reference chart for exact cartridge replacement is printed on carton. Your Shure Distributor has the "Packs" in stock. Write or call him now!

MODEL W50 . . . LIST PRICE \$25.75 . . . CODE: RUPAC

Manufactured under Shure Patents—Licensed under Patents of the Brush Development Company

SHURE BROTHERS, Inc.

Microphones and Acoustic Devices

225 West Huron Street, Chicago 10, Illinois

CABLE ADDRESS: SHUREMICRO



★ for replacement of worn pre-war changers
 ★ for constructing your own radio-phono combination
 it's

WEBSTER best known name in RECORD CHANGERS

When you replace your old, worn changer, or construct your own radio-phono combination — do as so many others have wisely done — choose Webster. Known for their high fidelity of reproduction, precision-made parts, and smooth, dependable performance, Webster Changers are truly "The Choice of Music Lovers."



Model 56

Shuts itself off after the last record has played! Plays "inside-out" or home recordings when in manual play position. Cushioned spindle protects records, Webster 4-pole, shaded pole motor, improved rim drive, feather-touch pickup, and simplified changer mechanism for long dependable service. All parts heavy gauge, copper or plated steel. Plays ten 12-inch or twelve 10-inch records. Dimensions: 14" x 14" x 9" overall (6½" above main plate, 2½" below.)



Model 50

Compact, Efficient, Model 50 is designed for use in smaller units where space is limited. It has the Webster two-tier bonded construction of changer mechanism, cushioned spindle, manual play position, improved rim drive, and feather-touch pickup. All parts are heavy gauge, copper-plated steel, and built for long dependable service. Plays ten 12-inch or twelve 10-inch records. Dimensions: 12" x 12¾" x 9" overall (6½" above main plate, 2½" below.)



see your
 dealer

The choice of music lovers

WEBSTER CHICAGO
 5610 BLOOMINGDALE AVE.
 CHICAGO 39, ILLINOIS

operate his business as any successful business must be operated. Accurate records and accounting to enable him to pass up service jobs that lose money. Clean, efficient service shops and store layouts that have eye-appeal. Effective use of his window display space with the right kind of displays, changed frequently. These are all segments of a program for merchandising education which will bring material benefits to every active member of the Association.

Predicated on our own experiences in Philadelphia we believe good radio service organizations will receive enthusiastic support and tangible assistance from broadcasting stations and particularly wholesale radio suppliers which service the radio Association's area.

Broadcasting station operators know that the quality of their programs is no better than the efficiency of the receiver that reproduces it. Efficient, capable radio service, widely available, is a decided asset to the broadcaster as well as the set user. Since most broadcasting station managers recognize this need for improved radio service they are usually ready to cooperate wholeheartedly with a service dealer organization which will lift the quality of radio receiver performance. Engineering personnel from the broadcasting stations are usually available as instructors in association training programs in receiver servicing and installation.

The radio service association will usually find a staunch friend in the power and light company which serves its area. These organizations are constantly looking for new ways to give their customers more value for their electrical service expenditures and a cooperative service dealer program provides an excellent opportunity in this direction. Power and light companies usually have auditoriums or other meeting rooms which can be used for Association meetings and as classrooms for evening training programs.

PR.SMA's staunchest friends have been the radio jobbers of Philadelphia who have consistently given us excellent support. The wholesalers have, in turn, benefited greatly from this cooperation. In a recent survey of buying preferences conducted among local radio servicemen the question was asked whether they bought their supplies locally through radio parts wholesalers, from outside suppliers or by mail. *Ninety-nine* per cent of the servicemen indicated they bought *all* of their supplies from local jobbers when the parts were available here.

In the final analysis it is the customer—the radio set user—who gains most from the activities of an active and alert radio service organization. Dealers cooperating to raise the horizons of radio service as a business can eliminate the chiselers, the racketeers and the fly-by-nights quicker and more effectively than could the individual dealer acting

PREPARED ASSORTMENTS GUARANTEED FIRST QUALITY

Cat. No.	Quantity	Description	Price
1001	100	1/2 Watt Resistors, All Insulated	\$2.98
1002	100	1/2 Watt Resistors, All Insulated	3.98
1003	100	1 Watt Resistors, All Insulated	4.45
1004	50	2 Watt Resistors, All Insulated	4.45
1005	10	Wire Wound Resistors Ass'd	2.98
		Watts	2.48
1006	50	200 Volt Paper Condensers	3.49
1007	50	400 Volt Paper Condensers	4.25
1008	50	600 Volt Paper Condensers	2.98
1009	50	Mica Condensers	6.75
1010	20	Dry Electrolytic Filter Condensers	3.98
1011	10	Resistance and Line Cords	4.50
1012	100	Wafer Sockets	8.50
1013	100	Plastic and Ceramic Sockets	
1014	10	25 Ft. Rolls Hookup Wire—Ass't Colors	1.98
1015	10	50 Ft. Rolls Hookup Wire—Ass't Colors	3.25
1016	10	100 Ft. Rolls Hookup Wire—Ass't Colors	6.75
1017	10	Volume and Tone Controls—No Switches	1.98
1018	50	Large Bakelite Knobs Push On	7.85
1019	50	Large Bakelite Knobs Set Screw	3.50
1020	50	Small and Medium Knobs Push On	3.75
1021	50	Small and Medium Knobs Set Screw	5.50
1022	100	Small Bar Knobs	.98
1023	100	Large Bar Knobs	3.45
1024	100 ft.	Spagheti and Vinylite	3.98
1025	50	Padders and Trimmers	2.49
1026	10	Coils I. F. R. F. Ant. and Osc.	3.98
1027	50	Pilot Lamps	2.98
1028	20	Toggle and Slide Switches	2.98
1029	20	Wafer and Ceramic Band Switches	2.98
1030	20	Auto Generator Condensers	2.98
1031	20	Auto Suppressors	2.98
1032	25	Electrical Wiring Devices, Plugs, Caps, Bases, Heater Plugs, etc.	2.75
1033	50	Electrical Wiring Devices, Plugs, Caps, Bases, Elements, Fuses, etc.	5.00

ELECTRICAL APPLIANCES AND PARTS

Item	Each
Fluorescent Kitchen Unit	\$4.75
Fluorescent Desk Lamp, Beautiful Finish, less Bulb	5.75
Single Burner Electric Stove, less Switch	2.55
Single Burner Electric Stove, with Switch	2.95
Double Burner Electric Stove, with Switch	6.25
Non-Automatic Electric Iron	3.95
Non-Automatic Toaster	3.75
Radiant Bowl Heater	4.25
Cabinet Type Heater	9.00
Bakelite Caps	.055
Rubber Caps	.09
Electric Iron Elements	.55
Nichrome Electric Stove Element	.12
Bakelite Heater Plug	.10
3 Way Cube Tap	.11
Replacement Toaster Element	.75
8 ft. Appliance Cord with Plug	.21
Electric Iron Heater Cord with Bakelite Plug	.45
Electric Iron Heater Cord with Switch Plug	.79

SEND FOR TRUTONE COMPLETE RAIL AND ELECTRICAL LIST

Terms: 25% deposit required with order. Balance C. O. D.

TRUTONE PRODUCTS CO.

303 West 42nd Street, Dept. N, New York (18), N. Y.

No Spreading Ourselves Out Too Thin!

Certainly, we could expand our facilities and offer you a more complete line. But, then, we couldn't do as well on deliveries as we're now doing!

So to serve you best, we are continuing our present maximum production on a limited line—thus assuring you the usual prompt and efficient Kenyon service.

THE MARK OF EXCELLENCE

KENYON

TRANSFORMER CO., Inc.

840 BARRY ST., NEW YORK, N. Y.

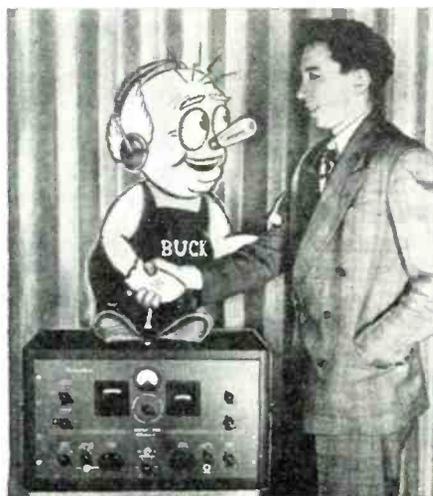
alone. Further, the Association results in a pooling of practical knowledge and experience which is reflected in improved methods of operation in members' shops and more value to the customer for his radio service dollar.

In years past, attempts have been made to form national associations of servicemen. It is the opinion of those of us who have been associated with successful service organizations for a number of years that there is no particular need at the present time for a national association of service dealers. However, we do feel that strong state associations should be built up. These state associations should be cooperative groups of autonomous local radio service dealers' organizations who can combine their activities for solving their problems on a state-wide basis.

The intense interest which has been spreading among service dealers throughout the State of Pennsylvania on the subject of adequate and equitable radio service associations, crystallized recently in a meeting at Harrisburg for the purpose of forming a state association. The meeting brought together officers and representatives of dealers and associations in Pittsburgh, Harrisburg, Philadelphia, Lehigh Valley and Williamsport. Representatives of the radio parts wholesalers and the broadcasting stations also attended the meeting. From plans drafted at this and a subsequent meeting a *State Federation of Radio Servicemen's Associations* will soon become a reality. We believe that through the medium of this organization a state-wide program will be developed and carried out which will go far towards helping the individual service dealer and provide radio set users with an increasingly higher standard of radio service.

-30-

Dan Rober of New York acted as stand-in for Maurice Kraay, W9HEL, who was declared winner of the Hammarlund SP-00-X Super-Pro when "Buck" Stretcher (the character seated on the receiver) presented the award. The contest to "name-the-pixy" was sponsored by Sun Radio & Electronics Co., Inc. of New York for all hams.



BARGAIN SPECIALS

FOR "GE" PORTABLES

2 volt Willard type 20-2 the exact replacement in Pre-War Model LB 530 "GE" Portable Radios. Also for other sets. Gangs nicely in multiples of 3 for 6 volts. In Plastic Case size 3 31/32 x 3 1/2 x 5 1/2" high. Shipped Dry. Uses standard battery electrolyte available everywhere. Regular List Value \$8.75 No. 5A142. Every One Brand New.



Each... \$3.95

The FINEST in HEADPHONES



Type P23. The Choice of the Air Corps headphones, highly sensitive, 8000 ohm impedance, bipolar magnets. Extremely comfortable sponge rubber ear cushions — stainless steel leather covered headband—concealed terminals—Six Foot Cord with PL55 plug. EVERY ONE BRAND NEW in Original Factory Cartons.

Stock No. 5A134 \$13.50 value. An Outstanding Buy, Only \$2.95

CODE PRACTICE SET

Consist of a top quality key and a Signal high frequency adjustable buzzer mounted on a black bakelite base, equipped with binding posts, ready for quick and simple connections to the 4 1/2 volt battery included. Complete ready to use.



Stock No. 5A145 Each \$2.95

Complete Nothing Else to Buy

CODE PRACTICE OSCILLATOR



Complete Nothing Else to Buy

Operates from 110 volts AC or DC. Plenty of Volume from Quality Midget Speaker. Complete with tube, high grade key, cord and plug—

Just Plug It In and it is ready to operate.

Stock No. 5A146 A REAL BUY. Each \$8.95



8000 OHM IMPEDENCE HEAD SET

Sturdy, hi-quality, built on the hearing aid principle. Ear fitting soft rubber cushions attached to receivers shuts out outside noise. Comfortable, light metal band easily shapes to contour of head. Comes complete as shown with 6 FOOT CORD and matching transformer. Cost to build many times the price we ask.

17A420, In Original Cartons. Special Each \$2.95

RESISTOR ASSORTMENT

Quality makes, insulated, RMA color coded assortment of 100 (50 one watt and 50 one-half watt) all popular capacities. Handy color code chart included

No. 18A74 Per assortment \$1.95

MASTER HARDWARE ASST.



Machine Screws Nuts Washers Soldering Lugs Grammets Spacers Rivets Eyelets Etc. Etc.

42 Individual Compartments, each containing a different type of most selected and often needed hardware. A total of over 1500 pieces. Including a wide variety of sizes, length and heads. This assortment will prove to be worth many times its small cost just to have it on hand when needed. Every Piece Clean, Bright and New. No. 3A35. An Outstanding Value... \$2.45

KRAEUTER PLIERS

Round Nose. A handy plier for shaping wire, metal and all around radio work. Made of forged steel with polished head.



No. 11A15. Overall length 6" Each... 95c

RF AMMETER



G.E. type D W 52. 4 Amperes, 2% accuracy. EXPANDED scale. 2.19" diam. body. Has internal thermocouple. List Price \$19.75

No. 20A840 Special Each \$3.43



COMING SOON

A New Complete B-A Catalog containing the latest in radio and electronic parts and devices, newest ham gear, gadgets, war surplus items. If you haven't already requested one do so now

WILLARD 2 VOLT



Compact Rechargeable Storage Battery in Spill-Proof Clear Plastic case. Only 2 3/8" square and 6" overall high—(About the size of the ordinary #6 Dry Cell) make it applicable for a wide range of uses where battery power is needed. Rating 24 AH. Gangs nicely for other voltages in multiples of 2 volts. Shipped Dry. Uses standard battery electrolyte available everywhere. Every One In Original Factory Carton

No. 5A133. While Our Stock Lasts. Special Each \$2.95

Order from this ad. Every Item Listed is GUARANTEED BRAND NEW, TOP QUALITY GOODS.

Terms—Cash with order or C. O. D with 20% deposit Add Postage.

BURSTEIN-APPLEBEE
EVERYTHING IN
RADIO AND ELECTRONIC DEVICES
1012-14 MCGEE STREET, KANSAS CITY 6, MISSOURI

**WE SHIP ANYWHERE
IN THE WORLD**

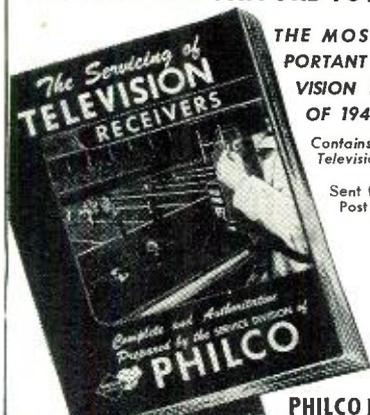
Internationally Famous

FLANAGAN RADIO CORP.

**SEND FOR
COMPLETE
LIST OF
AVAILABLE
RADIO TUBES
AND PRICES**



**INTERESTED IN TELEVISION?
THEN YOU CAN'T AFFORD TO MISS**



**THE MOST IM-
PORTANT TELE-
VISION BOOK
OF 1947**

Contains Latest
Television Data

Sent to you
Post Paid

**PHILCO BOOK
\$2.25**



**COYNE
BOOK
\$1.95**

Order Today From FLANAGAN

FREE CATALOG

Send for free
catalog and prices
of hard-to-get Radios, Ra-
dio Tubes, Radio Parts, Pickups,
Motors, Condensers, Tube Checkers, Volt and
Ohm Meters, Signal Generators, Signal Trac-
ers, etc. Please mention Radio News when
writing.

**FLANAGAN
RADIO CORP.**

Phila.'s Largest Stock of Radio Tubes
**N. E. Cor. 7th & Chestnut Sts.
Phila. 6, Penna.—U. S. A.**

Within the
INDUSTRY

ROY BROWN UNGER has been appointed to the post of assistant sales manager of the jobber division of *The World Products Corporation* of Cleveland, manufacturers of home and automobile radio aerials.



Mr. Unger was graduated in 1943 from Cornell University. As a first lieutenant of the field artillery he served overseas with the 77th Division on Okinawa and the Philippines.

His new duties include developing and directing new advertising and merchandising plans, expediting shipments and supplying customers with a complete service of sales aids.

C. J. ANTHONY has been appointed merchandising manager of the *John Meck Industries*, radio manufacturers of Plymouth, Indiana.

Mr. Anthony has been associated with the company since 1943 and has held posts of assistant to the sales manager, personnel director and sales promotion manager.

Three years before his association with Meck he was employed in the wholesale marketing department of the *Pure Oil Company*.

AERO NEEDLE COMPANY of Chicago manufacturers of the *Aeropoint* phonograph needle, have recently announced the appointment of *The Sampson Company* of 3201 South Michigan Avenue, as exclusive distributor of the company's products in the Chicagoland area.

RICHARD MATTISON, who for many years has been associated with *Tung-Sol Lamp Works, Inc.*, as manager of their wholesale division, recently joined the *Minerva National Sales Corporation* as general manager.



In his new post Mr. Mattison will direct sales activities in connection with the merchandising of the *Minerva* line of radios, radio-phonograph combinations, FM and television receivers.

JEFFERSON-TRAVIS INCORPORATED has become a wholly-owned subsidiary of the *Emerson Radio and Phonograph Corporation* of New York.

Jefferson-Travis, manufacturers of marine radio and radiotelephone equipment, will operate as a separate

company and will have at its disposal the engineering, purchasing, production, promotion and management counsel of *Emerson* personnel.

Robert C. Berner, an official of *Emerson*, has been elected president of *Jefferson-Travis Incorporated* and Harold Lloyd, formerly with the parent company has been named general manager. Ray Friedman will remain in his post of sales manager while Joseph Mas will continue to serve as chief engineer.

GENERAL CEMENT MANUFACTURING COMPANY of Rockford, Illinois was recently admitted as a new member of the Radio Manufacturers' Association by the RMA Board of Directors.

The company manufactures a line of products for the radio serviceman, including cement, dial belts and kits, wire strippers, etc.

BRUCE R. LAFFERTY has been promoted to the post of general service manager for *The Hallicrafters Company* of Chicago.



Mr. Lafferty, a veteran of eighteen years in the radio field, was formerly assistant to the general service manager of the company. He has been associated with the CAA as a radio engineer in charge of field installations and with the Chicago Ordnance District.

RADIO EQUIPMENT DISTRIBUTORS, West Coast outlet for a complete line of service and amateur parts and equipment, has recently moved to their new modern store at 312 West Pico Boulevard, Los Angeles.

The new location comprises 5000 square feet of floor space with 1500 feet set aside as a "ham shack" containing a complete line of amateur radio supplies.

One of the features of the new store is a technician's lounge where the latest news and technical information on radio is available. The downtown store at 709 South Main Street will continue to operate under the guidance of Jack Robbins.

RADIO CRAFTSMEN, INC., has entered the loudspeaker business, according to the company's vice-president and general manager, Byron L. Friend.

The company will produce a complete line of 8", 10" and 12" speakers with deliveries being made currently on the "Standard," "Master" and "De Luxe" lines.

Designed to be used as replacement units in radio-phonograph combinations and public address systems, these speakers are being merchandised through local jobbers.

* * *

GORDON S. CARBONNEAU, president of the company bearing his name, has announced the entry of his organization into the loud-speaker field in both the jobber and equipment lines.



Mr. Carbonneau, who served as production engineer for *Utah Radio Products* of Chicago, has been active in the radio industry for the past 25 years.

Although processing and manufacturing operations of *Carbonneau Industries* will be centered in Grand Rapids, Michigan, advertising and jobber sales offices will be located in Chicago.

* * *

DAN D. HALPIN, a pioneer in the promotion of commercial television, has been named television receiver sales manager for *RCA Victor Division of Radio Corporation of America*.

Mr. Halpin who has been engaged in television activities since he joined the division in 1940, is a past president of the American Television Society, a member of the Sales Executives Club of New York and past president of the Notre Dame Club of New York. While at Notre Dame, Mr. Halpin managed the 1930 national championship football team.

* * *

MYRON J. MORRIS has recently been named manager of the service division for *Electronic Corporation of America*.



In his new position, Mr. Morris will be responsible for the company's Integrated Service Plan which coordinates technical information, parts and service facilities for dealers.

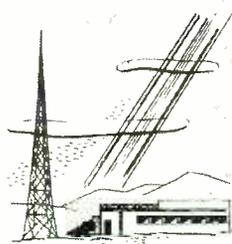
Prior to joining *ECA*, Mr. Morris was a radio and radar instructor for the Naval Signal Corps and a radar technician attached to the Naval Aviation Supply Office.

* * *

RADIO MANUFACTURERS ASSOCIATION and the National Association of Broadcasters have recently appointed a joint committee to provide closer cooperation on major radio problems, including the development of FM, television and other services in the public interest.

The liaison committee, made up of five members from each organization, includes, for RMA: W. R. G. Baker, *General Electric Company*, Walter Evans, *Westinghouse Electric Corporation*, Frank M. Folsom, *Radio Corporation of America*, Paul V. Galvin,

February, 1947



RADIO STATION STANDBY



MOBILE RADIO UNITS



GEOPHYSICAL SURVEY



MUNICIPAL SIGNAL STANDBY



RAILROAD RADIO



AMATEUR RADIO

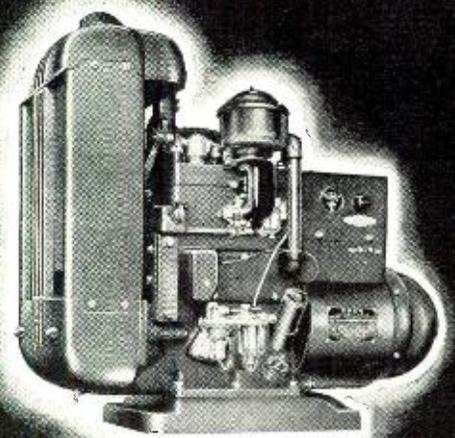


"SPOT" RECORDING

A.C. OR D.C.

POWER

PORTABLE, STANDBY
OR STATIONARY
for
Electronics Uses



Onan Electric Plants are completely self-contained, dependable power units built in a wide range of sizes and standard voltages.

Lightweight, one or two-cylinder, air-cooled models offer the maximum in portability for many applications. Portable A.C. models—350 to 3,000 watts; portable D.C. models—600 to 5,000 watts.

Although widely used for intermittent service as standby units, Onan two, four, and six-cylinder water-cooled plants are built for continuous heavy-duty operation . . . stationary or mobile. A.C. models—3 KW to 35 KW; D. C. models—3.5 KW to 10 KW.

WRITE FOR FOLDER

ONAN Electric Plants are available in many sizes and models. ALTERNATING CURRENT: 350 to 35,000 watts in all standard voltages and frequencies. DIRECT CURRENT: 600 to 10,000 watts, 115 and 230 volts. BATTERY CHARGERS: 500 to 3,500 watts; 6, 12, 24 and 32 volts.

D. W. ONAN & SONS INC.

2187 Royalston Ave.

Minneapolis 5, Minn.



FOUR REASONS
Why
RADIO SERVICEMEN PREFER
WRIGHT VERIFIED SPEAKERS

**Brightens
Tone Quality**

**Sturdy
Construction**

**Cones
Stay Centered**

★

**The Verified Guarantee Protects Them
Against Any Loss**

★

WRIGHT, Inc.
2233 UNIVERSITY AVE.

ST. PAUL 4

MINNESOTA

Galvin Manufacturing Corporation, and E. A. Nicholas, Farnsworth Television & Radio Corporation. NAB members include: T. A. M. Craven, Station WOL, Washington, D. C., William Fay, Station WHAM, Rochester, New York, Gordon Gray, Station WSJS, Winston-Salem, N. C., James Shouse, Station WLW, Cincinnati, Ohio, and Carleton D. Smith, Station WRC, Washington D. C.

* * *

HECTOR A. CASTELLUCCI was promoted recently to the post of assistant manager of the sales division of *Farnsworth Television & Radio Corporation.*



Mr. Castellucci, who has been associated with *Farnsworth* as a procurement specialist, is well-known in the radio and appliance industry, having been associated with *Grigsby-Grunow Company, Universal Cooler Corporation, World Utilities, Inc., and Servel Incorporated*

His offices will be maintained at the Fort Wayne, Indiana, headquarters of the company.

* * *

LAND-C-AIR SALES, INC., is the corporate name of a new sales representatives' organization recently organized by Robert E. Sargent, Paul Nichols and Walter C. Hustis.

The three founders of the new company were all formerly employed by *Jefferson-Travis Corporation*. Mr. Sargent and Mr. Hustis served as Western and Eastern Sales managers respectively, while Mr. Nicholas was director of purchases for the company.

The new company is located at 14-16 Pearl Street, New York City.

* * *

B. V. K. FRENCH, well-known radio engineer, has recently joined the *Howard W. Sams & Co., Inc.*, staff as director of field relations for the company.



In his new post Mr. French will act as liaison between the radio manufacturer and the servicing profession. He will assist in the expansion of the company's "Photofact" service to radio technicians.

Mr. French has served in various engineering capacities with *Federal Telephone and Telegraph Co.* of Buffalo, *RCA License Division Laboratory* and *P. R. Mallory Company* of Indianapolis. During the war he served on the Joint Army-Navy Standardization Board. He is a senior member of the I.R.E. and has served as chairman of the Connecticut and Indianapolis sections.

* * *

ILLINOIS CONDENSER COMPANY, INC., have moved into their new plant located at 1616 North Throop Street, Chicago, and are now in full operation at the new address.

RADIO NEWS



Sensational, Amazing

**NO ELECTRICITY — NO TUBES
NO BATTERIES — NO TUNING**

MYSTERY RADIO

Yes, this new MYSTERY RADIO provides instant reception from the nearest broadcasting station—just put little ear piece into your ear and attach wire clips to aerial and ground, presto—you have reception.

- So small, it will fit in the palm of your hand.
- Usually works swell by just attaching clip to aerial, bed spring, screen door or wire fence, etc.
- Nothing to wear out—no parts to replace.

Send check or money order for postpaid delivery. Dealer inquiries invited on quantity.

TAYBERN EQUIPMENT CO.

DEPT. RN-2

120 GREENWICH STREET NEW YORK 6, N. Y.



\$245

PRICE COMPLETE



Office



Sickroom



Youngsters

OUR KNOW HOW

**IS THE ANSWER TO YOUR
INSTRUMENT REPAIR PROBLEMS**

INSTRUMENT SERVICE technicians are specialists in METER and TEST EQUIPMENT repairs.

You will get prompt and guaranteed repair service on all makes of METERS — MULTI-METERS — SIGNAL GENERATORS — VACUUM TUBE VOLT-METERS — TUBE CHECKERS.

ALL CALIBRATIONS CHECKED AGAINST PRECISION STANDARDS.

Inquiries solicited.



INSTRUMENT SERVICE CO.

2515 AMSTERDAM AVENUE
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WIRE! WIRE! WIRE!

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* * *

C. RUSSELL FELDMANN, formerly president of *National Union Radio Corporation*, was recently elevated to the post of chairman of the board of the company.

Succeeding Mr. Feldmann as president of the company is Kenneth C. Meinken, who has been associated with *National Union* since 1941 as assistant to the president.

Other corporation officers elected to fill new posts included: Winfield H. Carey, to the office of treasurer and Jerome V. Deevy who was named secretary of the company.

* * *

AMOS H. CAREY has been named the new director of manufacturing for the *John Meck Industries* of Plymouth, Indiana.



Mr. Carey, who was formerly in charge of manufacturing for the *Radio Corporation of America*, came to *John Meck Industries* from *Sprague Electric Company* of North Adams, Massachusetts where he was in charge of all operations including special tool design, machine shop and production.

The company manufactures a line of home receivers.

* * *

SCOTT RADIO LABORATORIES, INC., held a preview of their new *Scott Video*, for the benefit of their dealers and the press at the Knickerbocker Hotel in Chicago recently.

A telecast of the Chicago Blackhawks-New York Rangers hockey game was the "feature" attraction of the evening with a special message to *Scott* dealers preceding the regular program.

The new *Scott Video* has been engineered to provide a direct-view 8x10 inch black and white image from the 12 inch cathode-ray tube. The new television unit is housed in a separate cabinet which is designed to be connected to either the present *Scott* chassis or the "Phantom," "Philharmonic," "Laureate" or the instrument of *Scott* prewar manufacture.

All of the video controls are on the television unit while the audio controls are on the regular *Scott* receiver. Magnetic focusing is employed and operates automatically once the installation is made. A brightness control is provided in addition to a touch tuning meter with needle indication to facilitate precise station settings.

-30-

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Technical BOOKS

"PRACTICAL ELECTRICAL MATHEMATICS" by W. E. Rasch. Published by *D. C. Heath and Company*, Boston. 355 pages. Price \$2.00.

While this text is designed primarily for the electrician, much of the material contained in the book is basic and applicable both to the radioman and those working entirely in the electrical field.

The author, an instructor in the Electrical Department of Washburne Trade School in Chicago, has not assumed a knowledge of mathematics on the part of the student over and above the study of arithmetic. From this point the author has proceeded with his exposé of "electrical mathematics" in easy progression, introducing only necessary mathematical techniques when they are needed.

In order to assist the students who use this text, presumably apprentice electricians and journeymen, the problems which appear at the end of each chapter deal with some phase of electrical work which the student may encounter on the job.

* * *

"RADIO OPERATING QUESTIONS AND ANSWERS" by Arthur R. Nilson & J. L. Hornung. Published by *McGraw-Hill Book Company*, New York. 409 pages. Price \$3.50.

The new and eighth edition of this practical handbook contains several innovations which should be of interest to those preparing to take FCC examinations for commercial or broadcast licenses.

This eighth edition has been revised to conform with new and altered FCC regulations and expanded to include newly added material. In addition, the new American Standards Association approved symbols for radio, telephone, telegraph and electronics circuits have been adopted and used.

Because of the particular makeup of the book, with the answers directly following the stated question, this text should prove to be invaluable to radio operators preparing for their license examinations. No attempt has been made to cover the over 1300 questions which might be asked on the licensing examination, but a sufficient cross-section is given to permit the student to determine just what sections might prove to be a stumbling block.

* * *

"PROFESSIONAL RADIO WRITING" by Albert R. Crews. Published by *Houghton Mifflin Company*, Boston. 463 pages. Price \$4.00.

Although most of our readers are not interested in the professional side of radio programming, we would like to call to their attention, from time to time, noteworthy books dealing with this phase of the broadcast industry.

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This book should be of value to the writer who wishes to embrace radio as offering a vast audience for his talents.

-30-

144 mc. Handie Talkie

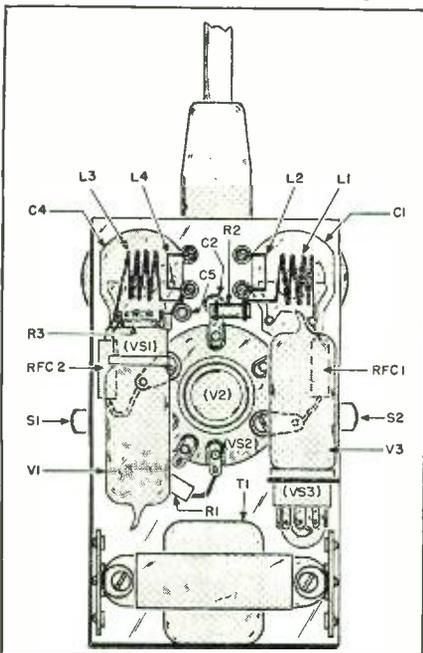
(Continued from page 55)

proximately 8" long. The next section is telescoped down to its normal position and the remainder sticking out from the bottom section is cut off. The same is done with the third section. The modified antenna when fully extended should be approximately 21" long. A $\frac{1}{4}$ wavelength antenna for the 144 mc. band would be close to 18". The other 3" are used inside the case for support.

A brass plug is turned down on a lathe to fit into the bottom section of the antenna. A shoulder on the plug provides a stop when the antenna is extended. A small groove is also turned on the plug providing a detent for the antenna contact spring. This spring contact is made from a piece of spring bronze and a small V is bent in one end. The vertex of the V rides in the plug groove and holds the antenna extended as well as providing the antenna connection.

The current drain from the filament circuit is 100 ma. in either transmit or receive. The "B" battery drain is approximately 6 ma. on receive and 15 on transmit. At a distance of 8 to 10 miles, two-way com-

Fig. 6. Mechanical layout shows front of chassis assembly of various component parts. Code numbers refer to the schematic diagram illustrated in Fig. 2.



February, 1947

THAT VERSATILE TYPE "K" SERIES



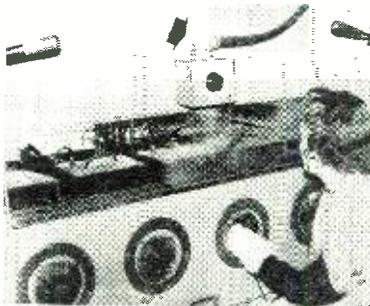
Cannon Electric type K-32SL Receptacle on Collins' "180K-1" Antenna Loading Unit.

TYPE
K-32SL



Mounting
Receptacle

Type "K" Receptacles are available in nine sizes & three styles. K-32SL Mounting Receptacle shown above has a wider flange than K-32S, and is adaptable for pin inserts only. Type RK-31SL carries socket insert assemblies only. Shell material is light-weight aluminum alloy.



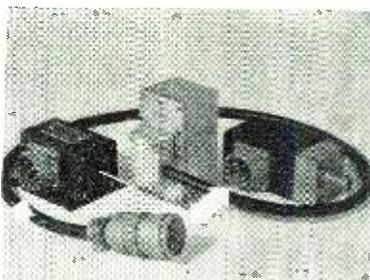
Cannon Electric Type K-23 Angle 90° Plug on testing equipment.

Type
K-23



Angle
90°
Plug

There are two angle 90° plug styles in the Type "K" Series: K-23 shown above and "RK-24" which carries pin insert assemblies only. K-23 carries socket insert assemblies only. Split shell construction makes possible easy inspection and soldering operations.



Cannon Electric K-22C; K-32SL. Statham Laboratories' Dynamometer, Accelerometer and Pressure Transmitter.

Type
RK-22



Straight
Plug

Three types of straight plugs are available in the "K" series: "RK-22" shown above, having pin insert assembly; "K-21" with socket insert assembly, and K-22 which has no coupling nut and is used almost exclusively for extension cable use. Both Straight and Angle 90° styles are available with integral cable clamps and are designated by adding "C" to the number, as "K-21C".

Also available in the "K" and "RK" Series are Straight Junction Shells, Angle 90° Junction Shells, Dummy Receptacles and Dust Caps.

For complete information on this connector series, write for the Cannon Electric Type "K" Bulletin. Prices are quoted on specific assemblies by factory or representatives. No price list is available. Address Department B-228.



CANNON ELECTRIC DEVELOPMENT COMPANY

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Frequency Converter

(Continued from page 39)

generated will appear every 50 kc. throughout the radio spectrum, several of which can suitably be used as *intermediate frequency*. This then would provide a harmonic in the vicinity of 550 kc. which would be the logical one to accept, inasmuch as it is the closest harmonic (within the b.c. band) to the fundamental frequency.

There are several advantages aside from economy to be gained by the use of a converter of this type. Selectivity, sensitivity, and signal to noise (hiss) ratio are improved; there are no "images" and both AM and FM signals can be received.

While the purpose of this article is to pass on to the hams, the idea in its simplest, basic form, where its intended use is for 144 mc. and higher frequencies, many worthwhile improvements are envisioned and being worked on (i.e. r.f. stage, separate quench osc., etc.) which will, it is expected, adapt the converter to use on *any* of the higher frequencies and provide good reception even in crowded communities, without the disadvantage of receiver radiation.

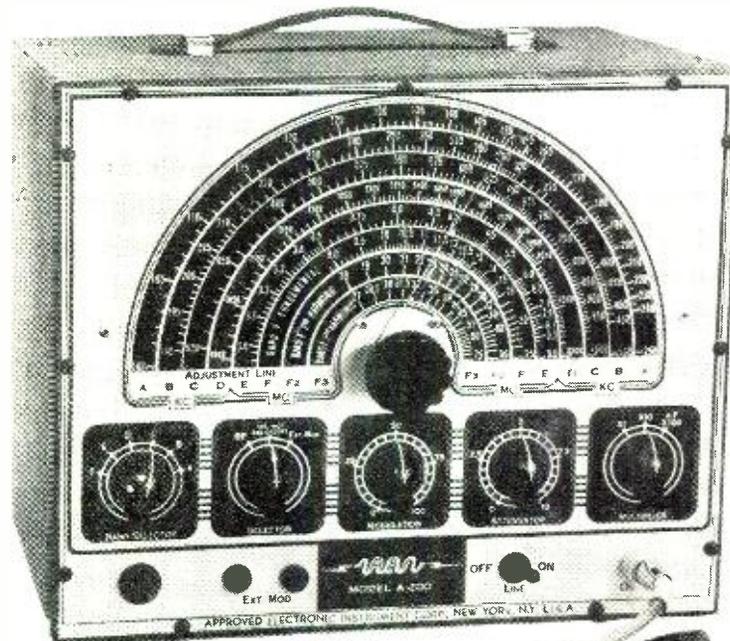
Construction

As can be seen in Fig. 2, the circuit is that of a conventional self-quench superregenerator, with several improvements to adapt it for use as a converter. The complete unit is housed in a metal box measuring 3" x 4" x 5". With the exception of the cable leads and shielded output lead which are mounted on the right hand side of the case, and the antenna pickup insulators which are mounted on the left hand side of the case, all parts are rigidly mounted on the panel itself. Due to the compact size of the unit, short leads are almost a necessity. The wiring itself is conventional and will not be elaborated on here, except for several details. The antenna coupling lead from the shielded cable inside the case should be a self-supporting solid wire (#14) which is not connected physically but is placed in close proximity to the coil near the plate end. This can be moved closer to or farther away from the coil to achieve the best possible coupling. One other thing which may be done to improve operation is to experiment with various values of C_2 and R_1 . Those values shown in the diagram were found to work best in the original set.

The receiver which is to be used with the converter can be equipped with a cable adaptor at the antenna lead to use the cable connector on the converter's output. Also the plug on the power supply cable can be whatever the builder desires to use. In the model unit an octal base was used. One other thing that deserves mention is the pilot light, which can be seen just below the small vernier dial, and which is a valuable addition, since it readily indicates when the converter

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Frequency range: 100 KC to 25 MC in 6 bands of fundamentals and 18 to 75 MC in 2 bands of harmonics of the 9 to 25 MC band. Entirely new in circuit design, consists of four components: RF oscillator, cathode follower, audio oscillator, and power supply.

The RF oscillator is a multivibrator type, with tuning coil and condenser coupled to the output of the oscillator, and fed to grid of cathode follower. This method of tuning does not load the oscillator and provides extremely high frequency stability. AF oscillator is resistance-capacitance fixed frequency type giving 440 cycle/sec. note which is fed into grid of cathode follower, through modulation control and selector switch.

Output attenuator and multiplier is in cathode circuit of the cathode follower, and varying these controls has no effect on either the RF or AF oscillators, thus adding still higher frequency stability. Conventional power supply operating on 117 volts 60 cycles. Complete with tubes, instruction manual, and coaxial output cable. Order today for shipment tomorrow. Use convenient coupon below.

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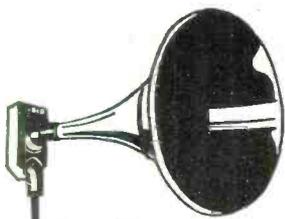
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The compressed air supply comes from a motor or gas-engine unit or from any other available source. For portable use, the gas-engine compressor also supplies the 110-volt A.C. for the amplifier.

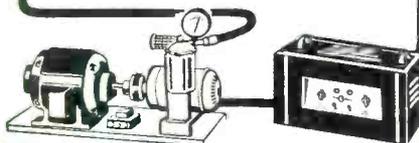
A special amplifier has been designed to match the VOCAL-AIRE driver unit. The impedance of the driver varies with the frequency of the signal and the VOCAL-AIRE amplifier matches this condition to achieve peak efficiency.

The coverage of these speakers may be hard to accept—but two drivers, each driving a pair of horns, cover the Yale Bowl which is 900' long, 500' wide and seats 75,000 persons. Two 20-watt amplifiers in cascade are all that is needed, one amplifier for each driver unit.

The compressor can be switched on and off remotely, from mike or amplifier... or a switch at the mike may be used to control plate voltage for stand-by.

Servicemen: If you haven't read up on air column speakers, we'll be glad to send you literature describing our system and if you have occasion to service our equipment, a request on your business stationery will bring you a free copy of our Service Manual.

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(Numerical Example)
Strongest Harmonics 50 Kc. Fundamental Freq.

Spacing of Harmonics—50 Kc.
100 Kc.*
150 Kc.*
200 Kc.*
250 Kc.*
300 Kc.*
350 Kc.*
400 Kc.*
450 Kc.*
500 Kc.*
550 Kc.*
600 Kc.
650 Kc.
700 Kc.
750 Kc.
800 Kc., Etc.**

The fundamental frequency and the spacing between the harmonics is determined by the quench frequency.
* Can be used as Intermediate Frequency.
** Harmonics continue up thru the radio frequency spectrum.

Table 1. Numerical example of the various harmonics that are produced by superregenerative frequency converter.

is in use. This is connected in parallel with the tube's heater.

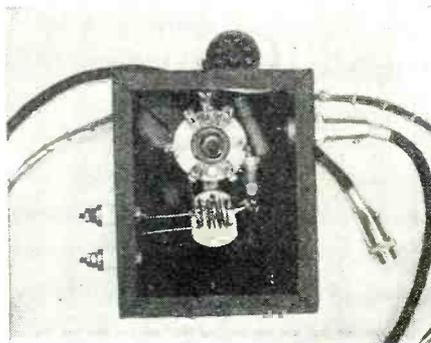
Operation

Operation of the unit is quite similar to a conventional superregen receiver with one exception: due to its exacting control over the plate voltage, the regeneration control will cause regeneration for only 4 or 5 points of the tuning dial at any one setting of the control; and as the tuning dial is adjusted, the regen control must also be adjusted simultaneously, for maximum results. When operating properly, the signals received will be of good clarity, free from the usual side band hisses, and of a quality not usually expected of the superregenerative receiver, whether the signals being received are AM or FM. Needless to say, the results that can be obtained far outweigh the nominal cost of the unit.

At the present time, a new unit, incorporating some of the improvements as suggested above, is in the construction stage, which it is hoped, will eliminate radiation, reduce the critical adjustment on the regen control, and otherwise improve the unit here described.

-30-

Fig. 3. Under chassis view of frequency converter shows simplicity of wiring.



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Capacity Operated Relays

(Continued from page 51)

changes in the order of 1.5: 1 to 3: 1 are obtainable as C is tuned through resonance. In general the magnitude of current change is insufficient and the slope of the plate current-sensing capacitance curve is too low to provide optimum sensitivity and snappy action of the relay.

In Fig. 2B it is possible to visualize that portion of the circuit comprising the battery, relay and terminals A and B , as a series circuit in which the phantom resistance subtended across terminals A and B is a function of the condition of resonance or anti-resonance between the LC load and the source of r.f. The resistance across A and B may be called the "control resistance," inasmuch as it will vary according to the magnitude or character of the capacitance change exhibited by sensing capacitor C . As explained above, however, the change in control resistance AB , as occasioned by change in sensing capacitor C , is insufficient.

Therefore, in Fig. 2C there is shown, in series with the battery, relay and control resistance R , a negative resistance R , the value of which may be caused to vary with the control resistance. When the series circuit current through the relay is maximum, due to minimum control resistance, concomittantly the resistance of R is minimum. When the series circuit current through the relay is minimum, due to maximum control resistance, concomittantly the resistance of R is maximum. While this negative resistance R might be a resistor, Fig. 5 illustrates the complete schematic diagram of a capacity-operated relay in which R consists of vacuum tubes V_1 and V_2 . Fig. 4 illustrates that a current change through the relay of 10: 1 may be attained. Where desirable, even greater ratios are possible with more care in circuit design.

In connection with Fig. 5, there is shown a sensing element comprising an LC circuit link-coupled to the tank circuit of a shunt-fed 10 megacycle Hartley oscillator employing the tetrode section of a 117L7GT tube V . It will be noted that the anode-cathode terminals of the oscillator tube V are connected in series with the relay field coil, the source of direct current and the anode-cathode terminals of the tetrode section of another 117L7GT tube V_2 . V_2 , in combination with the 12SF5 tube V_1 , comprises the essentials of the negative resistance R . The diode sections of both 117L7GT tubes cooperate to produce approximately 280 volts d.c. from the power mains. The functioning of the composite circuit may be explained by following through one cycle of operation.

With the sensing capacitor C tuned off-resonance, the oscillator tank im-

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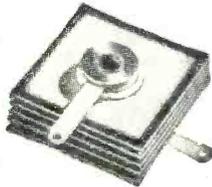
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pedance is relatively high and the series circuit current is minimum. The voltage drop across the field coil of the relay is low and, hence, the grid bias on V_1 is minimum, resulting in maximum plate current flow through the 1 megohm resistor and a high grid bias on tube V_2 . Tube V_2 therefore exhibits a high plate resistance, such that the plate potential on oscillator tube V is approximately 50 volts. In the circuit shown, the oscillator plate current is approximately 2 milliamperes in this condition.

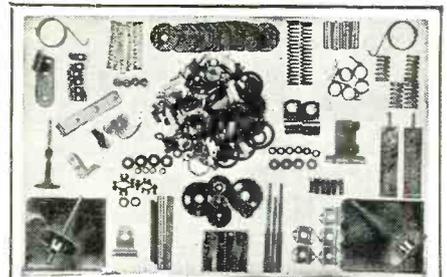
A suitable sensing element for link coupling to the capacity-operated relay may be constructed as shown in Fig. 2D. The coil and padding condenser are mounted inside a shield housing box, to which is attached the coaxial sensing condenser. The thin brass flange on the base of the condenser tube forms the "grounded" plate; and the thin brass disc on the supporting rod, which is electrically connected to the "hot" end of the coil and padding condenser stator, forms the "hot" plate of the sensing capacitor. The sensitivity of the sensing capacitor may be increased by increasing the diameter, and hence area, of the flange and disc.

When this apparatus is link coupled to the oscillator, adjustment of the padding condenser it will cause the relay to pull in. As an object approaches the sensing capacitor, detuning the sensing circuit, the relay will fall out. Link lines up to 50 feet in length have been successfully used.

As the sensing capacitor approaches resonance, the oscillator tank impedance begins to drop to a lower value, increasing the series circuit current. The voltage drop across the relay field coil and, hence, the bias on V_1 (Fig. 5) increases. This action, in reducing the plate current of V_1 and the bias on V_2 , results in a lowered V_2 plate resistance. The oscillator plate voltage and the series circuit current increase in a cumulative, or somewhat regenerative, fashion to a sharp maximum, resulting in snappy relay action. The oscillator plate current is approximately 20 milliamperes in this condition.

With the above-described capacity-operated relay several other types of sensing elements have been employed. For the lower frequencies where appreciable inductance is required for resonance, the types shown in Fig. 3A are feasible. The inside diameter of the outer tube should be enough greater than the coil diameter to reduce distributed capacitance, minimize resistance losses and permit reasonable circuit "Q." The illustrated coaxial type sensing elements were designed for experimental use in detecting the approach of a liquid, without physical contact, as it rose in a storage tank.

If higher operating frequencies are used, the coaxial types illustrated in Fig. 3B are applicable. These may be regarded as sections of coaxial line, somewhat shorter than an odd mul-



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multiple of $\frac{1}{4}$ wavelengths and terminated in the coaxial sensing capacitor. Both types may be end-sealed with a low loss dielectric material if necessary.

It is well to bring out that capacity sensing circuits of the type specifically described may be termed "capacity sensing" not alone by virtue of their sensibility to variations in the spacing of capacitor plates, but also because of their sensibility to variations in the properties of the dielectric material surrounding them. As stated previously, the magnitude of the resistance which an LC sensing element reflects to the tank circuit of its exciting source is determined largely by the resistance of the coil plus the effective resistance of the capacitor dielectric.

As illustrated in Fig. 2A, the sensing capacitor may be represented by a perfect condenser C paralleled by a resistance R_p , representing the "leaky" dielectric. The power factor of the dielectric material is related to R_p according to the following notation: Power factor = cosine θ = sine (90 - θ)

But for small angles:

Sine (90 - θ) = tangent (90 - θ)

Hence, p.f. (power factor) = tangent

$$(90 - \theta) = \frac{I_r}{I_c}$$

$$\text{But } I_r = \frac{E}{R_p} \text{ and } I_c = \frac{E}{X_c}$$

$$\text{p.f.} = \frac{X_c}{R_p} \quad R_p = \frac{X_c}{\text{p.f.}}$$

The resistance R_p combines with the resistance of the coil in the sensing unit to determine the magnitude of the resistance reflected to the tank circuit of the driving source at resonance. In the experimental work with the relay illustrated in Fig. 5 it was noted that, in certain cases, shunting the LC sensing circuit with a resistance increased the change in oscillator tank circuit impedance as indicated by the plate current of tube V.

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-50-

Transmission Lines

(Continued from page 46)

Such a solution does exist in the form of a quarter-wave matching transformer. For if a cable is exactly a quarter of a wavelength long, and if its characteristic impedance is:

$$Z_0 = \sqrt{Z_r Z_i}$$

where:

Z_0 is the characteristic impedance of the matching cable

Z_r is the impedance at output end of matching cable

Z_i is the impedance at input end of matching cable,

then the input is perfectly matched to the output. For instance, in the example cited under antenna mismatching, where the antenna impedance was 100 ohms and the receiver input 300 ohms, if a quarter-wave line whose characteristic impedance is:

$$\sqrt{100 \times 300} = 170 \text{ ohms (approx.)}$$

is connected in the circuit as shown in Fig. 4, then the antenna will be matched to the receiver. Fig. 5 is a

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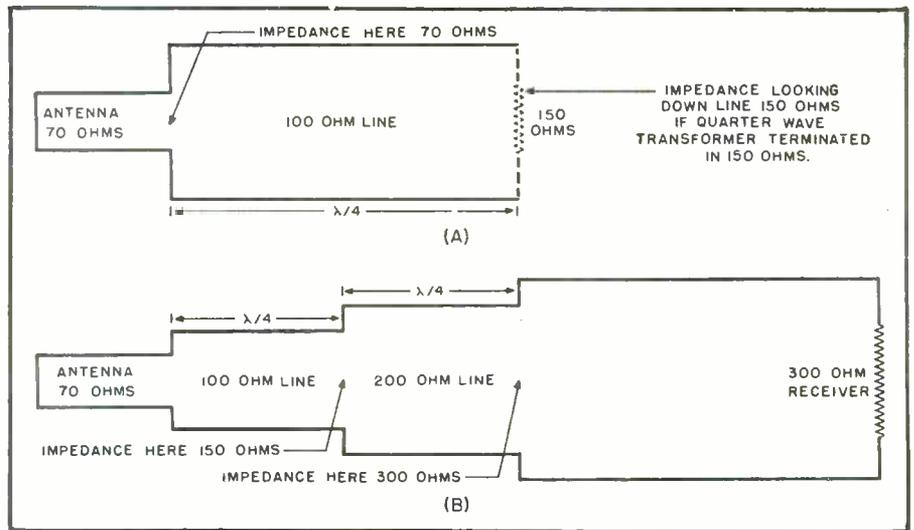


Fig. 6. (A). Stepping up antenna impedance to 150 ohms. (B). Matching a 70-ohm antenna to a 300-ohm receiver via two quarter-wave transformers.

nomograph whereby the characteristic impedance of the matching section can be calculated utilizing nothing more than a straight edge.

A quarter-wave transformer, however, has one serious disadvantage in that the line can be exactly a quarter of a wavelength long for only one frequency and not for any other. The receiver, on the other hand, must be capable of receiving all frequencies in the FM band (in the case of FM)—88 to 108 megacycles—whose quarter wavelengths then vary from 33 inches to 27 inches. The solution to this problem is usually in the form of a compromise. For instance if there are two stations of equal signal strength, one operating at 88 mc. and the other at 108 mc., a 30 inch quarter-wave line would be used. 30 inches is, of course, the mean value between 33 and 27 inches—the respective quarter wavelengths of the two frequencies involved.

If the matching ratio (ratio of output to input impedances) is not much over 2 then the fact that the line is 10 per-cent above or below a quarter of a wavelength is not too serious. Of course the line could be made more or less than 30 inches when it is desirable to favor certain stations or frequency bands.

When the matching ratio is higher, and the matching section must pass a wide band (88-108 mc.), then it is necessary to use two matching cables. In effect, the impedance is raised or lowered in steps. For example assume a 70 ohm antenna must be matched to a 300 ohm receiver. First we calculate, by use of the nomograph (Fig. 5), the characteristic im-

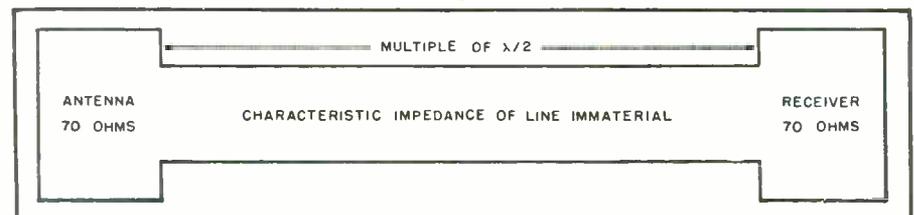
pedance of a quarter-wave transformer that will raise the antenna impedance to 150 ohms. Place a straight edge at Z_s equal to 150 and run it through Z_r equal to 70. Z_o is seen to be equal to 102 ohms. With a 100 ohm quarter-wave cable connected up as shown on Fig. 6A, the receiver now "sees" the antenna as a 150 ohm impedance. Now run a straight edge between Z_s equal to 300 and Z_r equal to 150, and the characteristic impedance of the second quarter-wave transformer comes out about 200 ohms. The two matching sections are then hooked up as shown on Fig. 6B and as a result a good, wider band match is accomplished between antenna and receiver.

There are some important precautions that must be observed in making quarter-wave transformers. In the first place, the connector length should be taken into consideration when calculating the necessary cable length. If a 30 inch line is desired, and the connector is 1 inch long, then the cable should be only 29 inches. Secondly, as just indicated, the connector is a part of the transmission line system and therefore should have the right characteristic impedance. For this reason not any connector can be used but only one which has been designed for high frequency cables. In addition, great care should be exercised when soldering the connector to make sure that a good connection exists and that no excess solder is present; otherwise the circuit may be mistuned.

Half-Wave Matching Lines

The other source of mismatch is between transmission line and receiver

Fig. 7. Method of eliminating the necessity of matching to line via a half-wave line.



and this too can be corrected by means of a simple circuit. If the length of the cable between antenna and receiver is exactly a half a wavelength long or a multiple of half wavelengths long, as shown on Fig. 7, then it does not matter what the characteristic impedance of the line is. Here again the problem of passing a wide band of frequencies occurs though it is not too critical in the FM band. The serviceman can learn the exact limitations of these matching networks only via the trial and error method.

Installing an Antenna

One of the features of FM receiving equipment is the fact that beyond a certain threshold value of signal input, additional signal has virtually no effect on the output. In other words, if the threshold signal input voltage is 3 microvolts, it will make virtually no difference at all as far as the operation of the receiver is concerned, whether a 3 or 33 microvolt signal is received. For this reason it is just a waste of energy to develop a highly efficient transmission line system which gives a signal that is far above the threshold value. Actually the antenna should deliver just enough signal so that it will be safely above the threshold value at all times.

The first step is, therefore, to determine the threshold value of the receiver. This can be done with the help of a signal generator. Then using any transmission line setup that is handy and whose constants are known, measure the input signal of a reference station. (Each serviceman should have a reference station, that is, one station about which he can say, "When I obtain 5 microvolts signal from WXYZ then I know that all the other stations are being received all right.") Compare this measured signal with that of the desired signal in terms of db. For example, if the signal that is measured is 1 microvolt and you need 5 microvolts to assure good reception, you must improve the transmission line system by 13.8 db.

A good method of summarizing the facts presented in this article might be to work out a typical antenna installation problem. Let's assume these facts.

A signal of 1 microvolt is measured when a dipole antenna is connected to a receiver through 2 feet of cable. (Because of the short length of cable there is no power loss due to the attenuation of the cable. The receiver is in the room where it will be permanently located. A signal of 5 microvolts is necessary before the receiver can be considered to be operating properly. As previously shown this means the transmission line system must be improved by 13.8 db. The other pertinent characteristics are:

- Receiver input 150 ohms
- Antenna impedance 73 ohms
- Cable characteristic impedance 300 ohms
- Cable attenuation 6 db. 100 ft.

The first step is to locate a position for the antenna where the most sig-

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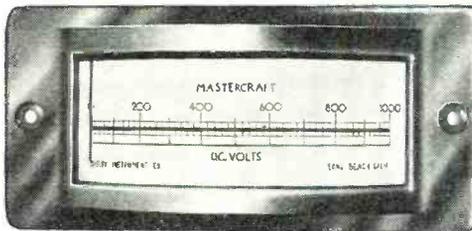
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nal exists. This can be done by the use of either a field strength meter, or by carrying the entire setup to different locations. The best location would probably be on the roof. When determining the best location for the antenna be sure to consider the length of the transmission line necessary to carry the signal into the receiver. For instance, a 2 db. advantage is obtained by moving the antenna 100 feet. But an additional 100 feet of cable results in an additional 6 db. loss due to the cable attenuation. Therefore we gain nothing by using this location—in fact we lose 4 db. of signal.

By locating the antenna on the roof we obtain, in this example, a 17 db. improvement in signal voltage. However the signal must now be transmitted through 100 feet of cable. The total attenuation of the cable is 6.5 db. per 100 feet due to the fact that there is a 2:1 standing wave ratio. The net gain is therefore only 10.5 db. This is not sufficient, so the next step is to obtain a better transmission line. A 4 db. per 100 feet—150 ohm line will increase the gain of the system to 13.0 db. The additional .8 db. necessary to give the desired signal voltage can be obtained by use of a 100 ohm quarter-wave transformer to correct the antenna mismatch. If more signal was necessary the serviceman might have to find a higher gain antenna or a lower loss cable.

The author hopes that with this article as a background the serviceman will be able to intelligently select the cables he requires by examining their characteristics. In general since dipoles are used for most FM and television home installations, the only type of transmission line that is used

is balanced lines. However, coaxial lines can be used as quarter-wave lines if desired.

There are two types of balanced lines—the less expensive unshielded, untwisted type and the more costly shielded or twisted line. Shielding or twisting the cable improves the signal-to-noise ratio only in areas where there is an abnormal amount of extraneous noises such as in automobiles, but otherwise it does not offer any other advantages.

-30-

Distortion Analyzer

(Continued from page 61)

than .25 volts, connect to the input binding posts and rotate the gain control for maximum. If the 10,000 ohm calibrating resistor fails to cause 100 microamperes deflection when 1 volt is applied to the grid of the 6SR7, it may become necessary to increase or decrease the value of the 82,000 ohm diode load resistor. Sufficient diode load resistance must be maintained to offset the internal resistance of the diode rectifier. When this is accomplished, the voltmeter scale will be linear. When the selector switch is placed in the 100 volt position voltage is read direct. When the switch is in the 10 volt position simply divide all readings by 10. When the selector switch is in the 1 volt position, divide all readings by 100. When the switch is placed in the .25 volt position, divide all readings by 4 and 100.

An error of 2% between scale readings will cause an error in distortion measurements of .2%, which is not serious. The values of inductance and

One of the features of the new Sylvania Lighting Center is the television receiver of unusual design which was engineered to provide video reception to any part of the living room. The special screen, which can be rotated from side to side, to a 180 degree angle or up and down to suit viewing conditions, was built around the 10-inch cathode-ray receiving tubes manufactured by the company. Although this receiver is not in production it illustrates a trend in modern design.

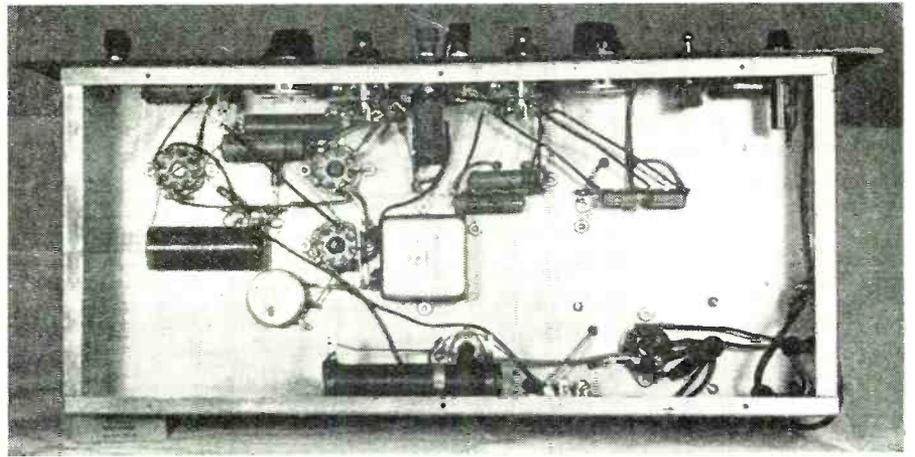


capacity for the filters can be determined quite easily with a reactance slide rule. The use of filter chokes is permissible for this application.

If it becomes desirable to use other than 400 or 1000 cycle filters or a different value of inductance, the following procedure is recommended. The value of inductance must be known. The design of the 1000 cycle filter is as follows. The reactance of 10 henries at 1000 cycles is approximately 65,000 ohms. A condenser reactance corresponding to this is .0025 μ f. Therefore, connect two .005 condensers in series giving a shunting capacity of .0025 and a center tap. If other frequencies or additional frequencies are desired, use the above procedure and simply use additional switch contacts and filter components. This filter network is capable of 60 db. of attenuation which, for all practical purposes, cancels the fundamental.

Distortion Analyzer Operation

Connect the input terminals to the voltage source to be analyzed. Place the frequency selector switch in the 400 cycle position. Place the "in-out" switch to "in" position. Place the vacuum tube voltmeter switch in the 10 volt position. Adjust the input gain control for full scale deflection on the 100 microampere meter. An audio oscillator having less than 1% distortion is connected to the input of the amplifier to be analyzed. The output of this oscillator should be adjusted



Under chassis view of completed instrument shows simplicity of wiring.

for normal input voltages of the amplifier to be analyzed.

Next, throw the "in-out" switch to the "out" position. Adjust the audio frequency oscillator for a minimum reading indicated by the microampere meter, at the same time adjusting the 150,000 ohm variable filter resistor. Vary the frequency of the oscillator at the same time for minimum, making the final adjustment with the 10,000 ohm variable resistor in the filter network. If the distortion is less than one volt, which would be 10%, then rotate the vacuum tube voltmeter switch to the 1 volt position. This scale reading will indicate 10% full scale.

Final adjustment should be made on this scale, and the frequency adjustment of the oscillator and the filter resistor will become quite critical. Since the input was readjusted for 10 volts, any voltage reading in the output can be read as direct harmonic distortion. Next, rotate the frequency selector switch to 1000 cycles and repeat the above procedure, changing the frequency of the audio oscillator to approximately 1000 cycles. By checking the distortion of an amplifier at several levels, it is possible to indicate the overload point of the amplifier.

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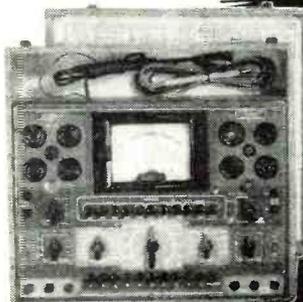
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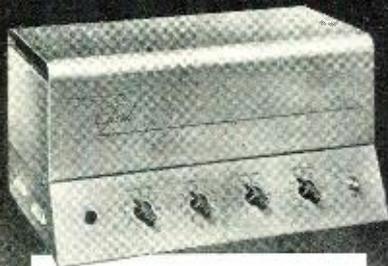
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the same type. The error between the two pieces of equipment was .2%. At one level the commercial equipment read .2% less and at another level of distortion it read .2% plus. We were unable to indicate which instrument was in error since the percentage was so small.

Before making any distortion measurements, it is advisable to check the distortion content of the audio oscillator to be used. If distortion is indicated, this percentage of distortion should be subtracted from any distortion measurements made using this oscillator. Oscillators having a distortion content in excess of 1% will produce quantitative measurements rather than qualitative. If the operator is simply reducing the distortion content of an amplifier, having a small amount of distortion in the audio oscillator it creates no particular problem. If actual distortion measurements are required, such an oscillator would not be satisfactory.

Those not familiar with distortion measuring equipment are apt to consider such equipment complicated devices that only the best of laboratories would attempt to construct. The author finds that many engineers using distortion measuring equipment seldom take the time to understand how it operates. Consequently, few engineers consider building a simple piece of equipment which can become practically worth its weight in gold in analyzing certain problems that are encountered almost daily.

Actually, the construction and operation of such a piece of equipment is relatively simple. The parts used in the construction of this distortion analyzer can be found in many so-called "junk boxes" with, of course, the exception of the 100 microampere meter. After an engineer has used distortion measuring equipment, restricting him from its use would be like removing his right arm. The equipment can become useful without construction in its entirety if a sensitive vacuum tube voltmeter with several ranges is available. Then it only becomes necessary to construct the filters, which consist merely of two potentiometers, a filter choke and two condensers.

Such a filter can be "hay-wired" together in a matter of minutes and prove to be a very desirable unit to have in any laboratory or repair shop. During the war many such filters were constructed and used on production lines, releasing the precision distortion equipment for laboratory use. A few fast measurements soon prove the filter is operating satisfactorily. If a low "Q" inductance is used, a certain amount of attenuation takes place at the harmonic frequencies. By using filter chokes with at least a 50 mil rating, the chances are one hundred to one that the "Q" of the inductance is sufficiently high to cause no difficulty. Of course, if an inductance bridge is available, measuring the "Q" is recommended.

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finds that measuring different output levels will cause the frequency of the filter network to change slightly. This shift does not occur in the equipment described in that the same level of voltage appears at the filters for each measurement since the input gain control is always set for full scale reading of 10 volts before making each measurement. Since the vacuum tube voltmeter is required, the expense of two binding posts makes it available for other type measurements. Some of the uses for the voltmeter are gain per stage measurements, fidelity measurements and all sorts of trouble shooting. The vacuum tube voltmeter circuit lacks frequency discrimination between 15 and 20,000 cycles. No effort was made to indicate the top frequency limits of the circuit. Such a range is satisfactory for all audio measurements.

Mechanical Construction

The panel layout at first glance will lead the reader to believe that operation of this equipment is quite complicated. Actually, distortion measurements are easily made in a matter of seconds. Precise adjustment is required but in no way difficult to make. The input binding posts are to the left of the panel. The input gain control is next with the vacuum tube voltmeter selector switch near the center. The "in-out" switch is located in the center connected in such a way that the toggle points toward the input binding posts when it is in the "in" position.

The filter selector switch is next followed by the coarse and fine adjustment controls. The power switch panel light and fuse complete the layout. The tube layout is such that all tubes are near their particular panel controls. The filter inductors are located in the immediate vicinity of the filter selector switch. The power supply is at the rear of the chassis to eliminate the possibility of hum pickup.

Selection of the chokes was determined by the availability of material. The filter choke should be at least 10 henries and the bridged-T inductors should be approximately 10 henries. If it becomes necessary to use more or less inductance for these filters, the condensers must be changed correspondingly.

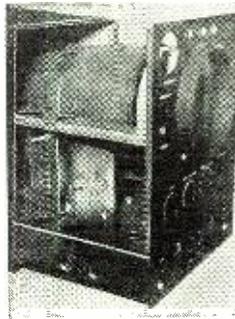
Point-to-point wiring is recommended rather than cabling, since such wiring reduces the possibility of stray pickup. The tube layout is such that individual shielding of parts is not necessary. A small receiver power transformer may be used, but the use of a voltage divider will undoubtedly be required, since the actual power consumption of this equipment is only a few mills. The voltage divider should be adjusted to approximately 200 volts. A 2 μ f. condenser is used as coupling between the plate of the 6SR7 and the plates of the 6H6, since this is actually a power detector.

A phone jack is connected between the 6H6 plates and ground, and as it becomes desirable to use this circuit as

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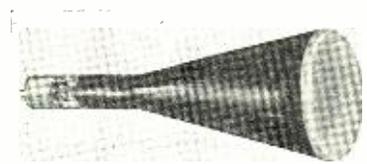
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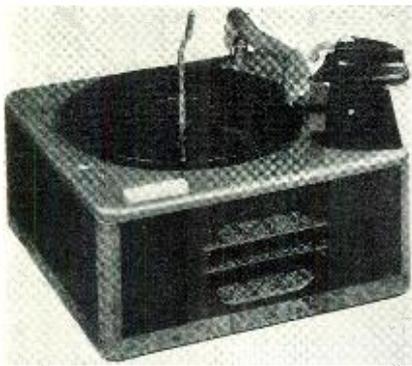
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a voltage amplifier, simply plug high impedance headphones into this jack. The use of the headphones will cause the vacuum tube voltmeter to read in error. Headphones should not be connected when the equipment is used as a vacuum tube voltmeter or a distortion analyzer.

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-30-

Great Lakes Radar

(Continued from page 38)

an alternating current power supply of 115 volts and 60 cycles, principally. For vessels where primary power is d.c., a suitable motor-generator set is used. A detachable viewing hood is provided to aid in observing the scope under unfavorable light conditions.

One fundamental difference among the various sets is found in the operating frequencies. Four (*Radiomarine, Sperry, Westinghouse, and Western Electric*) are built to operate on the "X" band or three cm. wavelength. The *Raytheon* and *GE* models operate on the "S" band, with a 10 cm. wavelength.

Supporters of the "X" band contend it provides better definition, better azimuth discrimination and hence is better for piloting a ship in close quarters. They also claim it furnishes greater range for a given radar sensitivity. "S" band advocates claim more reliability in bad, rainy weather, and less interference from "sea return."

Determination of which band is superior for operation on the Great Lakes is one of the hoped-for results of the project, although at the time of this writing it has not been decided whether all regularly-installed radar sets on Great Lakes ships will be limited to one band or the other.

Other differences and similarities can be discovered in an examination of some of the different sets (see Table 1).

One of the 10 cm. sets, *Raytheon's "Mariners Pathfinder,"* was installed on the self-unloader bulk freighter *George F. Rand* in August. Operating frequency is 3070 megacycles \pm 50 mc. Range scales are 1.5, 5, 15, and 50 miles. All exposed parts of the set are designed to withstand temperature from -40°C to 60°C . The indicator, housing a seven-inch CRT and mounted on a pedestal, is movable. It can be tilted 45 degrees in a vertical plane and rotated 45 degrees in a horizontal plane.

The transmitter, receiver, modulator and associated components are built in one unit. In the transmitter, pulse

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RADIO NEWS



Antenna unit of the Radiomarine radar installed on top of the pilot house of the "A. H. Ferbert." The 18 inch high parabolic cylinder is constructed of spaced stainless steel rods and rotates at 10 r.p.m. Lower part of antenna assembly includes a driving motor, synchro generator, gearing and the wave guide rotary joint.

rate is 1000 cycles and pulse length is 0.4 microseconds. Peak power output is more than 15 kw. Source of radio frequency, of course, is the magnetron. In the receiver, a 30 megacycle i.f. is used; the r.f. band pass is 3 mc.

The truncated parabolic antenna, 7 feet wide and 18 inches high, is installed on top of the ship's "A" frame, necessitating a waveguide run of approximately 70 feet. Antenna rotation is 7 r.p.m., both clockwise and counter-clockwise. It gives a beam approximately 3.5 degrees at half power points in horizontal plane. In the vertical plane the beam width is about 15 degrees. While proceeding on Lake Erie, gas buoys were observed at ranges of four to five miles. Ships were observed from 20 to 25 miles. A rainstorm, about 10 by 30 miles in area, was picked up and plotted. When the *Rand* entered the storm area, vessels and other targets were accurately observed. In the Detroit River channel, buoys, piers, and even rowboats were detected at limited ranges.

The other 10 cm. set is the *General Electric* "Electronic Navigator" installed on the 8000 ton steamer *E. T. Weir*. It uses a 7-inch PPI, with fixed range scales of 2, 6 and 30 miles. A true or relative bearing can be obtained by direct reading from a movable bearing cursor with respect to a movable azimuth scale.

The 4½ foot high viewing console contains all the radio equipment. Peak power output is the 7 kw. minimum output from the magnetron. Pulse length is 0.5 microseconds maximum, and pulse repetition rate is 1500 cycles per second. This frequency is determined by a blocking oscillator which simultaneously keys the modulator (pliotron tube) and the gate for the sweep generator.

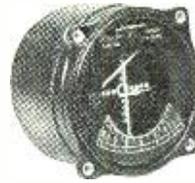
The reflector, a cast aluminum truncated parabola, makes about 11 r.p.m. and gives a beam width of five degrees to the half power points in the hori-

February, 1947

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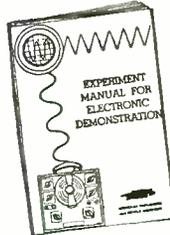
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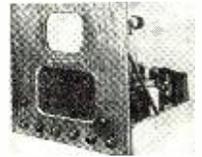
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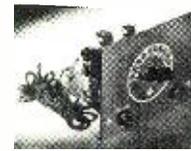
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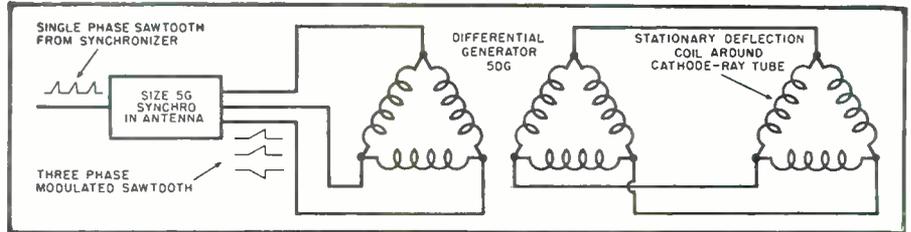
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Cathode-ray tube deflection system of Radiomarine's radar set.

zontal and 17 degrees to the half power points in the vertical.

The *Radiomarine* 3 cm. installation made in September on the *A. H. Ferbert*, operates on a frequency of 9320-9430 megacycles. It consists of three major units: oscilloscope indicator, antenna assembly and transmitter-receiver. A four-foot high indicator cabinet houses a 12-inch cathode ray tube, associated circuits and power supply.

Rotating the CRT's electron beam in synchronism with the rotation of the antenna, for accurate bearing data, is achieved electronically without use of a moving coil. Single phase saw-tooth energy from synchronizer circuits is fed through coaxial cable to a size 5 G Synchro generator located in the antenna assembly, and three-phase modulated saw-tooth waves are produced. This energy then is sent through a 5 DG (differential generator) to a stationary deflection coil around the neck of the CRT, and this coil controls beam rotation. A 5 DG is not required on a ship without gyro compass. Since the differential generator is driven from the gyro compass, a stabilized picture always is obtained, so that "UP" position on the scope always points to North. A true or relative bearing can be obtained by merely flipping a switch, without recalibration.

A gyro repeater scale is mounted at the head of the PPI, to indicate ship's course at all times, whether radar is on or off. Range can be varied from 1½, to 5, 15 and 50 miles.

The transmitter and receiver are built into a rectangular cabinet about five feet high, installed in the wheelhouse. Capable of delivering a peak power output of approximately 30 kw., the transmitter has two sets of pulse rates. For short distance operation, the pulse length is 0.25 microseconds and pulse rate is 3000 cycles. For longer ranges, the pulse length becomes 1 microsecond and the pulse rate 750 cycles.

An 18-inch high parabolic cylinder antenna is constructed of curved, spaced stainless steel rods and rotates at 10 r.p.m. It uses a horn-type feed. Mounted on a standard 16½ inch Navy flange, the lower section of the antenna assembly includes a driving motor, synchro generator, gearing and the wave guide rotary joint.

The *Westinghouse* "X" band set was installed in July aboard the *William G. Mather* while the ship was underway. It gives readings for areas with radii of 2, 8 and 32 miles. On the wheelhouse roof a cut paraboloidal antenna is mounted, in a round plastic

dome on a 5½ foot pedestal. This pedestal also houses the driving a.c. motor, related drive gears and a so-called synchro-tie system to coordinate the circular movement of antenna with rotation of electron beam.

In the weather proof base of the pedestal are the modulator, high voltage power supply, preamplifier and the r.f. head, which includes magnetron oscillator, the synthetic type crystal detector and local oscillator. The r.f. components are mounted in the antenna pedestal to cut possible power attenuation between transmitter and antenna.

The 7-inch PPI scope is mounted on a four-foot high cabinet, on the ship's bridge, called the indicator console. Within this cabinet are the low voltage power supply, the i.f. and video amplifiers and related PPI circuits.

The magnetron is triggered 2000 times a second by the action of a sine wave oscillator, blocking oscillator and thyatron tube, and emits a 0.4 microsecond pulse. Peak power output is more than 15 kw. Conducted by a horn-type wave guide to the radiator, the signal is sent out in a vertical fan pattern, two degrees wide horizontally and about 15° vertically. The radiator rotates at 12 r.p.m.

In the receiver, a constant i.f. signal of 60 megacycles is provided by action of a klystron local oscillator.

The *Sperry* 3 cm. set was installed on the *Frank Armstrong* in August, on a trip from Cleveland. It consists of an antenna assembly, viewing binnacle and transceiver unit which contains transmitter and receiver. Three internally-adjustable ranges can be set up on the 12-inch PPI; the first, from 100 yards to 2.5 miles, second, 500 yards to 6-12 miles, third, 1 mile to 20-40 miles.

Fixed electronic range markers, appearing at regular intervals, are provided for each scale; in addition there is a variable marker. Range at this marker can be read to the nearest 100 yards directly from a counter. To permit clearer definition of close targets, the ship's own position indicator at the center of the scope can be expanded.

This set can also be used in conjunction with the Coast Guard radar beacons, or racons, originally designed for aircraft navigation. By turning a control switch, the operator can bring in only signals from a beacon. These appear now as a series of short lines, coded to indicate the particular beacon. Provision is made so that the set will be able to operate with the new beacons designed for marine use.

Pulse width is 0.25 microseconds and 1000 cycles a second for radar; 2 microseconds and 400 cycles per second for beacon operation. Peak power output is 35 kw. The parabolic cylinder reflector, four feet wide and 18 inches high emits a beam 2 degrees or less in the horizontal plane, and more than 15 degrees in the vertical plane. It rotates at 15 r.p.m.

Last of the 3 cm. sets is the *Western Electric* radar which actually was the first of the six to be installed. Just before it went into operation aboard the *John T. Hutchison* a "Miss Radar of the Great Lakes" christened the antenna with a bottle containing water from all of the Lakes.

The installation consists of three basic units: the antenna on the pilot house, the indicator cabinet inside the pilot house, and the transmitter-receiver and synchronizer cabinets in the chart room.

Pulse length of the transmitted signal is of 0.5 microsecond duration and a frequency of 1000 cycles per second. The truncated parabolic antenna, made of laminated aluminum, turns at 12 r.p.m. It emits a beam pattern 15 degrees in the vertical plane and two degrees in the horizontal. The range scale is variable and can be adjusted to cover an area with a radius from one to 40 miles.

Because of delays in installation of some of the sets the operational phase of the research project will extend into the early part of the 1947 ship-

ping season, according to C. M. Jansky, the electronics engineer who heads the project committee. For this reason recommended standards for future sets will not be issued until later this year.

General reports have indicated that the sets have worked well. Ship personnel have caught on to radar quickly and are enthusiastic about its effectiveness. In one period when traffic approaching the St. Mary's River below the Sault locks was stalemated because of fog, two of the six radar-equipped ships were able to proceed straight to the locks and continue on their way. A performance like that is the best salesman radar can have.

To simplify the task of observing the PPI picture in coincidence with navigation charts, two methods have been developed and are under consideration for future addition to the equipment. One will be to project a microfilm of a radar-piloting chart on the PPI screen; the other is to superimpose the scope picture directly on a navigation chart by means of a reflectoscope or similar device.

In addition to its value for close range navigation, radar's ability to gather long-range information is expected to be helpful in expediting ship movements under the rapidly-changing weather conditions found on the Lakes.

Ship operators predict a brilliant career for radar in one of its first and biggest peacetime assignments.

In the words of Captain C. O. Rydholm, marine superintendent of the Cleveland-Cliffs Iron Company, which is a member of the Lake Carriers Association: "We believe radar will enable us to move cargoes with maximum speed, and, although our captains have set an enviable record of safe operations over the years, we believe radar will afford us an extra measure of safety for crews, cargo, and ships."

-30-

Crystal Diode Probe

(Continued from page 52)

High hum level and "hot" chassis make a.c./d.c. amplifiers unsatisfactory. Amplifiers feeding the output of a 6SQ7 tube into a 6F6 are usually satisfactory except when there is low signal generator output or low percentage of modulation. With less than 10% modulation an extra amplifier stage may be necessary.

A means of checking gain at the plate of the amplifier output tube may be provided by connecting a variable range a.c. voltmeter in series with a .25 μ f. condenser. Waveforms in any part of the receiver may also be measured and observed if a scope is connected through a .25 μ f. condenser between the power tube plate and the input to the scope's vertical amplifier.

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Consumers Are Sore

(Continued from page 53)

"We don't expect a strike from similar causes after this war. But, if today's explosive undercurrent of customer resentment is similarly ignored, retailers have no assurance that they will not suffer another consumers' strike—this time expressing a revolt against the shortsightedness of management and the high-riding arrogance of their employees."

It is not that they don't want that new radio, refrigerator, washing machine or range, but don't forget they've been making the old one "do" for some time and they may figure it will last a bit longer until they have a chance to "look around" and make comparisons. You're going to find a mighty small minority who are forced to buy a new unit and beware of arrogance in dealing with these few. They resent the fact they simply can't wait any longer and if you're smart you'll use every selling guile to please them. The consumer who must have a new unit immediately can make or break a sale you'll be hoping for in the days to come. Treat them as though they could walk right next door and buy an equally good product, as though your very success depended on pleasing them at this time.

As Walter Morrow, president of the American Retail federation aptly puts it: "Soon there won't be any more sass from the lass behind the counter. The boss is fed up with her (or him), too. Just as you are." He says, along with electric irons and inner spring mattresses, courtesy will be back in the nation's stores.

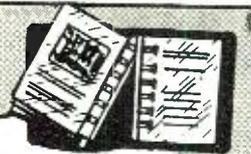
There will be more than courtesy too. You can expect an early return to extensive advertising, special wrapping, frequent deliveries, easy credit and other consumer lures.

Of course if you care to, you can continue the "take it or leave it" attitude now, during the early days of reconversion. Don't forget that this sales brutality will react against you, however, in the not too distant future.

You have a great opportunity right now to practice all the arts of good selling without the pressures which will enforce them later on. If you can learn to humble yourself to the point of average decency in your sales relationships today, when the cards are stacked in your favor, you will reap rich rewards when merchandise starts pouring into the market and competition again becomes bitter.

It is probable that all who read this have had their skin rubbed raw in some wartime encounters with insolent merchants and sales people. Remember every person who enters your store has had similar experiences and they're on the touchy side until they find out how you are going to handle them. They know that for the moment some types of merchandise are scarce. They know you can lounge back and read a newspaper while they

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RADIO NEWS

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examine the merchandise, and for that reason these first forced customers are particularly sensitive to your treatment of them.

Your cue is to lean over backwards to please them, put them at their ease, make them feel they are important. The merchant who administers the sedative of good selling to "war nerved" consumers will find his reputation growing by leaps and bounds. This is a condition where the soft word not only turneth away wrath but buildeth a future business. Consumers properly handled today will be so astounded to find their ego built, they will not only spread the news far and wide to their friends, but will defend the justification of their purchase by praising the advantages of the unit they buy.

Don't be deceived by a rush of curious people who come to see the first of this, that, or the other piece of equipment which reaches your store. Turning curiosity into a signature on a purchase contract requires good old-fashioned salesmanship. Use these early postwar demonstrations to garner names of prospects—you're going to need them not too many months from now. A distributor tells us the story of a dealer who simply had to have nine deluxe floor lamps the minute the factory could ship. His customers were demanding them. He finally received the shipment and much to his dismay he found the demand had melted away. Now that he had the lamps, the customers who were ready to lay the cash on the line had other obligations at the moment, they thought they'd wait for some new kind of lamp they'd just heard about or some other excuse.

Of course, you're going into the greatest land of sales opportunity our country has ever known but you're not going to just drift into it on a downy cloud. You're going to have to sell your way into every foot of it. If you don't, your competitor will.

Woe unto the retailer who doesn't face the facts. Lure the customers in, start at once to put on your best company manners, your smoothest sales approach. Sell them on the fact that you *want* their business, you sympathize with the kicking around they've received during the war years. Be free to admit you've taken some pretty shabby treatment from the other merchants yourself. Consumers are sore. Salve them to sell them.

-30-



"Pa tried washing his feet in the automatic dishwasher!"

RADIO NEWS

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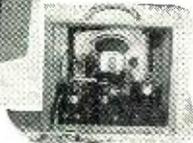
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LETTERS

from our readers

READER FROM NIGERIA

BEING a regular local subscriber to RADIO NEWS I thought I would write you a few lines to congratulate you on your new feature 'RN Circuit Page' which is very helpful to the serviceman, it is something I have been looking for—it is swell.

"Being a radio serviceman, I follow all the articles on servicing with interest and await each copy with expectation of new articles.

"Keep it up."

Rufus Allen
Lagos, Nigeria

Thanks, Mr. Allen. It is always nice to hear from our readers.

* * *

THE CATHODE FOLLOWER

PLEASE allow me a word on the cathode follower situation. Mr. Gaines is very correct in stating that the 6A5G is an indirectly heated type. In fact, I use them in my personal amplifier, which consequently has absolutely inaudible hum, a thing difficult to achieve with 2A3's. However, the facts must also include this drawback. The cathode on the 6A5 is connected to the heater internally. The purpose in using 6L6s was, to interpret Stevens more correctly, to avoid the necessity of separate filament windings. Please slip this information in as soon as possible as I fear some incautious persons may purchase 6A5Gs in ignorance and they cost quite a bit. There would also be wasted time and money on other parts of the system.

"Now regarding cathode followers. I am rather interested in high quality reproduction, but am also skeptical of the claims made.

"To be specific, I set up a push-pull 6L6 cathode follower system which disappointed me. Perhaps you can spot my error. I used fixed bias (in the range from 22.5 to 45 volts) employing a good battery. The plate voltages ran up to 350 and 400 volts. Transformer coupling was used. The plate load was that recommended by Stevens yet my results differ.

"The maximum undistorted power output (checked on a large scope) was in no case much larger (10%-20%) than the normal connection. That is, about 3.5 watts undistorted. Stevens claims 8. However, I measured into a resistance load, with the first obvious deviation from sine being the m.u.p.o. point. The frequency was varied to assure that driver and output transformers were not at fault. Both were oversized.

"Worse, from my point of view, was the large amount of noise produced by oscillations of the heater cathode system. These mechanical vibrations, resulting from a.c. voltage from heater

to cathode is distressing. These vibrations are audible at my own threshold of 19.5 kc. Could this be tolerated in a high quality system? I think not.

"More power to Stevens, anyway. I am getting at my objections in this fashion.

"I have acquired a low capacity filament transformer which will cause small loss of high frequencies using such tubes as 6B4s or 6A3s. (Unfortunately, I have not had time for measurements, but it is theoretical fact that a capacitive load is bad for linearity of cathode followers). Immediately I should have large powers available with better highs and no noise. Also the matter of bias on the output tubes is deserving of investigation. Doubling the bias on 6L6s did not alter the maximum undistorted power output more than 10%, while 'B' drain is obviously lessened. Intermodulation will be the limiting factor, no doubt, but savings in power seem possible.

"Also the business of widening the response of transformers can be gone about in a different way. Neutralization is rare in audio amplifiers, but it is possible and worthwhile where high response is poor, under certain common conditions.

"I am all in favor of damping and economy, but I like to see them achieved in the simplest, cheapest way (specially the economy)."

Charles McCleskey

Thanks to Reader McCleskey for his comments. Any more pro's or con's on the cathode follower?

* * *

BOUQUET FOR THE "LITTLE GUYS"

THE story of the 'Spindle Eye' and her role in the Bikini Atomic Bomb experiment, appearing in the December issue of RADIO NEWS, was read with deep interest. My interest comes of having been closely associated with the project from the day the first incomplete sketch was made in Manila until the day the ship sailed for the Orient from Seattle. Lt. Col. 'Marty' Luichinger has written a fine description of the equipment that went into the 'Spindle Eye' and his story is the only firsthand account I have read of her use during 'Operation Crossroads.'

"To the generals go the laurels when the battle is won. But the little guys, the privates, the non-coms, the junior officers—they are the men who slug it out to make victory possible. So it was in the case of the 'Spindle Eye.' It is with the thought that a footnote might be of interest to your readers that I am writing to tell you of the work done by the 'little guys,' especially the dozen or more hams, who

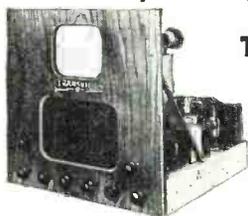
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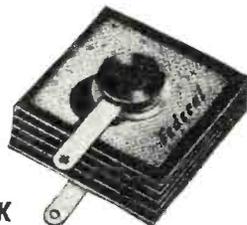
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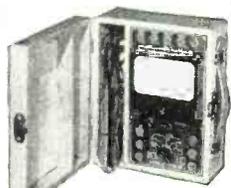
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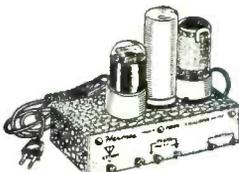
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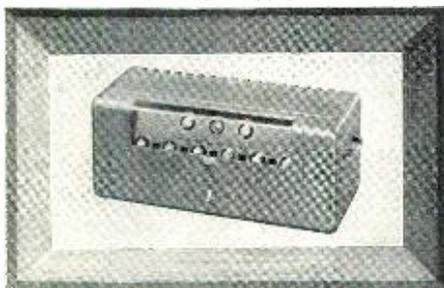
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combined their efforts to make the "Spindle Eye" the great ship that she is.

"A young public relations officer, Major Donald G. Weiss, New York City, formerly Radio Officer on General MacArthur's Public Relations staff, was the driving force behind the birth of the "Eye." It was he who continued to press the need of a ship to back up the "Apache" at a time when many high ranking GHQ officers felt that the latter vessel was adequate to meet the press and broadcast needs of all the Allied countries. He eventually convinced the brass that the "Apache" simply did not have the facilities necessary to carry the volume of press and radio traffic that would come out of a full scale invasion of the Japanese home islands. Major Weiss called upon his wealth of press/radio relations experience extending from the Solomons to Luzon to dream up the many innovations that went into the "Spindle Eye."

"The undersigned, then in the radio engineering section of General MacArthur's signal office, was detailed by the Chief Signal Officer to plan the Signal Corps equipment that would be needed to meet the recommendations of the Public Relations Office.

"To the civilian technicians of the Army Signal Corps' Alaska Communications Systems, Seattle, go the credit for the superb radio and telephone installation. These boys, most of them hams, burned the midnight oil for weeks in order that the ship might sail on schedule. Richard C. Young, W7BDQ, showing all the ingenuity inherent in a ham, solved many knotty technical problems. He could be seen daily in conference with Howard W. Johnson, W7NU, and Myron Scott, shop foreman, as they worked out the design of some special piece of gear needed for this unusual radio ship.

"Bert K. Field, W7CHG, Carl Minister, W9JDT, Garry Lewis, W6TSM, Matt Gormley, W7ETN, and Robert Jefferson, W7DSY, assembled the 7.5 kw. RCA transmitter with nothing to guide them but a small schematic diagram.

"Roy Stanton, heading a telephone crew consisting of Joe Busey and Frank Davis, wired the radio control switchboards, and installed the 100 subscriber common battery switchboard and the carrier terminal bays. William M. Bruner, ex-W7FPU, supervised the installation of audio and recording equipment in the two control rooms. Other hams who spent long hours on installation and testing were: S/Sgt. Darrell Taylor, W7EBH, Albert Mowery, W7BCS, Del Rutledge, W7DC/K6SYM and Norbert Bouchard, W7IMF.

"Surprisingly few bugs developed, attesting to the first class job done by those ACS hams.

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International Short-Wave

(Continued from page 116)

with an interlude of music. ("Radio Call") Is heard weak to fair here in the Eastern U.S.

Denmark—A Danish correspondent to "Radio Call" magazine (Australia) reports that the new 50-kw. Danish short-wave transmitter is scheduled to take the air early in 1947; it will cover Australia and New Zealand as well as South America; it is believed frequencies in the 19-, 25-, and 31-m. bands will be used. Address for reports on transmissions from this country is Statsradiofonien, Rosenborgs Allé, Copenhagen, Denmark (Danmark). Should be heard well in North America.

Ecuador—HC4EB, 6.870, Radio Manta, is heard evenings to 11 p.m. sign-off; this is correct call, not HC4AB. (Legge) Complete schedule is 7:30-11 p.m. (Smith)

HC5HC, "O das del Chimborazo," located at Riobamba, is a new station heard between 9-11 p.m. on 4.960. (Legge)

HCJB's frequency in the 19-m. band has been changed from 15.095 to 15.115, probably to escape QRM from HOXA, 15.100; on at 7 a.m. (Sutton)

Ethiopia—Radio Addis Ababa, listed as 15.103, but actually operating on about 15.065/15.070, was heard afternoons the last week of November, 1-3 p.m.; played badly worn, old recordings, some of them ("The Last Round-Up" and "Harbor Lights," for example) two or three times during a transmission; pauses between recordings, probably changed discs by hand. Had frequent announcements in English. Was good level here in West Virginia; have airmailed the station for schedules. Grady Ferguson, North Carolina, reported hearing this station opening at 8:16 p.m. with a recording, and with English announcement; second English announcement was not until 30 or more minutes later; faded out around 9:10-9:30 p.m. These may have been tests.

Finland—OIX2, 9.505, Peri, is being heard on East Coast at 7:15-7:25 a.m. with English news. (Ferguson) OIX1, 6.120, Helsinki, is reported to be scheduled 12 midnight-2 a.m., 4-7 a.m., and 10:30 a.m.-3:30 p.m., according to a recent DX broadcast from Radio Australia. (Ferguson) OIX2, 9.505, is heard well in England with English news around 7:15 p.m. (Harrison) The 15.190 frequency parallels (Bromley)

OIX4, 15.190, Peri, is being heard irregularly around 7:15-7:35 p.m. with English news; chimes usually precede the news. (Grivakis)

France—August Balbi, Los Angeles, recently received word from Radio Paris that they expect to have two 100-kw. transmitters in operation by April.

French Morocco—CNR3, 9.082 (varying), Rabat, is good signal in the

February, 1947

Vy 73 to you, OM, for a Joyous Christmas and a Productive New Year!

Bil Harrison, W2AVA

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RAK-7 Navy long wave TRF receiver. 15 to 600 KC. With AC power supply. 9 tubes. **\$59.50**

BC-406—15 tube UHF RECEIVER. Slightly used. **\$19.95**

(BC-406A—\$29.75) Easily converted to a hot superhet ham receiver. See our previous ads.

Code Practice Oscillator AN/GSC-T1. Works on 110 Volt AC, etc. In carrying case. **\$14.95**

Dynamotor. Runs on 6 or 12 volts. Delivers 500 volt at 160 MA. From PE103 Power Pack. **\$9.95**

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Signal Corps AN29-C. Sturdy, lightweight, brass antenna extends to 12' 10" telescopes to 15". ¾" diameter. Weighs only 30 oz. FB for mobile, or rotary beam elements. **\$1.95 each, six at \$1.74**

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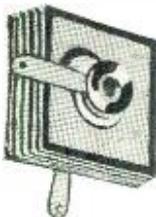
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Eastern U.S. afternoons; heard with French programs around 4-4:30 p.m. and later. (Sutton)

Germany—BFN, 7.290, Hamburg, is heard on West Coast at 2 a.m. with local (*English*) news and weather reports. (Balbi)

Greece—Radio Athens, 7.295, comes on the air at 2:58 p.m.; has brief *English* announcement, then is all in Greek to 3:45 p.m. sign-off with martial tune. (Bromley)

Guadeloupe—Radio Guadeloupe, 5.985, Pointe-a-Pitre, is now reported heard well in the East, in French and Spanish, 5:15-7 p.m., and irregularly to after 8:05 p.m. (URDXC)

Guatemala—TGWA, 15.170, is being heard with excellent signals, usually with fine marimba music, afternoons here in the East. TGRA, 6.255, "La Voz de la Guardia Civil," is heard evenings to 10 p.m. sign-off; replaces TGNA and relays TGR (1350 kcs.). (URDXC)

Haiti—HH2H, 5.948, Port-au-Prince, was heard recently between 9:45-10 p.m. relaying New York (in French); signs off at 10 p.m. (Norris)

Holland—PCJ, 15.220, Hilversum, was tuned recently at 7:10 a.m. with chime signal; at 7:15 a.m. opened program in Dutch to the Netherlands East Indies. (Ferguson) A feature story on PCJ will appear shortly in this Department.

Honduras—HRP1, 6.350, San Pedro Sula, "El Eco de Honduras," is heard from around 7:30 p.m. in North Carolina with good signal; at 9 p.m. relays the BBC news in Spanish from London. (Ferguson)

Hong Kong—"This is ZBW, Hong Kong. We are now taking you over to London for the news," is announced at 6 a.m. on 9.538; this announcement is made on completion of a recorded session; the BBC news is followed by a weather forecast; then there is more recorded music, compared in *English*; at 6:30 a.m., after station identification again, the program continues in Chinese. ("Radio Call") Hong Kong is just audible around 6-6:30 a.m. here in West Virginia; signal should be improving.

India—Madras, 4.920, and Delhi, 4.960, parallel Bombay, 7.24, and other AIR stations now in the 7:30 a.m. *English* news. (Dilg) The 41-m. AIR transmitters are coming through with fair to good signals at that time here in the East; Bombay, 7.24, usually identifies in *English* around 7:15 a.m.

VUD7, 15.160, Delhi, is heard at 9:30 a.m. with *English* news, off at 9:45 a.m. VUD10, 11.830, Delhi, was heard a recent evening opening at 10:15 p.m., gave schedules for the day, and said was operating to Africa on 21.51, 17.83, 15.29, 15.19, 15.16, and 11.83. (Ferguson)

The 15.19 transmitter continues to be heard widely in the Eastern U.S. with a good signal in the evening, with *English* newscasts at 9:30, 10:30 p.m.

VUD10, 17.830, Delhi, has been heard in Ohio between 7:30-8:50 a.m.; has BBC news relay at 7:45 a.m. (Sutton)

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- 100 Resistors, 1/2 and 1-watt.
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Address _____
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From Sweden it is reported that AIR is using 21.510 between 7-8 a.m. (Malmgren) In Australia, this station on announced frequency of 21.510 is heard closing down at 8:30 a.m.; reported as early as 1:30 a.m. with splendid signals "Down Under." (Gillett)

Iran—The new s.w. station at Tabriz, capital of Azerbaijan Province, is heard in Sweden between 9 a.m.-1:45 p.m. on a frequency of about 6.090. (Skoog) Is listed as 6.087. This station is heard by Paul Dilg, Monrovia, California, opening at 9 a.m. with 5 pips; Mr. Dilg first reported it as "unknown," but has since observed that Azerbaijan Province is 8 hours ahead of EST, whereas the remainder of Iran is 8½ hours ahead of EST; sometimes has a good signal on West Coast, Mr. Dilg reports.

EPB, 15.100, Teheran, signs off at 7:32 a.m. (Sutton) Still can be heard weekly in East some mornings at 6:15 a.m. when has *English* news, and later; identifies at 7 a.m. as "Ici Teheran."

Iraq—YI5KG, 7.085, Baghdad, is coming through again mornings to West Coast, but does *not* now have *English* news at 11 a.m. as has been reported from some quarters in the past. (Dilg)

Italy—Australians report a good signal at around 4 p.m. from *Radio Italiana*, 11.810.

Jamaica—ZQI, 4.700, Kingston, is heard well these early evenings in the Eastern U.S., 4:30-6:30 p.m. weekdays; world news is heard at 5:15 p.m. According to the URDXC, closedown on Sundays is at 5:30 p.m., and a frequency of 2.330 has been brought into use for Sunday *only*, between 6-8:30 p.m.

Japan—JZK, 15.160, Tokyo, was heard recently in contact with KQZ from tuning at 6:40 to their sign-off at 7:08 p.m.; they mentioned frequencies of 9.295 and 7.815 (probably used mornings); a few mornings later, Tokyo was picked up on 9.295 with transcriptions and a news relay at 8:30 a.m., signal was weak and "mushy." (Ferguson)

JLT3, 15.225 (varying), Tokyo, has a strong signal around 6 p.m. some evenings.

American authorities in Tokyo are expanding their short-wave facilities; in addition to JLR, 6.015, and JCV, 3.075, two further outlets have been added—JLP, 9.605, and another on about 4.880. ("Radio Call") Close-down is at 9 a.m.

I have recently been hearing JLR, 6.015, relaying AFRS programs around 6-7 a.m.; good signal here in West Virginia; at 7 a.m. EST, they give local time as "9 p.m."

WVTD, "The Voice of the British Commonwealth Occupation Forces in Japan," reported by Australians as heard one or two times some months ago on 15.831, closing at 8:15 a.m., is believed to have been a harmonic of a medium-wave outlet. ("Radio Call")

Java—The new Indonesian station on 10.365 is scheduled *daily* between

WALTER ASHE

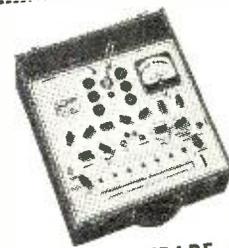
It pays to deal with one of the best—reliable Walter Ashe! And here's our offer if you want a trade: express your old instrument to us and let us know which new instrument you are interested in. We will quote you a real deal—with no obligation to you.



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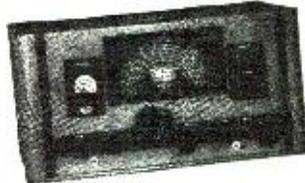
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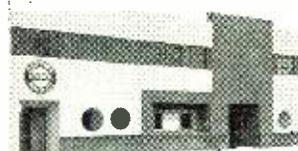
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- RADIO CITY MULTITESTER, Model 447, a value at..... **17.95**
- HANLAN APPLIANCE TESTER, a real buy..... **10.95**
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DeLuxe	chrome trim	gray enamel	
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3973	7x11x9	\$4.95	\$3.72
3974	10x14x9	5.40	4.05
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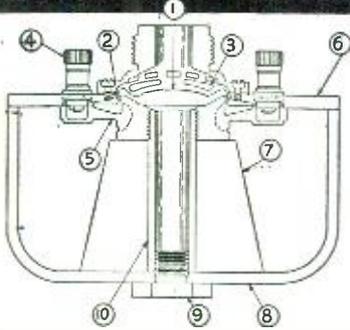
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Write for circular RN-247 giving complete details.

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11-11:30 a.m.; and tests between 8-9 a.m. on Mondays, Wednesdays, Fridays, and Sundays; signs on with "Allo Holland," off with a march, not Dutch National Anthem. (Dilg) Is heard in Sweden. (Skoog)

According to "Radio Call," the 11.010 transmitter opens at 4 a.m. with details of programs originating from "The Indonesian Broadcasting Centre." From 4 to 4:30 a.m., *English* is broadcast for Australian listeners; 4:30-5:30 a.m., Dutch for Netherlands Indies and Australia; 5:30-7:30 a.m., *English* for Australian listeners; 7:30-8:30 a.m., Indonesian for Netherlands Indies and Australia; 8:30-9 a.m., Siamese for Siam; 9-9:30 a.m., *English* for Indian listeners; 9:30-10 a.m., Indian languages for India; 10-10:30 a.m., Arabic; 10:30-11 a.m., Dutch for Holland; and 11-11:30 a.m., *English* for England and Europe. Continues to send a good signal to the Eastern U.S. early mornings; usually *English* news, read by a woman, can be heard around 7-7:30 a.m.

"The Allied Forces' Radio in Batavia" is stated to operate on 4.613 and 2.600; at 9 a.m. is scheduled to take a relay of "The Voice of Britain" period from the British Far Eastern Broadcasting Service, Singapore. ("Radio Call")

A Javanese station on about 6.380 was logged in Australia some weeks ago; announced as Djajakarta; was heard around 6:30 a.m. with a program of English-type recordings. ("Radio Call")

The Javan on 10.060 usually signs off around 11 a.m., but on Saturdays generally runs to 11:30 a.m. or later. (Dilg) It is believed this frequency is not used on Sundays and Mondays. A frequency of about 7.997 parallels this one.

Korea—JODK, 2.510, Seoul, is being heard again early mornings on West Coast. (Dilg) Runs to around 8:30 a.m. sign-off, which is in *English* and other languages. ("Radio and Hobbies," Australia) The singing of "Auld Lang Syne" as a goodnight signature was recently replaced by another vocal tune. ("Radio Call") Opens at 4:30 p.m. ("Radio World," Australia)

Lebanon—Beirut, 8.020, is now audible in the Eastern United States between 3-4 p.m. with fair strength; has Arabic programs between 3:15-4 p.m. sign-off, closes with "La Marseillaise." (Legge)

Madagascar—Australians report this country has provided exceptionally strong signals by putting into service a new transmitter on 6.065, with 6.140 in parallel; sign-off is at 1 p.m. ("Radio Call")

Malaya—Radio Malaya's Blue Network broadcasts on 7.22 from 11 p.m.-1 a.m.; on 4.78, 8:30-11 a.m.; Red Network, 4.82, 11 p.m.-1 a.m.; and on 4.78, 6:45-8:30 a.m. Address, Department of Broadcasting, Cathay Building, Singapore, Malaya. (ISWC, London)

Manchuria—According to the ISWC, London, MTCY, 11.78, Hsinking, is scheduled 4:24-4:50 p.m.; address,

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No. YT-113H. Physically and electrically identical to No. YT-111H, but constructed with conventional transformer iron..... **\$12.75**

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Manchuria Telephone & Telegraph Co., Ltd., Hsinking Central Broadcast Station, Hsinking, Manchuria. May now announce as Changchun.

An oriental station heard by West Coast DXers on this frequency early mornings may be Hsinking.

Mozambique—A short *English* news service can be heard from CR7AB, 3.493, at 2:55 p.m.; at 3 p.m., the announcer requests listeners to tune to 9.715 for further *English* broadcasts. ("Radio Call") The 9.715 frequency is scheduled to have *English* news at 2:55 p.m. However, the URDXC reports that the 9.715 frequency is now off the air, and that 9.650 is being used for the period between 2-3:30 p.m. weekdays, with sign-off at 2:30 p.m. on Sundays; may have call of CR7BJ which is listed on 9.645.

New Caledonia—*Radio Noumea*, 6.208, was heard in Australia recently as late as 5:30 a.m. some mornings; may have been tests, normal sign-off is around 4 a.m. ("Radio Call") Is good signal in New Zealand at 2 a.m. (Whitty) I believe 2 a.m. is sign-on time.

Norway—According to the URDXC, Oslo, 6.187, is scheduled weekdays between 3 a.m.-5 p.m., Saturdays to 6 p.m.

In Sweden, the Fredrikstad short-wave transmitter has been heard with special tests on 6.130, at 12 noon-1:30 p.m. and 3:45-5 p.m. (Lindhe)

Palestine—Direct from Tim Hefferman, assistant engineer, P.O. Box 636, Jaffa, Palestine, comes this information regarding Sharqal-Adna: "Present frequencies are 3.325, 2.5 kw.; 6.190, 7.5 kw.; 6.170, 7.5 kw.; 6.790, 2.5 day, 7.5 kw. night; 11.720, 7.5 kw. day. Between 12 midnight-1:15 a.m. all transmitters are used, except 11.720; and between 4:30 a.m.-1:15 p.m. all transmitters are used, but 11.720 goes off at 11:15 a.m., while the 6.790 (7.5 kw.) one closes down at 11:30 a.m.; on Fridays and Sundays all transmitters except 11.720 are heard 12 midnight-1:15 a.m.; and between 5 a.m.-1:15 p.m., all transmitters are in use, other than that 11.720 signs off at 11:15 a.m., and 6.790 (7.5 kw.) at 11:30 a.m. We are also scheduled to do some tests in *English* every Saturday very soon; proposed times are 1:15-6:59 p.m. on all waves." Sample, attractive QSL cards were sent along and Mr. Hefferman stated these are sent all reporters.

Incidentally, although the 6.135 frequency is reported "off the air," I have more recently heard it signing on at 12 midnight along with those listed by Mr. Hefferman.

Panama—Direct from *Radio Central America*, Wilbur T. Morrison, chief engineer, informs me that HOXA, 15.100, has Spanish news at 12:30-12:45 p.m. and 6-6:30 p.m., and that the *English* news is scheduled for 10:45-11 p.m. This station is heard with good signal in most parts of the world.

Philippines—A recent DX broadcast from *Radio Australia* listed a Manila s.w. station as operating on

8.000; schedule was not given. (Dilg) A late flash from Paul Dilg, Monrovia, California, reports he picked up a station on approximately 9.710, signing off at 11 a.m., with a call that sounded like KZ-I (maybe KZRI), believed to be Manila; said would be "back tomorrow at 5:30 a.m." evidently meaning local (Manila) time; QRM made readability low.

Now that XGOY has left 9.635 (listed, but usually swung to 9.640), KZRH, 9.640, Manila, announcing as "The Voice of the Philippines," can be heard with fair level early mornings here in the Eastern U.S.; has *English* news at 5:30 a.m.

Pitcairn Island—From A. W. Owen, GW2FUD, Radio Officer of a British

ship running between Montreal, New York, and Australia, and who does some commercial work with Radio ZKG, comes this additional information regarding radio on Pitcairn:

"The amateur call of Nelson Dyett, operator of ZKG, is ZL2FR and not ZL2FM. When working on radiotelephony, Dyett says, 'ZL2FR . . . Z-L-2-Fat-Rabbits.' Also, the frequency used by ZKG5 is not 7.270, but 17.270. It is quite true that both ZL2FR and Andrew Young, VR6AY (the Government Secretary of the Island) have so far had no replies to their applications for amateur relicensing. After 7 years' stay on the island, however, Dyett hopes to be home again in the first few months of 1947, and will

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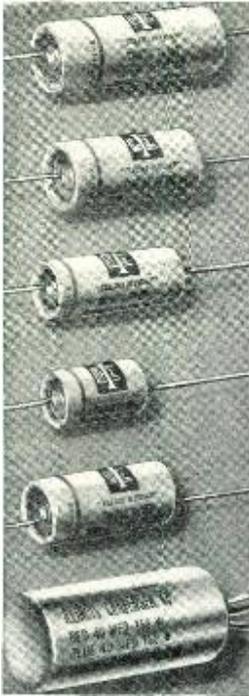
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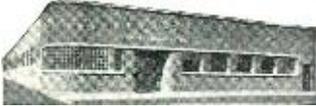


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again be active as ZL2FR; his home address is 8 Duthie Street, Karori, Wellington, New Zealand. The present population of Pitcairn is only 120 compared to the 1939 figure of 185—the balance are now living in New Zealand and Australia, and cannot return just yet. During the war period when ZKG was a naval station, staffed by personnel of the Royal New Zealand Navy, the population was, of course, increased, but such military personnel have now left the island. Mail arrives there nine times a year, although in the nine months up to September, 1946, thirty ships had called in."

Portugal—CSW7, 9.730, Lisbon, was heard recently signing off at 8:30 p.m. (Norris)

Portuguese Guinea—Radio Bissau is reported again, 5-5:30 p.m. on 7.100. (URDXC) Is listed on 7.094.

South Africa—Mervyn P. Laubscher, Johannesburg, has just forwarded via airmail this data obtained direct from the SABC: "The short-wave station at Durban (6.169) was dismantled when the new medium-wave transmitters were put on the air. It is proposed to erect a new short-wave transmitter at Pietermaritzburg as soon as equipment can be obtained. We can assure you that the Johannesburg station on 11.71 has not been in operation for a long time and it is unlikely that it will be used in the near future." The 11.71 SABC station reported some time ago by several monitors may have been a harmonic.

The SABC harmonic on 11 megacycles is still being heard with strong signal in Pretoria. (Ecksteen)

Sweden—The special DX broadcast on November 24, 1946, dedicated to readers of RADIO NEWS, transmitted over SBT, 15.155, and SDB-2, 10.780, was heard on the latter frequency in South Africa. (Laubscher)

SBU, 9.535, Stockholm, is now scheduled 1-5 p.m. (paralleling 10.780) and 8-9 p.m. (paralleling SBP, 11.705). (URDXC)

Tahiti—FO8AA, 6.980, Papeete, is heard on West Coast, Tuesdays and Fridays around 10-11:45 p.m.; peaks at 11:30 p.m.; has bad c.w. interference. (Balbi, Dilg) This one still eludes your ISW Editor here in the East; it also applies to several other Eastern DXers who are "out to get" Tahiti!

Turkey—TAP, 9.465, recently has been coming in with a good signal in the Eastern U.S. at 12:45 p.m. when has English news. In the 4:30 p.m. English transmissions on Monday, Thursday (to England) and Sunday (Postbag), this station usually has severe CWQRM, sometimes is completely blocked out.

U.S.S.R.—Moscow's announced frequency of 11.72 is best one now in use in the morning transmission in English to North America, 7:20-8:15 a.m., although the 11.63 and 15.18 frequencies are good level some mornings, also; 17.820 parallels. Recently I have observed an echo on about 11.718;

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It may be that Kiev is used on this frequency to relay Moscow during this period.

Petropvlovsk (Kamchatka), 6 07, has a strong signal on West Coast, 1:45-2:30 a.m. or later daily, and Saturdays between 12 midnight-1:30 a.m.; the 9.565 transmitter, located at Kom-somolsk, Khabarovsk Territory in Siberia, is heard strong from 9 p.m. on; still has *English* news at 4 a.m. Heard in the Home Service at 2 a.m. irregularly are frequencies of 6.11, 6.125, 6.06. (Balbi)

RV15, 5.940, Khabarovsk, has been heard recently after 9:30 a.m. with news in Russian (at dictation speed), read by a woman; has been heard as late as after 10 a.m. (Dilg)

Uruguay—In a verification to Gote Olsson, Sweden, it was stated that CXA-19, 11.835, operates between 6 a.m.-10 p.m. daily. In an attractive brochure now being sent out by this station with its verification card, it is stated: "Under the Southern Cross vibrates in the Voice of 'El Espectador' the fervent wish for and the ratification of the Liberty of Man. From the mast of 'El Espectador,' Hope goes out to the roads of the world in sense of the purest Fraternity."

Vatican City—HVJ, 15.095, has French at 9:30, German at 9:45, and *English* news at 10 a.m.; good level.

(Ferguson) The 9.660 frequency is heard on West Coast at 10:15 a.m., signing off to India, good signal. (Balbi) It is reported that HVJ's 6.190 frequency can be heard in Spanish between 2:50-3:15 p.m.

Acknowledgments

AUSTRALIA—Radio Australia; Gillett, *Radio Call*; Addis; Keast, *Australasian Radio World*; Matthews, Short Wave League of W. Australia. BELGIUM—Salmon. BRITISH COLUMBIA—Verigin, Park. CALIFORNIA—Balbi, Dilg, WestDyke; Norton. URDXC; Anderson, Woodruff. COLORADO—Woolley. DENMARK—Friis. DISTRICT OF COLUMBIA—Eaton, Havlena, U.S.S.R. Embassy, Hay; Harris, WIRN; ENGLAND—*London Calling*, BBC; Atkins, Garrard; Bear, ISWC; Lloyd, Wicks, White, Mitchell, Daniels, Hall, Shankie; Charge, BSWL, *The Short Wave Review*; Norris, Tonks, Friend, McGee, Harris, Muxlow, Brown, Rowden, Harrison, Logan, Hughes, Pearson, P. Hayes. FRENCH INDO-CHINA—Mrs. Margaret Coughlin, Radio Saigon. ILLINOIS—Wajda, Daum. INDIA—AIR, Delhi; Lalljee. INDIANA—Flitcraft, Green, Cossell. IRELAND—Levi. ITALY—*Radio Club D'Italia*. KANSAS—Seckler. KENTUCKY—French. LOUISIANA—Crandall, Crites. MASSACHUSETTS—Sternfelt, Harris,

Holzman, Simonian, French, Healey, Kernan. MICHIGAN—Reid, Sekach. MINNESOTA—Ecklund. MISSOURI—James; Kiernski, IRT. NEW JERSEY—Wooley; Williams, American QSL Bureau; Shaw, Stauhs, Crowell. NEW YORK—Legge, BBC, Beck, Taylor, Ignoll, Kentzel, Sink, Gernert. NEW ZEALAND—Gray, Whitty, NZDXC. NORTH CAROLINA—Ferguson. NORWAY—Otnes. OHIO—Berg, Sutton; Jacobs, GNSWLC; Campos. ONTARIO—Smith, Hart, Bromley. PALESTINE—Heffernan, Sharq-al-Adna. PANAMA—Radio Central America. PENNSYLVANIA—Cooley, Jones, Callahan, Conley, Hankins, Starry, Brown. POLAND—*Radio Warsaw*. QUEBEC—Gauvreau, Dunlop. SCOTLAND—Morris, Watson. SOUTH AFRICA—Laubscher, Eckstein, SABC. SPAIN—Alonso, *Radio Club Espanol*. SWEDEN—Skooog, Skogsberg, Carl-Eric Petersson, Kaldereen, Mattsson, Lindhe; Samsoie, *Radiotjanst*; Forsstrom, Swalen, Frick, Ohrwall, Persson, Gillbert Andersson, Gimby, Malmgren, Rundblad, Gustafsson, Bengt Andersson, Olsson. TENNESSEE—Seaton. TEXAS—Giles, Rice, Thompson, Lyerly. VIRGINIA—Norris. WALES—Owen. WEST VIRGINIA—Rupert, Reese, Gonder, McLaughlin, Arthur. WISCONSIN—Reed, Thomka, Walz.

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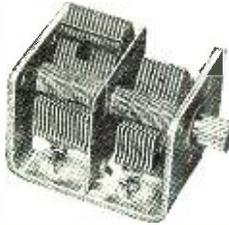
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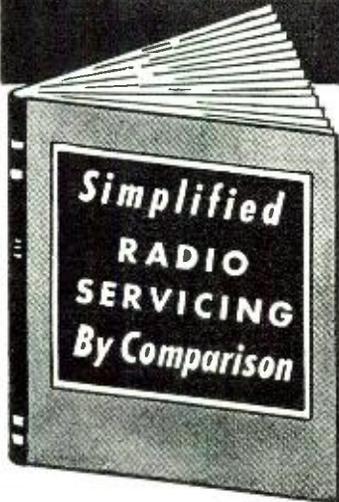
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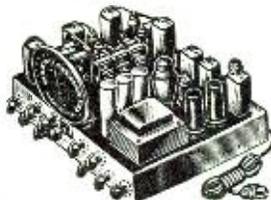
Amazing New Invention



Find radio faults with a new simplified method. Repair all radios in minutes instead of hours. Revolutionary, different *Comparison* technique permits you to do expert work almost immediately. Most repairs can be made without test equipment. Simplified point-to-point, cross-reference, circuit suggestions locate faults quickly and easily.



CHARTS, BLUE-PRINTS, TESTS, PICTURES, HINTS, JOB-SHEETS



Learn time-saving trouble shooting short-cuts; find any radio fault with ease. Follow the tests shown on 24 large circuit blue-prints. Over 1,000 practical repair hints. For all types of radios. Hundreds of simplified tests using a 5c resistor and any filter condenser. Introductory material for beginners and to serve as review for experienced radio men. Several chapters on test equipment. Complete plan in manual form, 64 job sheets, data on all tubes, large size: 8 1/2 x 11 inches. Schematics, pictures, charts. Sold on no-risk trial. Use coupon to order.

NO TESTERS NEEDED REPAIR ANY RADIO IN MINUTES

This newly developed method tells you how to locate the source of trouble in any radio set without equipment. Make needed tests, measure voltage, trace the signal, by using only a 5c resistor, small condenser, and a crystal detector. Inject signals without any signal generator. Test parts by the new *Comparison* method. Test tubes without equipment. Repair any radio expertly following simplified picture plans. Improve your radio servicing ability. Data on all sets, portables, AC-DC, FM, recorders, intercoms, P.A. Examine and apply the plan for 10 days without obligation or risk. Send trial coupon today →

NO RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS

9 S. Kedzie Ave., Chicago 12, Illinois

Ship postpaid the new complete Simplified Radio Servicing by Comparison Method manual for 10 days' examination. I am enclosing \$1.50, full price. I must be entirely satisfied or you will refund my total remittance.

NAME:

ADDRESS:

February, 1947

161

HIGH VOLTAGE KIT
2500 V. DC
Up to 50 MA.
\$14.00

Contains following list of three (3) hermetically sealed components, made by outstanding mfrs.

1 ea.—Trans. Pri.—115 V 60 V. Sec. 3000 V-50 MA. — \$7.50
1 ea.—Trans. Pri.—115 V 60 V. Sec. 6.3 V. 6.3 A. — \$3.80
—@ 3 amps HI-insul. — \$3.80
1 ea. Condenser, oil 3 sec. 2 mfd ea 4000 VDCW — \$4.60

Dynamic Microphone
100-125 ohms Impedance high level output — use with any multiple line to grid Input Transformer. Excellent speech Freq. response—rugged—use in your favorite mike stand. Famous mfr. Dimensions 1 3/4" diam. x 1 1/2" deep. — \$2.40

I.F. Transformers
Television Type—Iron core—Trap tuned—Shielded. 30 M.C.—2 1/2" x 3/4" x 3/4" — 2 for \$1.95

Motors—Aircraft—28 V. DC
Single ended shaft 1/4" x 1" long—Reversible. Over-all 2 1/2" x 1 3/8" Bendix — \$4.75

2 Mfd.—2,000 V.—Oil — \$2.25
With mounting—ceramic standoffs

1-1-1 Mfd.—Oil—1,200 V.V. DC
3,000 V. Test. C-D 4" L x 2 1/2" D x 3" H — \$1.45

IR 5-IS 5-IT 4 — 89c each

Milliammeter 0-200 Full Scale
0-5 MA Movement 2 1/2" sq. case—TRIPLETT — \$2.95

Audio Output Xformer
High quality. Freq. response flat to 8,000 cycles. Push-bull plates to voice coils. Variable impedances Amertran J-871. — \$1.50

ALL MERCHANDISE FULLY GUARANTEED
F.O.B. N.Y.C. — Remit 20% — Balance C.O.D.
No Orders Accepted Under \$5.00

KELVIN ELECTRONICS
74 Cortlandt Street, New York 7, N. Y.

WAR SURPLUS BARGAINS
WAR SURPLUS BARGAINS

BIG SAVINGS
Hundreds of specials for RADIO SERVICEMEN

- CATHODE RAY TUBES
- POWER & TRANSMITTING TUBES
- HEADPHONES, etc.
- HARD-TO-FIND TEST METERS

7 LB. EXPERIMENTERS RADIO PARTS ASST.
A "gold mine" for the experimenter, radio serviceman, handyman and repairman. Hundreds of valuable radio, radar and electronic parts, screw machine parts, bushings, sub assemblies, etc. More than your money's worth every time. An amazing value. Money-back guarantee.

K130R—FULL 7 POUNDS ONLY \$179

War Surplus Bargain Book
Page after page of war surplus and other bargains for the radio serviceman; also specials for home shop and outdoors.
IT'S FREE! WRITE TO-DAY

FREE CATALOG

STARK'S Dept. RN-2 509 So. STATE STREET CHICAGO - 5, ILLINOIS

metallized ceramics, printed circuits and miscellaneous steatite pieces.

Those interested in obtaining a copy of this catalogue should address their requests to *Centralab*, 900 E. Keefe Avenue, Milwaukee, 1, Wisconsin. Ask for form No. 720.

RELAY MANUAL

Wells Sales Inc. of Chicago has recently issued a comprehensive manual covering hundreds of relays which they have available for immediate shipment.

Representative of the products of many well-known manufacturers, the listing includes telephone relays, slow action d.c. relays, aircraft service relays, midget d.c. relays, hermetically sealed relays, keying relays, and many others.

A copy of this manual "Relays for Every Purpose" will be sent free of charge to those requesting it from *Wells Sales Inc.*, 4717 W. Madison Street, Chicago 44, Illinois.

SYLVANIA BULLETINS

The Radio Tube Division of *Sylvania Electric Products Inc.* has just announced the availability of three new bulletins describing electronic test instruments manufactured by the company's Electronics Division.

The bulletins cover the Types 139 and 140 Tube Testers, the Type 134 Polymeter and the Type X-7018 Modulation Meter.

In addition to describing these instruments, the bulletins list operating characteristics and special features of the test equipment.

Copies of any or all of these bulletins will be forwarded promptly to readers who make their requests direct to *Sylvania Electric Products Inc.*, Emporium, Pennsylvania.

REFERENCE CHART

Originally designed to facilitate engineering procedures, *E. F. Johnson Company* has now made available a handy reference chart which identifies the proper sockets and cap connectors for each of some 800 transmitting, control, regulator, rectifier, receiving and miscellaneous tubes.

This easy-to-use and practical chart will be distributed free of charge by the company to readers of *RADIO NEWS* who may obtain their copies either from the company's distributors or by writing direct to *E. F. Johnson Company*, Dept. Z, Waseca, Minnesota.

RESISTOR CATALOGUE

Resistors, Incorporated of Chicago have just released a new catalogue containing resistor data on their full line of resistors and windings.

Included in this catalogue is data on fixed and adjustable resistors, r.f. and choke plates, ferrule resistors, heating elements, special windings and accessories. This data consists of pictorial diagrams, complete specifications and application information on each product.

The resistors feature the "silver-soldered" connection construction,

ORDER NOW

- BC 312 Army Receivers (New Condition)...\$59.95
- Signal Corps 1-222A Signal Generator Range 8-15 MC, 150-230 MC.....\$69.95
- 300 Ohm Amphenol Twin Lead, per 100 ft. \$ 2.90
- 75 Ohm Amphenol Twin Lead, per 100 ft. \$ 2.00
- Kilowatt 72 Ohm Amphenol Twin Lead, per 100 ft. \$ 7.20
- 5 Volt, 26 Amp. Trans (20,000 V. ins. uncased) \$ 4.95
- 3 Gang 410 Mmfd. Per Sect. Cond. Excellent quality \$ 2.95
- 2" PM Speaker (Bakelite Cased) Used in Walkie Talkie \$ 1.95
- Signal Corps Telegraph Key \$ 1.10
- VT 127 Tubes (Equivalent to 100 TL) \$ 3.50
- Jan 6 AK5 Tube: \$ 1.95
- Jan 832-A Tube: \$ 5.95
- 5" PM Army Communications Speaker, Metal Case, 4000 Ohm Output. Matches Exactly BC 312, BC 348, etc. \$ 2.95

Send for Our Special Bulletin of Government Surplus Items

DOW RADIO

1759 E. COLORADO PASADENA 4, CALIF.
Pasadena Phone—SYcamore 3-1195
Los Angeles Phone—RYan 16683

Radio Men Needed

The Finest in Radio Training

Train for well-paid positions in Radio Engineering, Television, Electronics. Thorough courses in frequency modulation, math, mechanical drawing, construction, repair, aviation and police systems, sales and service, broadcasting.

APPROVED FOR VETERANS UNDER G. I. BILL

Low Tuition and Living Costs. Fine Climate —Hunting and Fishing.

New classes start each month. Write

COL. H. C. WASHBURN
Dept. 1 Clovis, New Mexico

Benson Radio Institute

300 Printed Name & Address Labels 50¢



1001 diff. uses for these appealing, sparkling, 2 Color GUMMED Labels nicely printed with your name & address. Stick 'em on letters, Envs, Books, Files, etc. 300 labels bound in neat Imit. Leath. fabric CASE; easily removed as needed. Just 50c postpaid Money back immediately if not pleased!

ANNUAL PRESS BOX 591-QF LYNN, MASS.

RADIO SERVICEMEN: SPECIALS

- SELENIUM RECTIFIER—Replaces 1726, etc. \$0.99
- SUPREME PHONE NEEDLE (0-000 Plays)99
- DIAL CORD KIT—60 Ft. Ass'd & 6 Springs.99
- KNOB KIT—20 Ass'd Screw & Spring.95
- RESISTOR KIT—100 Ass'd 1/2, 1/4, 1 Watt.49
- BY PASS COND. KIT—35 Ass'd .005 to 1. 1.95
- SPEAKER GRILLE CLOTH—6 Ass'd 6"sq.69
- ANT. & OSCIL. or ANT. & RF. COIL SETS. 1.59
- SPEAKERS—4" or 5" PM. ALNICO 5. 1.59
- TUBE SHIELDS or FP. COND. MT. PLATES.04
- RADIO-5 TUBE SUPER '47 MODEL. NET 18.95

NATIONALLY KNOWN BRAND. Write Today for Bargain Bulletin
RADIO DISTRIBUTING CO., Pasadena 18, Cal.

RADIO COURSES

Servicing, Broadcast Engineering, Commercial Operating, Television

INDIVIDUAL LABORATORY WORK!—LEARN BY DOING: DIY and EVENING CLASSES

Approved by the Maryland State Department of Education and the Veterans Administration
FREE TO VETS—TEXTBOOKS, TOOLS, TEST SET
Write for Bulletin

BALTIMORE TECHNICAL INSTITUTE

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ELECTRONICS

Fully equipped laboratory and communications room. Uncrowded facilities. Engineer-instructors provide superior practical training in Radio Communications (for FCC exams) and in Radio-Television Servicing. New classes monthly. Write for latest bulletin—no obligation. Approved for Veterans.

Member: Los Angeles Chamber of Commerce.

WESTERN RADIO COMMUNICATIONS INSTITUTE
C31 West Ninth Street, Los Angeles 15, Calif.

which consists of resistance wire silver-soldered to the solder lug to assure a more permanent electrical bond.

Free copies of Catalogue No. 87 are being distributed upon request to *Resistors, Incorporated*, 2241 South Indiana Avenue, Chicago 16, Illinois.

-30-

Spot Radio News

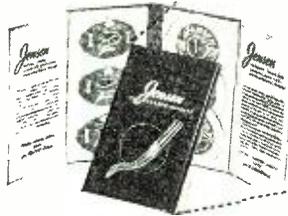
(Continued from page 22)

are as broad as the imagination of the public and the ingenuity of equipment manufacturers." Latest ideas in the field include using units for communication between mountain climbers. FCC also predicts that the units—and their operators—will probably make headlines in times of national disaster, such as floods, hurricanes, or earthquakes, when all wires are down.

RADAR'S USE to study the stars is proving successful, we learn from scientists at the Bureau of Standards. Biggest experiment in this type of radar work so far took place in October, during the huge meteor shower. Overcast weather would have prevented accurate observations but radar made the meteor fragments "clearly visible," the investigators reported. Their work, which is to be continued, is aimed, among other things, to determine the effect of meteors on radio waves, particularly important in FM broadcasting and long-range radio communication and navigation. Radar is also expected to be helpful in astronomy as a method of observing both on overcast nights and during the day, when meteors are not visible. The scientists are tending after preliminary work toward the theory that "bursts" on local station programs from long-distance stations are caused by meteors. One way in which meteors may affect radio waves is to cause these "bursts" on FM channels, it is thought. Out of the research on the effect of such phenomena will come decisions as to which frequencies are the best for the various types of radio services. Whatever the result, radar would seem to be in this type of work to stay. "The tests," declare the Bureau of Standards experts, "indicate that radar, besides being a plane locator and navigation device, is a valuable tool for the study of radio-wave propagation and is finding a place as an observing instrument in the field of astronomy."

HAMS ARE ALSO DOING YEOMAN SERVICE in the meteor field. When skies are overcast, many have been enlisted to check up on meteor fragments, which register their presence clearly with a "bump" on short-wave sets. On the big meteor nights last October hams counted thousands. The shortwave "sound" of meteor fragments, one Princeton professor declared afterwards, may make it possible in time to set up automatic

More MONEY in your POCKET



when you carry the handy Jensen Saleskit.

Radio Servicemen who take the Jensen Phonograph Needle Saleskit on service calls say they would not be without it. This handy kit, shown above, helps demonstrate fine needles, sells on sight, adds \$\$\$s to your income.

Contains 3 Jensen Concert Needles retailing at \$1 each, and 3 Jensen Genuine Sapphire Needles

at \$2.50 each. Needles are beautifully packaged. Adds profit to every call. What's more, Jensen phonograph needles augment your work, assure full, clear tone of the instrument you repair, make all records sound better.

Generous discounts to servicemen boys; your income. WRITE TODAY for complete details.

JENSEN INDUSTRIES, Inc., 331 SOUTH WOOD ST. • CHICAGO 12, ILL.

WARD

WORLD'S FINEST
AND FASTEST SELLING
Aerials

Here's Your Newest Profit Builder! A striking, three-dimensional display which catches the eye of every customer. It's completely assembled, ready to place on your counter and bring in easy, extra sales. You pay only for the four fast moving models mounted. The display itself is FREE!

Model 61-7
PROFIT BUILDER
LIST \$22.00

Each of these models is engineered and equipped to fit every car!

WARD

Aerials

THE WARD PRODUCTS CORPORATION • 1523 E. 45th STREET, CLEVELAND 3, OHIO
EXPORT DEPARTMENT: C. O. BRANDES, MGR., 4900 ELCLID AVENUE, CLEVELAND 3, OHIO
IN CANADA: ATLAS RADIO CORP., 560 KING STREET WEST, TORONTO, ONTARIO, CANADA



Every Ward model has been tested and approved by car and radio set manufacturers—our proof of quality inside and out.

**WE OFFER FOR SALE
AT BARGAIN PRICES
VACUUM TUBES
GUARANTEED**

9002-0003—9006-954-956-6Y6 Ea. \$0.65
 VR 150. Ea. 85c; VR 105. VR 75. VR 90. Ea. 1.20
 E1148 (HY615), Ea. \$1.00; 2x2/879 1.00
 6H6—Ea. 65c; 6C4—Ea. 75c; 6AC7—Ea. 90c;
 6AK5 Ea. 1.00
 6AG5—Ea. \$1.25; 6J6 Ea. 1.00

SPECIAL 866/866A Brand New Jan. 85
872/A Brand New Jan. 2.50
5B11 Brand New Jan. 5.00

ROTARY SWITCH—9 wafers, 4 shields, wafer dia. 1½" switch 1½" long, each deck multi-contact; brand new, individually backed. 1.00

ULTRA HI FREQ DIPOLD ANTENNA with single coax connector on mounting bracket, 11½" L x ¾" dia. spacers 5½" L x 5" W, brand new, 2 in a package; complete. 1.50

CONTROL BOX ASSEMBLY—Seven 6 foot color coded wire lengths in copper shield. Hooked to control box containing 1 H.D. dpdt toggle switch, 3 phone jacks, 2-10,000 ohm pots with knobs; brand new, complete. 1.75

A KIT FOR A Battery Charger or Auto Radio Checker or As a Supply for Dynamotor in Surplus Equipment. Consists of

- 115 Volt Primary—6 or 12 Volt Secondary at 5 Amp Xformer
- Selenium Stack—6 Volt @ 4 Amp. or 12 Volt at 3 Amp.
- Smoothing Capacitor 1000 Mfd.
- Chassis Black Crackle
- Binding Posts. Instructions Furnished.

COMPLETE AND GUARANTEED— \$10.00

Write for specials on other kits.

25% deposit required on all C.O.D. orders. Prompt delivery assured.

GREENWICH SALES CO.
 59 Cortland St., Whitehall 3-3052, New York 7, N. Y.

BARGAINS

- 2" PM Speaker with Output \$ 1.58
- Generator Condensers
- Solar .1— .25 or .5 MFD19
- Solar 30 MFD 450 Can.
- Plugs into Octal Socket78
- Signal Generator—All Wave 49.95
- Tube Checker—Latest Portable 39.50
- LEACH Break-in, Keying Relay
- 6 or 12 V. DC \$20.13 list, Net 2.50
- Superior CA-11 Signal Tracer 18.75
- VM Record Changer (Complete) \$18.95 ea. 2 for 35.00

Send for Latest Bulletin, 25% Deposit on C.O.D. Orders

MAC'S RADIO SUPPLY
 8320-22 LONG BEACH BLVD.
 SOUTH GATE, CALIF.
 Telephones — KIMBALL 4111-4112

Vasco SUPREME QUALITY
 TRADE-MARK REG. U. S. PAT. OFF.
ELECTRIC SOLDERING IRONS
 4116 AVALON BLVD., LOS ANGELES 11, CALIF.

RADIO ENGINEERING I
 COMPLETE Radio Engineering Course. Bachelor of Science Degree. Courses also in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering, Business Administration, Accounting, Secretarial, Science. 64th year. Enter Mar., June, Sept., Jan. School now filled to capacity. No applications can be accepted until further notice.
TRI-STATE COLLEGE 1627 College Ave. ANGOLA, INDIANA

counters, but until that day hams are enlisted by scientists to help estimate the number of fragments when a big meteor shower goes on. Big showers are rather frequent—next one is scheduled for April 21. But if you want to know how they sound—you probably do already—there are little showers almost every week. It's when an otherwise well-modulated voice you are listening to bawls one syllable extra loud. Only he doesn't, really. It's a meteor fragment passing by in the neighborhood.

—50—

Retailing Basics
(Continued from page 43)

dealer a good start on his advertising program by making certain brands household words through extensive consumer advertising. Some of these organizations have cooperative advertising plans which will focus attention on both the products and the dealer handling the line.

Small town dealers, or dealers in large cities who have access to neighborhood newspapers, can use such media to publicize their name and merchandise. Handbills can be used effectively to cover the dealer's immediate territory. Local movie houses and radio stations can be used to advantage in some locations.

Another form of advertising is the show window. The dealer can gain publicity by installing "live" or action windows, to demonstrate merchandise. A transparent washing machine can be used to show the action of the unit in washing the family clothes. A demonstrator could be used to show the ease with which the ironing can be done with an electric ironer. A live window demonstration will always draw a crowd. A roast or some other baked product could be prepared in an electric range set up in the show window. Demonstration cards, explaining the advantages of this form of cooking, should be set up and details of the experiment under way explained. Numbered tickets could be passed out and the holder of the lucky number would be entitled to the food which had been prepared during the demonstration.

Direct mail advertising is still a very effective means of telling your story to a select audience. Mailing pieces should be dignified, yet attractive. They should tell a simple story about one or two items and should include a sincere invitation to the prospective customer to visit the store and inspect the merchandise. Be sure the name and address are included. The letter should be addressed to the lady of the house, by name, and should be sent by first class mail in order to receive the attention usually reserved for her personal correspondence.

When conditions indicate, house-to-house canvassing can be used to advertise and sell the dealer's line. In case the dealer selects this form of merchandising, it is of utmost impor-

Guaranteed Factory Rebuilt Radio VIBRATORS—\$1.00

6 volt Non Synchronous Vibrators \$1.00 ea. 6 volt Synchronous, 12, 32, and 110 volt Vibrators \$1.25 ea. Defective parts replaced. **48 HOUR SERVICE.** For the very prompt service enclose remittance and return postage. We rebuild any make or kind of radio vibrator. C.O.D. orders accepted. Send your sick vibrators to

BEST VIBRATOR CO.
 Box 5802, Cleveland 1, Ohio

RADIO

RADIO Technician and Radio Communications courses. Register now for new classes starting first MONDAY of each month. Day and Evening Classes.
AMERICAN RADIO INSTITUTE
 101 West 63d St., New York 23, N. Y.
 Approved under GI Bill of Rights.

CONDENSERS

50 paper and mica condensers \$1.00. Brand new, fine assortment, popular sizes. Wt. app. 1 lb. f.o.b. Cash, check or M. O.
Kensington, P.O. Box 91, Bklyn. 18, N. Y.

RADIO TUBES

Most Critical Types in Stock
 50L6, 1A7, 35Z5, etc.
 Brand New, in Sealed Cartons
 100% Guaranteed
 Repairmen and Dealers, Write For List at Trade Discounts
RADIO-EXPERTS
 178 E. 33rd Street Paterson 4, N. J.

BUILD YOUR OWN FAST FREEZER PLANS 1190

It's easy to build this household appliance and profitable to use. Save up to 75%. Operates on 110 or 32 volts. Plans show 5 sizes and are easy to follow. **ENJOY MAKING ONE OF these freezers from new or used parts. No expert knowledge needed. Mail \$1.00 bill or check for complete plans and catalog.**
LE JAY MFG. CO., 454 LeJay Bldg., Minneapolis 8, Minn.



FILMGRAPH PAT'D Conference Recorders

UNINTERRUPTED Longtime (up to 12 hours) Conference & Telephone Recordings on Safety Film Models for Dictation "TALKIES"
ECONOMICAL PERMANENT INSTANTANEOUS PLAY-BACK
MILES REPRODUCER CO., INC. 812 BROADWAY, N.Y. 3 RN-2

SOUND RECORDING SCHOOL

A practical 9 months' course in Sound Fundamentals, Recording, and Sound Transmission measurements; in a laboratory containing transmission sets, oscillators, square wave generator and intermodulation analyzer, and other equipment.
 Two complete recording studios assimilating broadcast, motion picture and commercial sound recording, under the direction of H. M. Tremaine.
 Approved for Veterans
DON MARTIN SCHOOL OF RADIO ARTS
 1655 Cherokee St., Hollywood, Calif.

PEN-OSCIL-LITE

Extremely convenient test oscillator for all radio servicing; alignment • Small as a pen • Self powered • Range from 700 cycles audio to over 600 megacycles u.h.f. • Output from zero to 125 v. • Low in cost • Used by Signal Corps • Write for information.
GENERAL TEST EQUIPMENT
38 Argye Buffalo 9, N. Y.

tance that the persons chosen for this work be trained carefully for their job. To many customers, the salesman who calls on them in their homes will be the only contact they have with the dealer's store. Because of this feature of house-to-house selling, salesmen must be neat, courteous, enthusiastic and fully informed on the line of radios and appliances carried by the store.

Some dealers have found that telephone selling is profitable, but if this program is adopted, a carefully thought out plan must be made before tackling the telephone list. Unless this procedure is set up carefully, it can make more enemies than friends for the store. Care must be taken not to call at hours which are obviously inconvenient to the housewife, i.e. just before mealtime when she would be working in the kitchen, or very early in the day when she might be upstairs making the beds, etc.

Basic to all of these advertising promotion schemes is the fact that demonstrations, explanations and advertising copy must be simple and non-technical. The average customer cannot understand a technical discussion of horsepower, three-line service entrance, etc. The customer *does* want to know how much the unit will cost to operate, what it can do for him in terms of comfort, convenience, safety, and family welfare. All of these points can be explained and demonstrated by the use of homely analogies and without resorting to high-flown technical data from the service manual prepared by the manufacturer.

6. *The manufacturers' responsibility.* Make a thorough study of what manufacturers and national distributors have to offer in the way of sales helps. Manufacturers of "brand" merchandise who advertise extensively assume some responsibility for the relation between their dealer and his customers. Because of this close tie-in, the manufacturers will welcome suggestions from dealers on how they can be of assistance in making the selling job easier, and keeping the customer sold. This assistance can materially reduce the dealer's cost of doing business. It can take several different forms; cooperative advertising, the loan of demonstrators, mailing pieces with the dealer's name imprinted, window displays and point-of-sales material.

7. *Becoming community conscious.* It is important that a dealer become a real force in the community. Nothing is more detrimental to his success than for him to assume the attitude that what happens to his community is of no interest to him. If a dealer makes a living in a city or town, he owes it to himself and his business to become community conscious. If possible, the dealer should live in the community that gives him his bread and butter; he should go to the church there; he should join clubs and civic groups and contribute to accepted "worthy causes."

8. *Customer relations.* In conclusion,

February, 1947



The Most Efficient Auto Radio Tuning Cable-Servicing Machine in Use Today!

Completely redesigned to meet MODERN Servicing requirements, the NEW JFD REMOTE-O-CABLE REPLACER is a vital necessity in the workshop of every auto-radio serviceman.

- 1 SWEDGES SHAFTING TO PREVENT UNRAVELLING.
- 2 CUTS SHAFTING TO EXACT LENGTH.
- 3 REPLACES OLD FITTINGS ON NEW SHAFTING.
- 4 CASING GROOVE MAKES CUTTING EASY.

J. E. D. MANUFACTURING CO. 4111 FT. HAMILTON PKWAY, B'KLYN, N. Y.

WITH

SILVER "VOMAX"

YOU CAN—

Post-war design and construction at pre-war uninflated price is the secret of overwhelming demand for "VOMAX", the true v.t.v.m. Unequaled at any price, it is bought and used by the Bureau of Standards, Navy, F.C.C., C.A.A., schools, universities, research laboratories—and by thousands of experience-wise service technicians. You, too, will find "VOMAX" your greatest profit meter. Only \$59.85 at your favorite jobber.

Measure every type and kind of voltage in receiver design and servicing. "VOMAX" increases your efficiency and profits by equipping you to measure r.f., i.f., a.f.—actual signal volts—a.v.c., a.f.c., discriminator—a.c. and d.c. volts. Input resistance is so astronomically high you can measure directly even in the highest resistance circuits. "VOMAX" is also your output db. meter—measures direct current up thru 12 Amp. auto range; resistance up to 2,000 megohms.

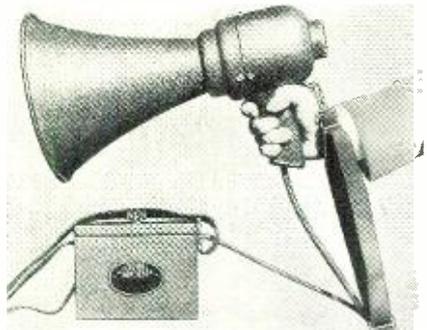
OVER 35 YEARS OF RADIO ENGINEERING ACHIEVEMENT

McMurdo Silver Co., Inc.

1240 MAIN ST., HARTFORD 3, CONNECTICUT

Send postcard for new catalog of measuring instruments, communication receivers, transmitters, kits and parts. See them at your favorite jobber.

NEW PORTABLE ELECTRIC MEGAPHONE



Projects Clear Audible Speech To Long Distances...Instantly!

Completely portable. Operates any time, any place. No installing, no wiring, no speakers, no headphones. Just press trigger switch and amplified voice is beamed to area desired. Reproduction is crisp, clear, undistorted. Self-powered. Standard batteries. Quality constructed throughout. Simple to operate. Low-priced.

A Good Profit Item For Dealers

Dealers will find this new item an excellent profit-making addition to their line. Sell it! Rent it! Attractive discounts.

Write For Complete Details NOW!

International Industries, Inc.

6519 N. Clark Street Chicago 26, Illinois

Get your Crystals from FEDERATED'S

"ROCK"
PILE!



Your Choice of Frequencies 40-Meter Fundamental Crystals

6798 to 7416 Kc in 1-Kc steps, in stock. Perfect for 20-meter doublers, and quadruplers for 10-11 meter band. All brand new, made to our order (not war-weary surplus!). New type holder fits octal socket. Specify frequency desired, together with alternate choice. **EXCEPTIONAL BUY!** Your Choice, any frequency, each **99c**

10 MFD—1000 DC W.V.

Oil-Filled Condenser

In rectangular can. Porcelain insulators, mounting flanges. Made by well-known manufacturer. **UNUSUAL VALUE;** \$1.29
Your Cost, Each.....

FINE HAM GEAR IN STOCK for IMMEDIATE DELIVERY

New Meck Transmitter T60-1—RME-45
Hammarlund HQ-129-X—Hammarlund Super-pro
National 240-D—National HRO
National 100-ASD—National NC-46
Millen ECO-90700

MAIL ORDERS: 25% Deposit, Balance C.O.D.

Federated Purchaser
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there are a few important points which should be mentioned in connection with the dealer's relations with his customers. For one thing, a great many customers will probably want to buy on credit. Arrangements should be made well in advance so that when this type of request is made a complete and definite plan for handling such extensions of credit can be laid before the customer.

Another point which looms large in the customer's mind is that of promises made and kept. Don't tell your customer that a product will be delivered, serviced, etc. or that one of your employees will call at a certain time unless you are prepared to fulfill that promise 100%.

Be sure every item that you sell is properly installed and is in perfect working condition before you consider the transaction concluded. New merchandise which needs demonstration, such as ranges, refrigerators, certain radios, etc. should be explained and operated in the customer's home after installation in order to insure that the housewife or member of the family who will use the equipment is thoroughly familiar with the item. It is well to make a "follow-up" call or visit a week or ten days after the installation has been completed in order to intercept any complaints at the source and make the correction. Bad news travels fast and a customer who is dissatisfied with merchandise bought at your store is a carrier of ill tidings for your reputation.

When it becomes necessary to service merchandise which you have sold

Photo Credits

Pages	Credit
35 (top)	Lake Carriers Assn.
35	Raytheon
36	Sperry Gyroscopic
37, 145	Westinghouse
38	General Electric
40, 41	Federal Telephone & Radio Corp.
42, 43, 53	Arthur Haug, Staff Photographer
49 (bottom)	Walter Steinhard, Staff Photographer
52	National Radio Service
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58 (top right), 59 (right)	U. S. Navy
60, 61	Packard-Bell
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104	Barker Brothers
122	Acme
125	Sun Radio & Electronics Co.
140	Sylvania Electric Products Inc.
Cover	Allied Advtr. Agency, Inc.

to the customer, be sure that the best possible job is done on the unit; that it is operating satisfactorily, and that it is re-installed carefully and promptly.

Finally, a very small but important item. Customers who come into the store and buy small items which they propose to carry with them will appreciate receiving well-wrapped parcels. If you are handing good-looking packages to your customers to carry, you can earn an extra measure of free advertising by using distinctive paper which will tell the world at large that the item was purchased at your store.

In the last analysis, the best advertising that a dealer can receive is "word of mouth advertising." You can't gain a worthwhile reputation without working for it. By following the suggestions included in this article you have started on the road to becoming a successful business man because the principles stated are as old as successful business.

-30-

RCA's newly developed mobile television unit has been designed to facilitate news coverage and other remote pickup operations. This unit is mounted on a standard 1½ ton truck chassis, and can be used to transport all the equipment necessary for picking up, monitoring, and relaying remote television events to the studio. Mounted in the rear of the vehicle, facing two large shatterproof windows, is a specially constructed operating desk for the monitoring, control, and power supplies used with the Image Orthicon Camera. Immediately below the rear windows are six cable reels mounted on crane-like arms to permit easy winding and unwinding of camera cable. The roof of the unit is reinforced.



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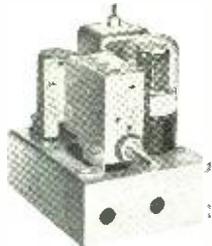
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—SET BUILDERS— TWO-TUBE SUPER HET KIT

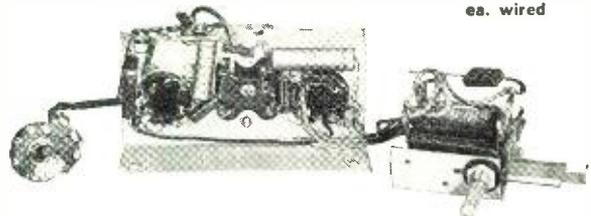


Upright model

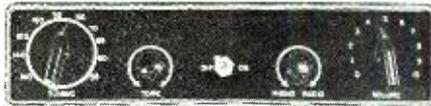
Completely wired ready to connect into any AC-DC or 6 volt filament with 125 V or more B supply —plate current drains—2 mls

High gain and selectivity—plays with 6 ft. of wire —excellent for PA systems, radio tuners and for making combination kits for set builders—tunes poice calls

\$7.95
ea.
unwired
\$9.95
ea. wired



Laydown model where space is essential



Escutcheon plate with knobs as illustrated goes with each unit—wired or unwired.

Consists of:

- 1 312-1 Perm. Tuners
- 1 322-2 I.F. Coils
- 1 263-5034-4 Tub. Cond. .05 mfd.
- 2 263-1034-5 Tub. Cond. .01 mfd.
- 1 232-2515-2 Mica Cond. 250 mfd.
- 1 232-5015-4 Mica Cond. 470 mfd.
- 1 232-5015-3 Mica Cond. 500 mfd.
- 1 111-22312 1/2 W. C a r b. Resistor. 22 K
- 1 111-33512 1/2 W. C a r b. Resistor. 3.3M
- 1 111-10612 1/2 W. C a r b. Resistor. 10M
- 1 111-27412 1/2 W. C a r b. Resistor. 270K
- 2 558-1 Octal Sockets
- 2 727A1 Tube Shields
- 1 571-3 Tube Clips
- 1 chassis
- 1 12SA7
- 1 12S07
- 1 Vol. Control
- 1 phono switch
- 1 on-off switch
- 2 knobs
- 1 escutcheon plate

Quantity unlimited

20% deposit with orders

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Immediate delivery. Dept. A

U. S. SIGNAL CORPS 2-WAY TALKING SYSTEM

Western Electric product. Use them for inter-office communication, house to garage, living room to baby's room, on the farm, and many other places. Sensitive enough to pick up baby's whimper. Sturdy all-steel construction. Has push-to-talk switch, built-in speaker, 5Y3-6SJ7-6K6 tubes. The small unit is a speaker-receiver. Connect as many as 10 speakers in parallel. Comes ready to operate. 100 ft. of speaker cable supplied. Complete with master speaker-receiver



\$32.50
\$4.95

Extra speaker-receiver unit



RADIO PARTS ASSORTMENT

Hundreds of valuable and useful radio parts. Transformers, coils, condensers, wire, sockets, etc., etc.

A Better Buy
10 lbs. \$1.69



BROADCAST BAND CONVERTER

100 KC to 1550 KC

For owners of Army-Navy surplus receivers. Adapter supplied uses a 6SA7 tube mixer-oscillator. Beats BC signal against 3 Megs. Tune in on short wave. Tested with BC-312, 342, NC100-ASD, BC-348 and others. In ordering state model.

\$1.50



SPECIALS

- BC-312, 342 I.F. Crystal Transformer, resonant at 470 KC. Replace that 1st I.F. with this unit and separate those crowded ham-bands **\$ 6.49**
- Double Button Mike-to-Grid Trans. **.59**
- Kit of 10 R.F. & Osc. Coils. **.98**
- Pwr-Trans. 350-0-350, 60 Mils, 6.3v @ 3a, 5v @ 2a **2.15**
- H-S-30 Hearing Aid type Head Phone—a close out **1.98**
- H-S-16 Noise-proof Headset—Superior. **2.98**
- RA-20 Power Supply—For Signal Corps Receiver BC-342. Replace battery pack on BC-312 to convert to 110v. AC operation. ... **14.89**
- Output Transformer—Pri. 10,000 Ohms, Sec. 4,000, 250, 4 Ohms. **.69**
- Tube Tester, Fil. Trans. All tubes. **1.98**

Cash, Check or M.O. Write Dept. N

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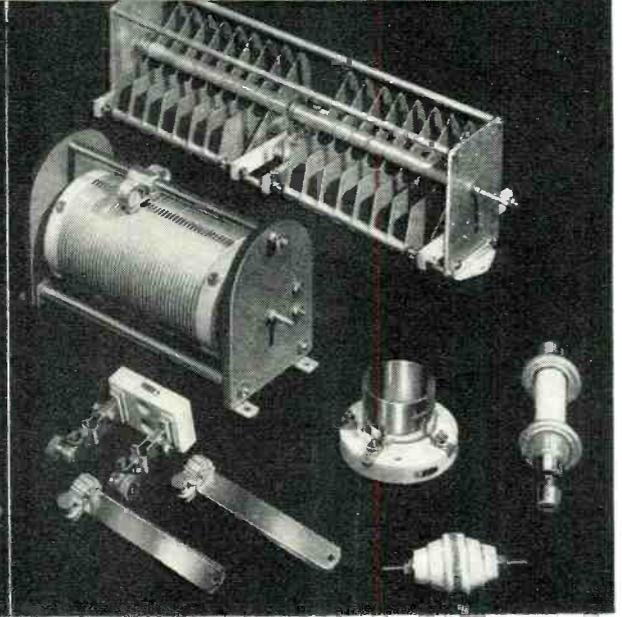
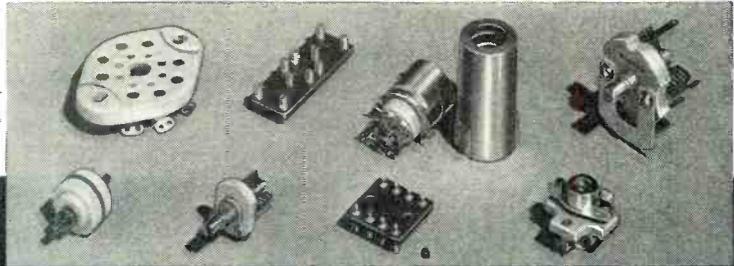
COMPONENTS

for the voice that

WHISPERS

for the voice that

SHOUTS



If you design or build electronic equipment no smaller than a handy-talkie, no larger than a 50 KW transmitter there are JOHNSON components "your size." Many of the small parts above find application in circuits operating at battery voltages. The miniature socket for instance is a modification of a predecessor that floated down over Europe in a handy-talkie with the paratroopers. They're catalog items with the exception of the terminal boards which typify JOHNSON ability to manufacture special assemblies quickly, easily and economically. The miniature condenser is an inch and half overall, has .015" spacing,

12 mmf. maximum and 3 mmf. minimum capacity. On the large side of the condenser family are the pressurized nitrogen-dielectric condensers offering RMS voltage ratings to 30,000 V capacities to 10,000 mmf., and highest capacity to mounting space ratios. Similar comparisons might be made with the other JOHNSON components.

Between the large and small above there's a big JOHNSON line from which to choose. Check the list below for parts you need. You'll find them carefully designed, skillfully manufactured. For more information write department Z today.

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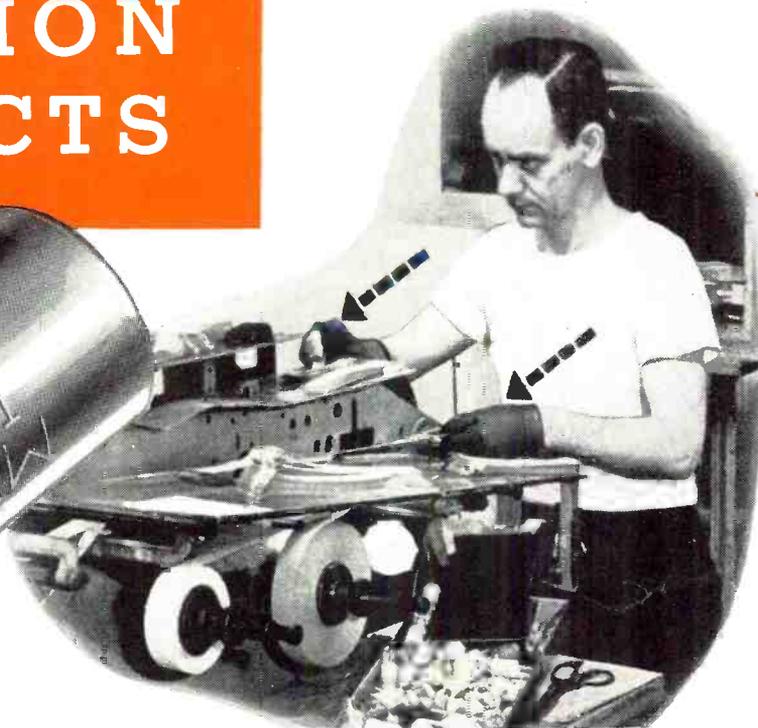
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RADIO NEWS

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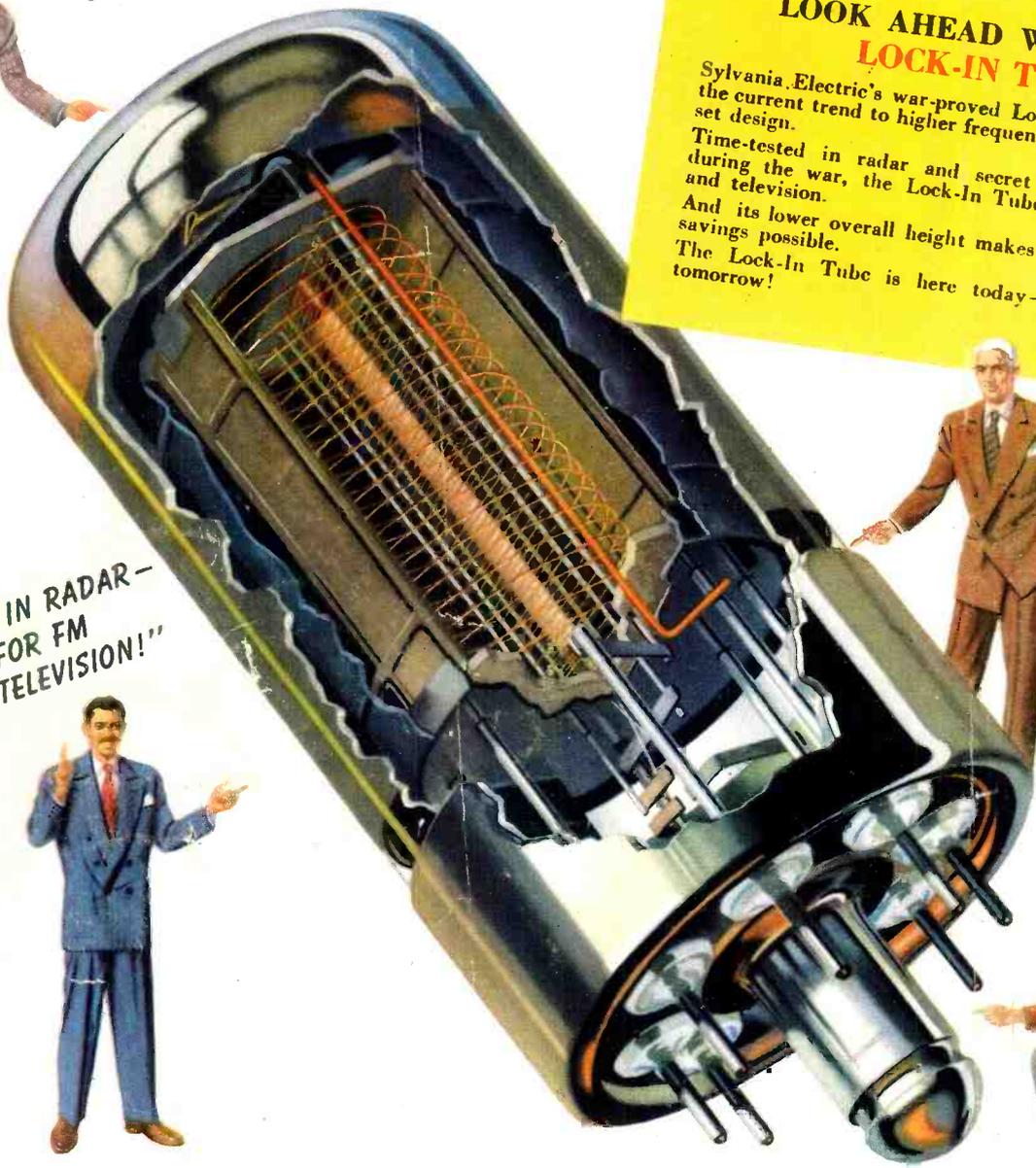
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