

RADIO NEWS

725-307
transmitter.
Beginners Xmas
Universal with
that new.
Phono Acc.

JUNE
1947
35¢



RN-57-J60789-48
LAURENCE THORSON
DALLAS WIS

RADIO-RADAR ON THE QUEEN ELIZABETH e 41

Like having an **EXTRA MAN** in your shop

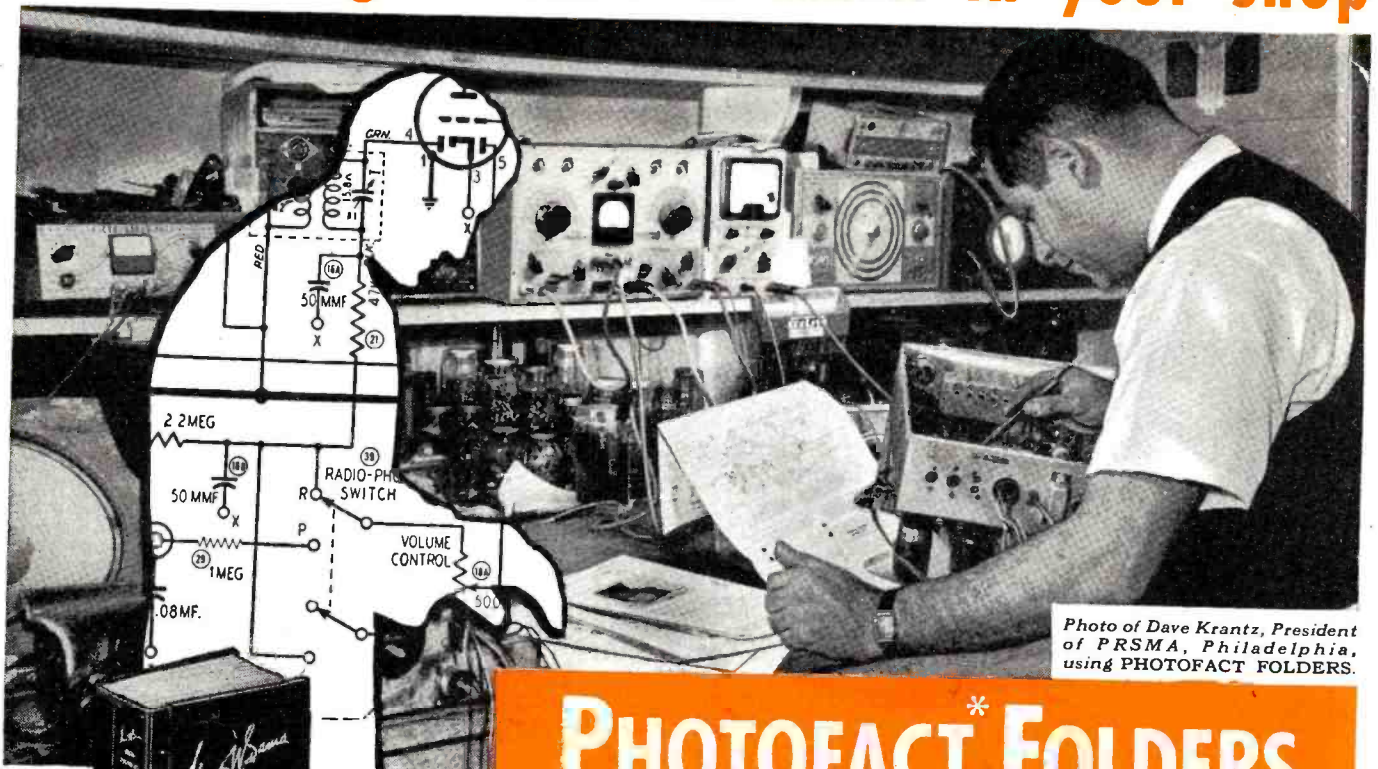


Photo of Dave Krantz, President of PRSMA, Philadelphia, using PHOTOFAC FOLDERS.



VOLUME 1, containing first ten sets of PHOTOFAC FOLDERS in de luxe binder, \$18.39. Individual sets Nos. 1 to 10, \$1.50 each. De Luxe Binder alone, \$3.39.

PHOTOFAC^{*} FOLDERS
 HELP YOU EARN MORE MONEY...
Cost less than 9¢ a day

COMPLETE ✓

Everything you need in one handy, unified form—large schematics, pictorials keyed to parts lists and alignment data, complete listings of parts values and replacements, alignment, stage gain, circuit voltage and resistance analysis, *coil resistances*, dial cord stringing, disassembly instructions, record changer analysis and repair.

ACCURATE ✓

All sets are actually taken apart and analyzed by experts in the Sams laboratories. Every part is measured, tested and triple-checked for accuracy. All data is original. This means the data you get is *right*.

CORRECT ✓

PHOTOFAC FOLDERS are issued twice monthly, as the new receivers come off production lines. You don't have to wait for information. As receiver changes are made, you get correction and addition sheets for your files. Your data is always up to the minute.

READY TO USE ✓

All diagrams and pictures are coded to numbered parts lists. Everything is positively identified for fast work. All folders are set up in uniform, easy-to-follow style: big type, big illustrations—no hunting, guessing or eye strain—no more loss of time and temper.

"Like having an extra man in my shop" . . . "The kind of 'specialist I need" . . . that's what hundreds of radio servicemen say about PHOTOFAC FOLDERS. Yet this indispensable "hired help" actually costs less than 9 cents a day!

Here are the straight facts: PHOTOFAC FOLDERS offer the best information ever prepared for radio servicemen—complete, accurate, up-to-the-minute, easy to use. They save you hours of time and effort because they place at your fingertips ALL the information you need to do a better job. And that means you can earn MORE MONEY.

The information in PHOTOFAC FOLDERS is *right* because it is based on actual analysis of sample sets right in our own laboratories. It is complete and current, too, because it covers all radios, phonographs, record changers, recorders, communications systems and power amplifiers as they reach the market.

PHOTOFAC FOLDERS come to you in sets of 30 to 50 at only \$1.50 per set. Low as this price is, it also includes membership in the Howard W. Sams Institute.

Set No. 19 will be ready for mailing May 10th. Set No. 20 on May 25th. Sets Nos. 11 to 18 inclusive, also priced at \$1.50 each, are available for immediate order.

Actually, PHOTOFAC FOLDERS cost you nothing since they pay for themselves again and again. They're ready to help you now—at the most difficult time in servicing history. See your distributor or write us today. In Canada, address A. C. Simmonds & Sons, 301 King Street East, Toronto, Ontario.

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PHOTOFAC SERVICE

"The service that pays for itself over and over again"



KIT 1 (left) I send you Soldering Equipment and Radio Parts; show you how to do Radio Soldering; how to mount and connect Radio parts; give you practical experience.

KIT 2 (left) Early in my course I show you how to build this N. R. I. Tester with parts I send. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.



VETERANS

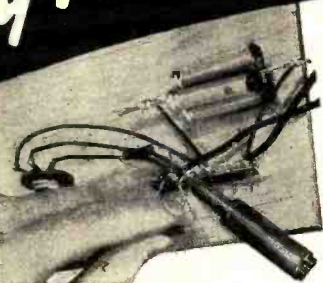
You can get this training in your own home under G. I. Bill. Mail coupon for full details.

Be a RADIO Technician

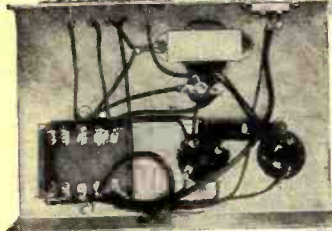
Learn by PRACTICING in Spare Time

with **BIG KITS** of **RADIO PARTS** I send you

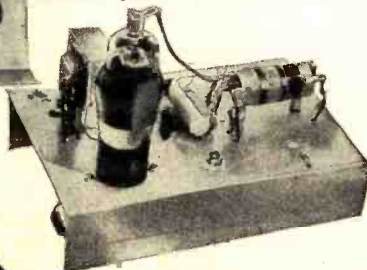
KIT 3 You get parts to build Radio Circuits; then test them; see how they work, learn how to design special circuits; how to locate and repair circuit defects.



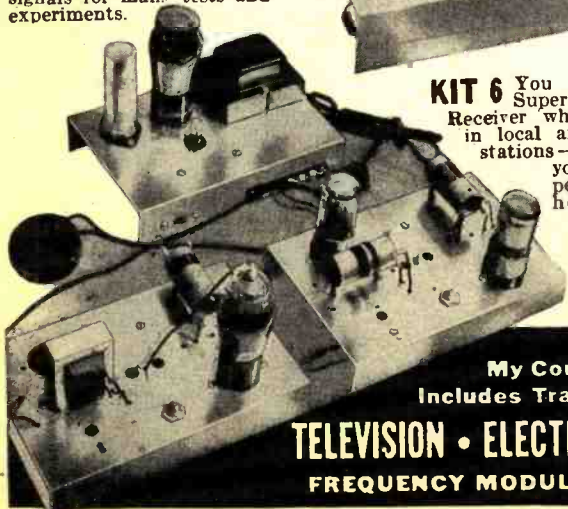
KIT 4 You get parts to build this Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds; learn to correct power pack troubles.



KIT 5 Building this A. M. Signal Generator gives you more valuable experience. It provides amplitude-modulated signals for many tests and experiments.



KIT 6 You build this Superheterodyne Receiver which brings in local and distant stations—and gives you more experience to help you win success in Radio.



My Course Includes Training in **TELEVISION • ELECTRONICS**
FREQUENCY MODULATION

Do you want a good-pay job in the fast-growing Radio Industry—or your own Radio Shop? Mail the Coupon for a Sample Lesson and my 64-page book, "How to Be a Success in Radio-Television-Electronics," both FREE. See how I will train you at home—how you get practical Radio experience building, testing Radio circuits with **BIG KITS OF PARTS** I send!

Many Beginners Soon Make Extra Money in Spare Time While Learning

The day you enroll I start sending **EXTRA MONEY JOB SHEETS** that show how to make **EXTRA** money fixing neighbors' Radios in spare time while still learning! It's probably easier to get started now than ever before, because the Radio Repair Business is booming. Trained Radio Technicians also find profitable opportunities in Police, Aviation, Marine Radio, Broadcasting, Radio Manufacturing, Public Address work. Think of even greater opportunities as Television, FM, and Electronic devices become available to the public! Send for **FREE** books now!



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Mail Coupon for Sample Lesson and my **FREE** 64-page book. Read the details about my Course; letters from men I trained; see how quickly, easily you can get started. No obligation! Just **MAIL COUPON** NOW in envelope or paste on penny postal. **J. E. SMITH, President, Dept. 7FR, National Radio Institute, Pioneer Home Study Radio School, Washington 9, D. C.**

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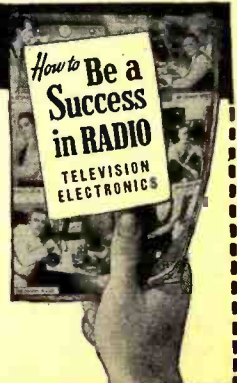
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THE COVER: A portable adds vacation enjoyment whether traveling on the "Queen Elizabeth" or by bus. This Lewyt portable is housed in a plastic case with special easy-carrying handle. Photo by Walter Steinhard.

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RADIO NEWS

First in radio-electronics

Average Paid Circulation over 135,000

Reg. U. S. Pat. Off.

JUNE, 1947

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ZIFF-DAVIS PUBLISHING COMPANY
185 North Wabash Ave., Chicago 1, Ill.
VOLUME 37 • NUMBER 6



Member
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RADIO NEWS is published monthly by the Ziff-Davis Publishing Company, 185 N. Wabash Ave., Chicago 1, Ill. Subscription Rates: in U.S. and Canada \$4.00 (12 issues), single copies 35 cents; in Mexico, South and Central America, and U.S. Possessions, \$4.00 (12 issues); in British Empire, \$5.00 (12 issues)—all other foreign countries \$5.00 (12 issues). Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Entered as second class matter at the Post Office Dept., Ottawa, Canada. Contributors should retain a copy of contributions and include return postage. Contributions will be handled with reasonable care but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever revisions and by-line changes that are necessary. Payment made at our current rates, covers all authors', contributors', or contestants' rights, title, and interest in and to accepted material, including photos and drawings.

RADIO NEWS

Going places
(AGAIN)

hallicrafters



Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio equipped expedition to the Mountains of the Moon in deepest Africa—a new and exciting test for the ingenuity of hams and the performance of Hallicrafters equipment.

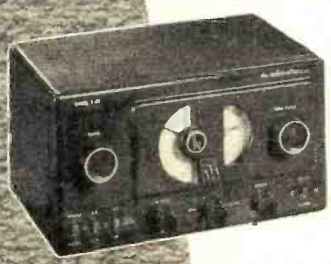
3 GREAT RECEIVERS designed and priced for hams who are going places, too



Model SX-42 Described by hams who have operated it as "the first real postwar receiver." One of the finest CW receivers yet developed. Greatest continuous frequency coverage of any communications receiver—from 540 kc to 110 Mc, in six bands. FM-AM-CW. 15 tubes. Matching speakers available. **\$27500**

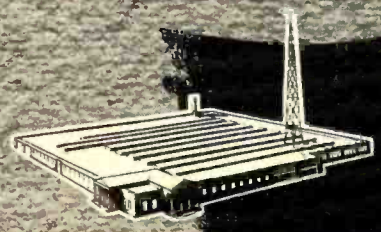


Model S-40A Function, beauty, unusual radio performance and reasonable price are all combined in this fine receiver. Overall frequency range from 540 kc to 43 Mc, in four bands. Nine tubes. Built-in dynamic speaker. Many circuit refinements never before available in medium price class. **\$8950**



Model S-38 Overall frequency range from 540 kc to 32 Mc, in four bands. Self contained speaker. Compact and rugged, high performance at a low price. Makes an ideal standby receiver for hams. CW pitch control is adjustable from front panel. Automatic noise limiter. **\$4750**

Prices slightly higher in zone 2



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The new 9728-410P high voltage AN connector insert, newest addition to the Amphenol family. It is one of more than 200 types available for use with the five basic shells shown.

AN AMPHENOL EXCLUSIVE

Non-rotating solder terminals and aligned solder wells

Amphenol terminals do not rotate, and they are properly aligned for fast, easy soldering. Ask the men on your production line how many hours a day this feature will save. Other exclusive features of Amphenol AN connectors will be described in a later issue.

How **AMPHENOL** AN Connectors

Step Up Your Profit Potential

Standardized AN connectors provide a fast, fool-proof way to connect any industrial electronic equipment which frequently must be disconnected from associated equipment or power source.

Their use also permits the prefabrication of associated wiring to accommodate one or many circuits. This greatly simplifies and lowers the cost of electronic installations. AN connectors also permit such equipment to be completely tested at the factory before shipment to user. Upon arrival it then can be connected for operation in minutes.

These advantages combine to widen the field in which electronics may practicably be applied. Thus they offer an increased sales and profit potential to makers of electronic devices.

The Amphenol AN connector family offers you a number of important points of mechanical and electrical superiority. It is comprised of over 200 styles of dielectric inserts. These are interchange-

able in any of the five major Amphenol metal shell designs (each of which is available in eighteen sizes). The practically endless variety of possible combinations offers an efficient solution to any industrial electronic connector problem.

Amphenol inserts handle currents up to 200 amperes, voltages up to 22,000. Housings include types which are pressure-proof, moisture-proof and explosion proof. Standard elements also are available for thermocouple installations.

Amphenol, long the leading builder of AN connectors for aircraft, ships, tanks and ordnance, is still completely tooled for large scale production. This makes these connectors available to industry at costs far below prewar levels. Write today for complete technical and cost data.

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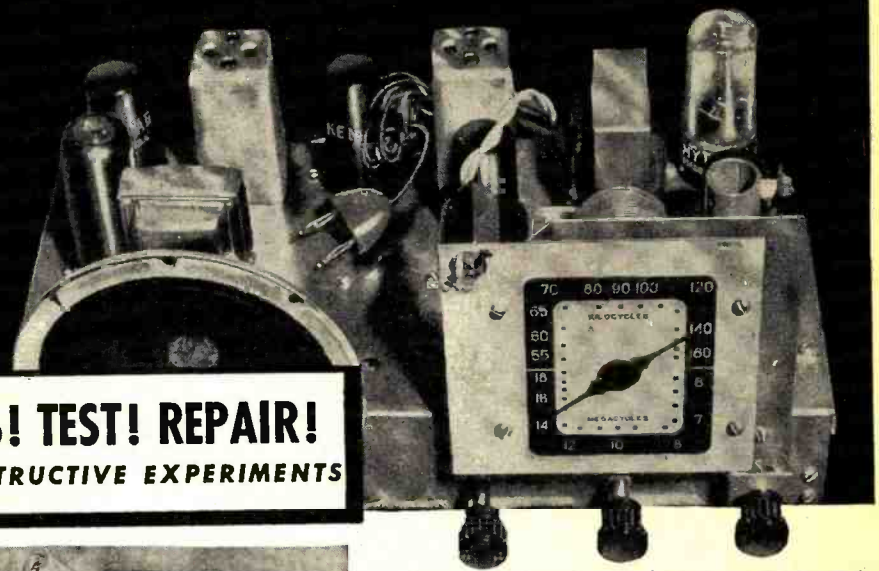
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LEARN HOW TO BUILD CIRCUITS! TEST! REPAIR!
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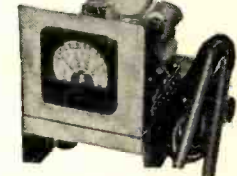


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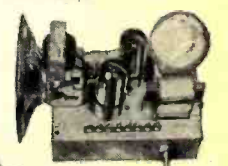
I train your mind by putting you to work with your hands on a big 6-Tube Superheterodyne Receiver. And, believe me, when you get busy with real Radio Parts — 8 big Kits of them — you really LEARN Radio and learn it RIGHT! You get the practical stuff you need to be useful in Radio, and that's what it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

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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.

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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.



Soldering, wiring, connecting Radio parts . . . building circuits — 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.

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.



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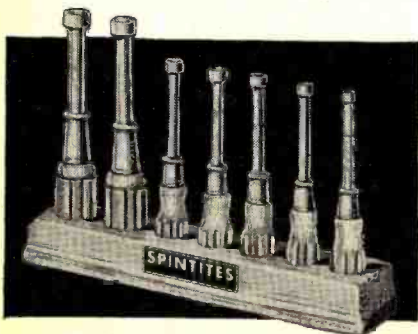
PARTNERS IN TIME!

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
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For the RECORD.

BY THE EDITOR

TELEVISION as an entertainment medium is still fighting many obstacles lying in the path to its success. Although the production of TV receivers is going on at a rapid pace, the fact remains that widespread acceptance is being delayed because of the terrific selling price of these receivers.

Many thousands of new television sets have now been installed in Chicago, Philadelphia, New York, Los Angeles and other metropolitan centers but in nearly all cases receivers adorn the living rooms of people having high incomes. In other words, the class of people that can afford to buy television sets are those who stay at home the least. As far as the advertiser or sponsor of TV programs is concerned, there is little, if any, advertising opportunity for products for widespread sale in this market.

In the early days of radio everyone, regardless of income, had the necessary cash to either build or buy a crystal set or tube receiver. This new means of entertainment provided a mass market for the sale of goods. Radio sets were cheap and were therefore enjoyed by all. Television sets, on the other hand, are being purchased only by a small percentage of potential televisioners.

As one Eastern executive recently pointed out, most of the sets are going to highly sophisticated groups who expect the best and can pay for the best. This applies to all forms of entertainment they buy including regular visits to swanky night spots, etc. It is to television's disadvantage, therefore, that this class represents radio's poorest audience as they are definitely not radio fans. They seldom, if ever, write letters to the sponsors either criticizing or praising their programs. They are so accustomed to the most expensive forms of entertainment that television leaves them rather dissatisfied after the novelty wears off.

It is a well known fact that mass acceptance of television is the key to much needed revenue for better television programming. Manufacturers cannot be blamed when they hesitate to sign up for a television show knowing, beyond a doubt, that their program will not be witnessed or heard by people who can afford to buy their products.

Television receivers will come down in price. In fact, they will be forced to drop even though the manufacturers today won't admit it.

We receive many letters every month asking for the design of a top-notch television receiver that can be built for less than \$100.00. Accordingly,

we are working with a top-flight television expert in an attempt to satisfy this need. After a careful study of existing picture tubes, we came to the conclusion that a 3" scope tube can and does give a clear, sharp picture that can be comfortably seen by several people in a dimmed room. Progress on this set, which can be made available in kit form, has substantiated our belief that hundreds of servicemen will be able to duplicate the original results had by the designer.

We expect to publish a complete "how to build it" article on this TV set in an early fall issue of RADIO NEWS.

We feel that this set will do much to encourage widespread acceptance of television as well as to tempt the manufacturers to produce simplified sets which, in turn, will contribute to a mass acceptance of television. But of equal importance will be the practical experience that servicemen will glean by actually constructing a workable unit. They will become familiar with the many intricacies present in so complicated a piece of electronic gear. They will learn how to handle high voltages with caution and, above all, they will be able to get the "feel" of servicing and aligning procedures.

We have said right along, and we repeat, there are literally hundreds of servicemen fully capable of taking care of television receivers when they finally reach the customer's home. In fact, a recent report from a reliable source says that one of the leading TV manufacturers, formerly very insistent upon their own factory service, are now planning to train and authorize their servicemen-dealers to handle the installation and maintenance of the product in their local communities.

THERE are still many millions of dollars worth of surplus electronic items remaining on the radio market. Some of these "surplus items" have considerable merit and are well adapted for use other than originally intended but in some cases suppliers have misrepresented their merchandise with the result that many individuals have made justifiable complaints.

It is impossible to evaluate all of the thousands of items now available. One case was called to our attention recently where a surplus house offered a transmitter-receiver (apparently new and complete) with no indication that the merchandise was not "ready to operate." There are many good buys in surplus equipment but—buy carefully O.R.



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Here's an entirely new, highly versatile, moderately priced communications receiver packed with all the advanced features most desired by every Amateur and SWL. The NC-173 offers complete coverage from 540 kc to 31 mc—with extended range of 48-56 mc for the Amateur 6-meter band. The skillfully engineered 13 tube circuit is designed for high stability, average sensitivity of 3 microvolts, 6 position selectivity and a new high in operating ease. Plus values: New "double-action" type double-diode noise limiter; panel trimmer for maximum performance with any antenna; 3.5 watt output with exceptional fidelity; signal level meter; accurately calibrated, easy-to-read main tuning and bandsread dials; provision for battery operation in emergencies. Housed in an attractive smooth gray metal cabinet of modern design, complete with tubes and 6" speaker **\$189⁵⁰** in matching cabinet. NET ONLY

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- Send full information on Communications Receivers and Time Payment Plan, without obligation.

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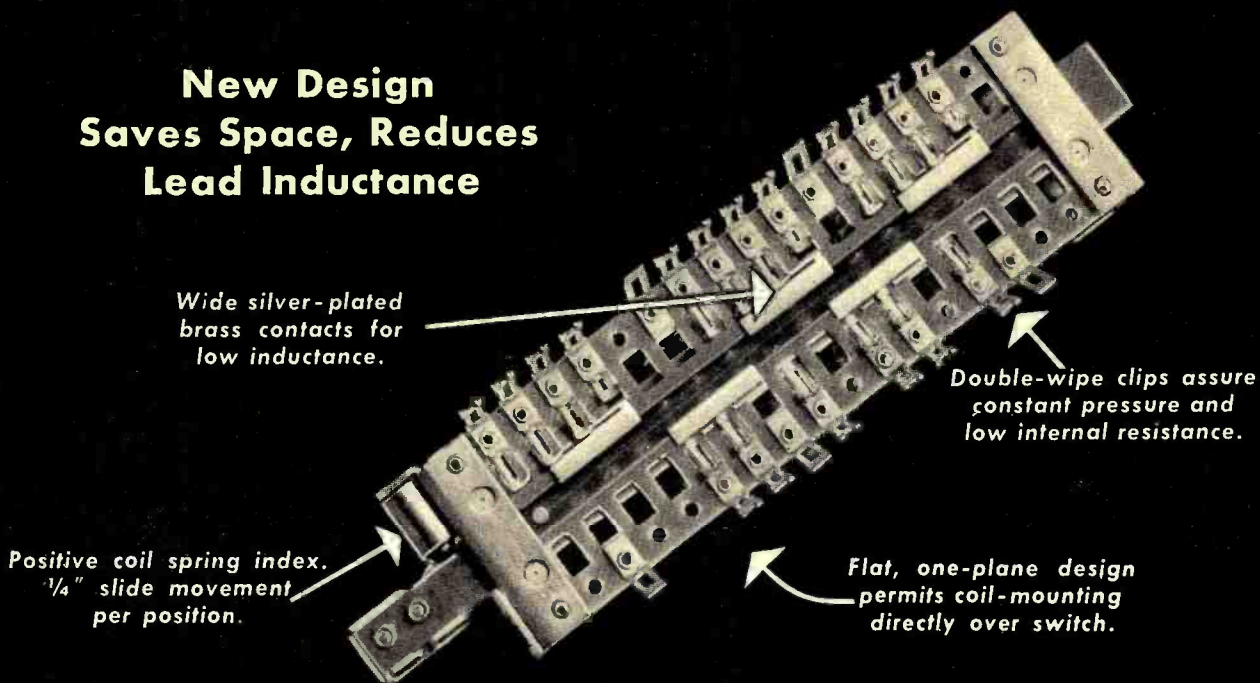
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Centralab Announces a Revolutionary New SLIDE SWITCH

for Improved AM and FM Performance!

New Design Saves Space, Reduces Lead Inductance



Compact, Versatile, fits wide range of high frequency operations!

TO MEET an ever-growing demand, Centralab now offers you an outstanding new slide switch, designed for peak AM and FM performance plus maximum reliability and long service life.

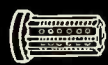
Flat, horizontal design saves valuable space, for the first time allows short leads, convenient location to coils, reduced lead inductances for new improved efficiency on low and high frequencies.

Note these fine points of construction and design: 4-point suspension with "twisted ear" mounting on base or panel from .038" min. to .052" max. . . . Optional size or length of unit — min. 5 clips per side, max. 20 clips per side . . . Standard brass silver-plated clips and contacts with original CRL double-wiping clip design . . . Index life — exceeds RMA standard 10,000 cycle minimum life test . . . 2 or 3 position, shorting type contacts . . . Movement of slide per position — $\frac{1}{4}$ inch.

Write for complete information on this important new switch development. Send for bulletin 953.



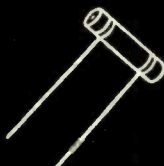
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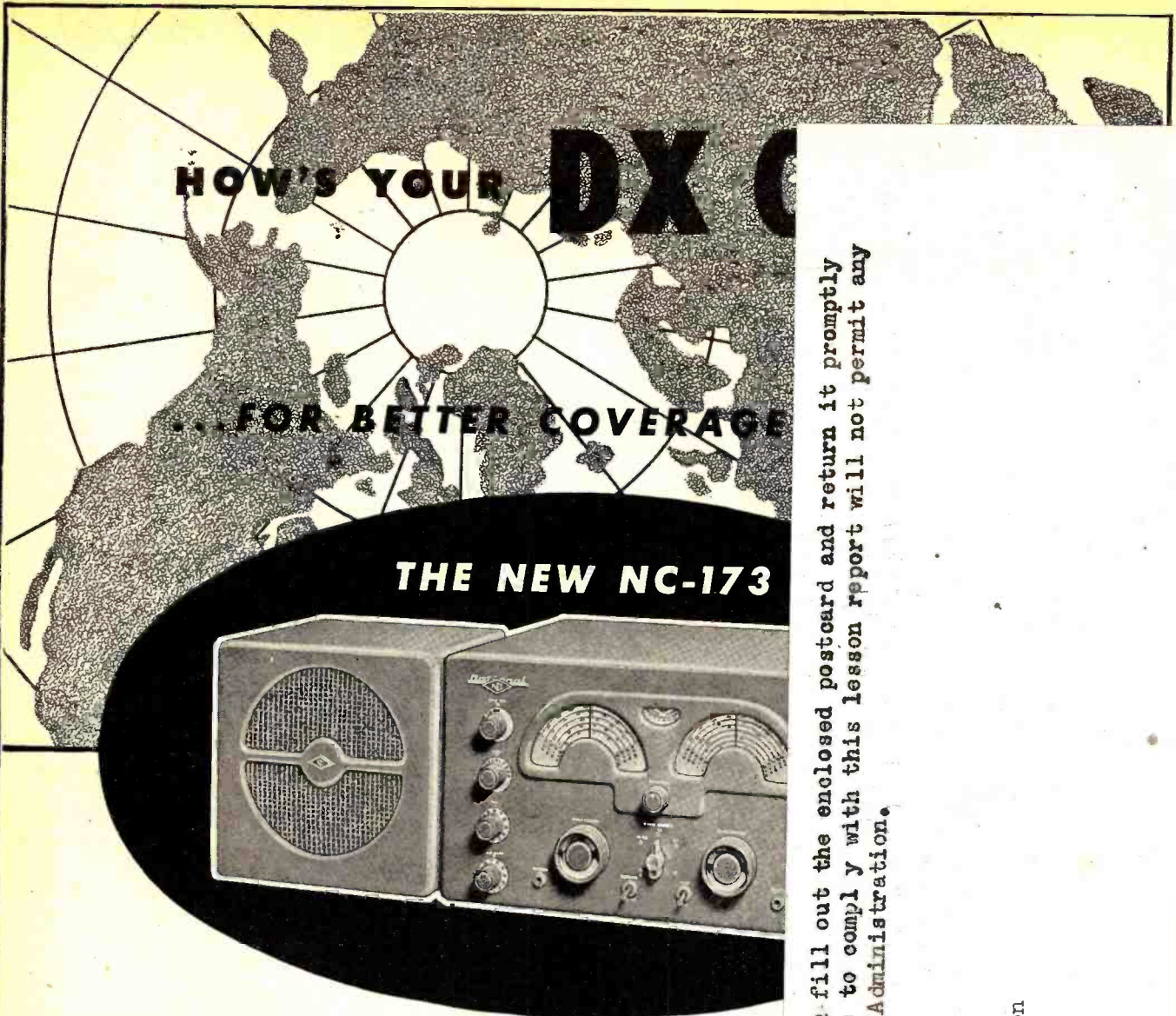
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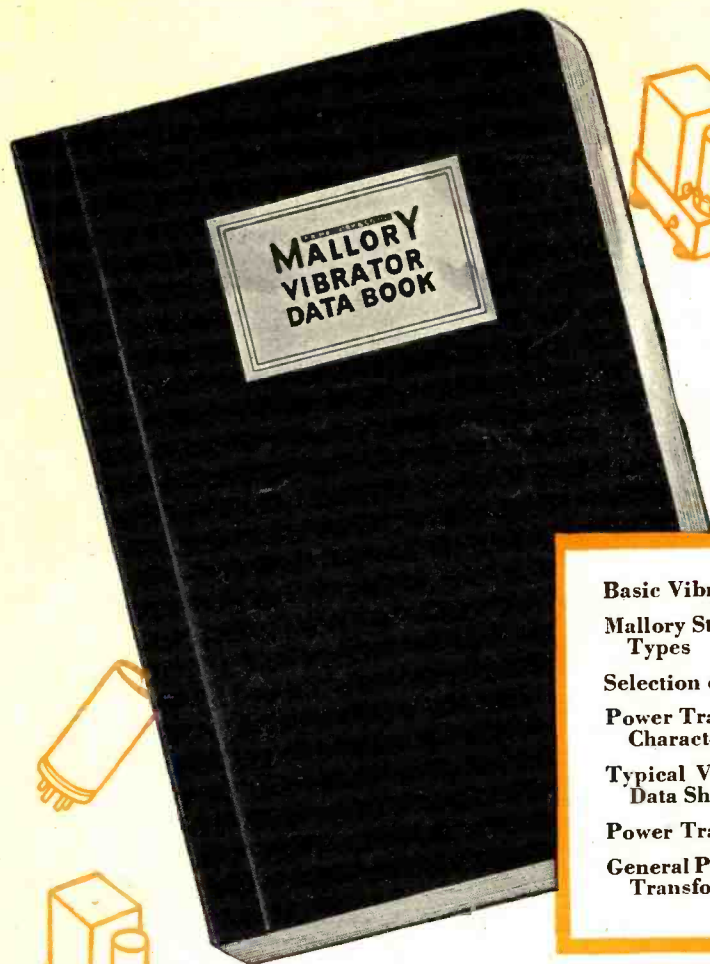
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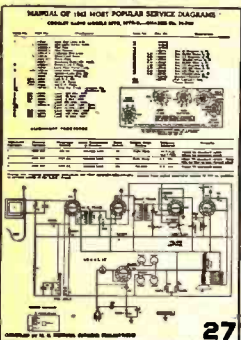
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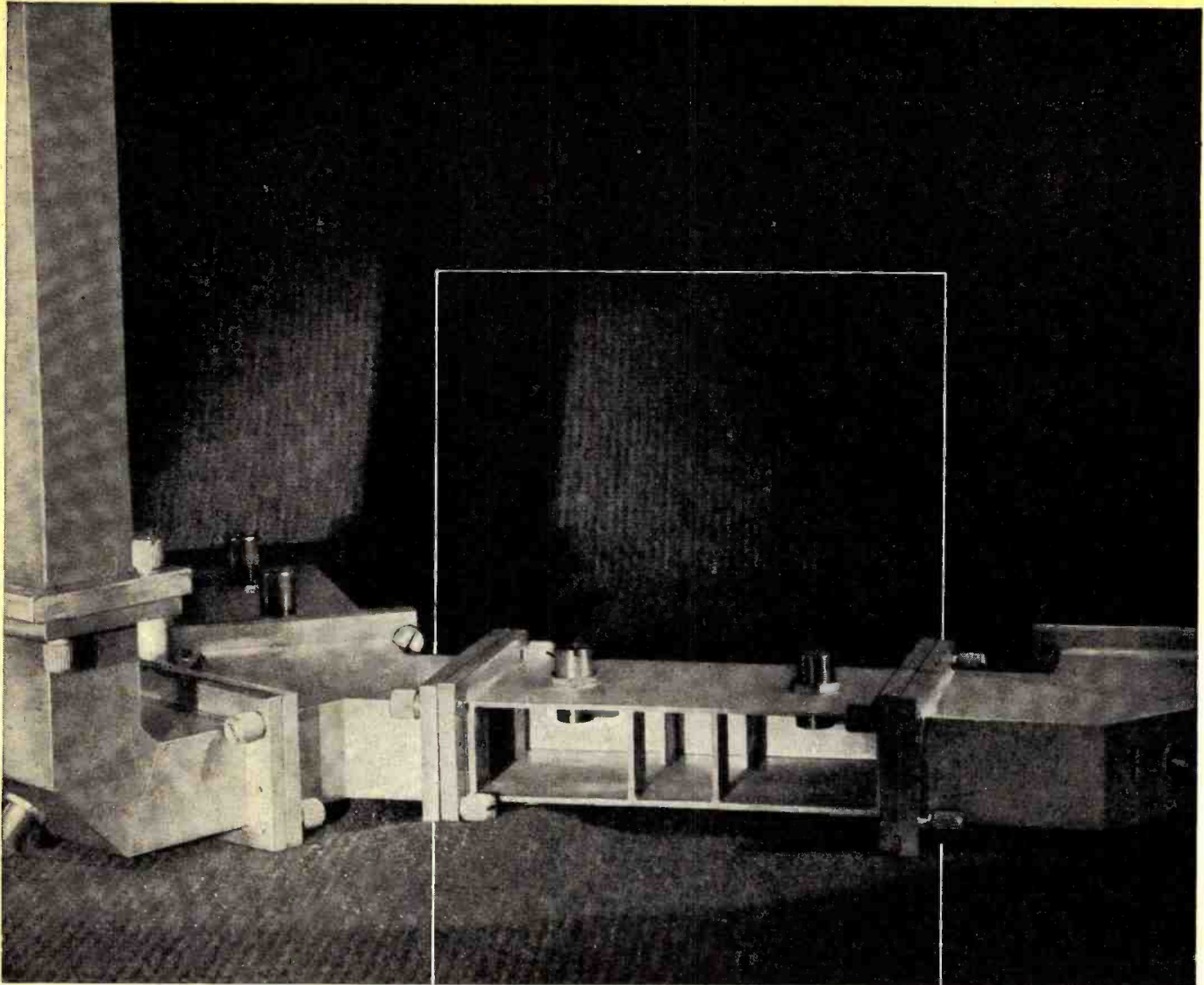
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The two filters in the picture (one with side cut away) are used to separate two radio channels coming in on the same antenna but on different frequencies. At the end of the connecting waveguide, the channels are made to part company, each going to a different circuit through its assigned filter.

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Thirty years ago, when all telephone service went by wire, Bell scientists developed means of sending dozens of conversations over the same line.

This they did by giving to each conversation a different *carrier frequency*; then to separate it from the others, they used a device which they had invented and named—the *electric wave filter*.

Today, in microwave telephone systems, the message-bearing waves pass to and from the antenna in pipes called waveguides. So scientists in Bell

Laboratories devised a different kind of filter—a filter in a waveguide. This filter is a system of electrically resonant cavities formed by walls and partitions. Waves that set up sympathetic vibrations in the cavities pass through; others are reflected.

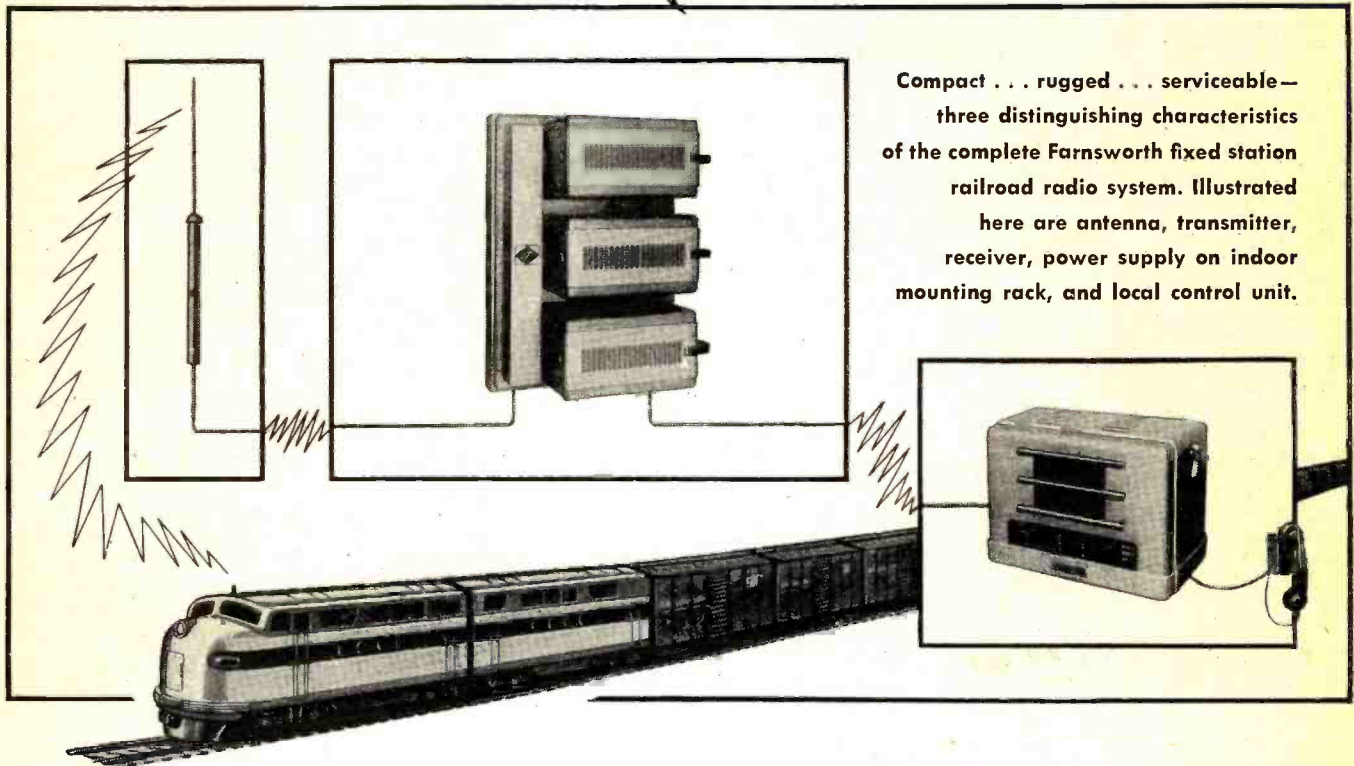
In the Bell System, now, single circuits are carrying many conversations at the same time through precision wave-filtering.



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Spot Radio News

★ Presenting latest information on the Radio Industry.

By **FRED HAMLIN**

Washington Editor, RADIO NEWS

WE FLEW all the way to Panama to get a couple of interviews with the boys who managed radio for the Navy's South Pole expedition, and whaddya think? We ran into one of the top men who told us he had joined the Navy in the first place as the result of an article he read in RADIO NEWS and is one of our constant readers. He is Lieut. Robert L. Nichols, formerly W9KXU, of Xenia, Ohio.

Lieut. Nichols, who became a ham in 1938, joined the Navy communications reserves after reading about them in RADIO NEWS in 1941. He was a radar expert with one of the first night fighter units in the Pacific, and in the fall of 1944 joined Squadron VFN 109 aboard the *USS Enterprise*—the first night fighter group to work from a flattop. With this outfit he was an airborne radar officer and saw action over Iwo Jima and Okinawa, among other hot spots. He was also at Bikini for the big bomb tests as an observer for the Airborne Coordination Group of the Naval Research Laboratory at Washington, D. C., his now permanent base, and became airborne electronics officer for the South Pole show, known in Navy circles as Operation Highjump.

NICHOLS REPORTS that he had fourteen men on his staff at Little America, and a lot of equipment. In order not to make tests under practical working conditions too fancy—one purpose of the expedition was to see how normal equipment would react under abnormal South Pole conditions—most of his equipment was strictly standard. Radio units installed included four or five sets of SCR 610's (FM) and the AM 694, both from the Army Signal Corps. Indeed, most sets used on the ice were of Signal Corps origin. The 694 was especially efficient, Lieut. Nichols says. It was used as the key equipment in communicating with ships standing-by off Little America to supply the ice-cap base and pick up personnel when exploration was completed.

THE SCR 610 is an FM transceiver and was the first to begin operation at the new base. Installed in a Navy weasel, it began portable operations as soon as it hit the ice and before the camp was completed. Only trouble encountered was a shortening of

the efficiency of its batteries owing to the unusual conditions. . . . Another movable that performed well was the SCR 536, better known as "handie-talkie," which saw some service, but not as much as might be expected. It had a maximum range of half a mile but since Little America was based on an ice cap extending scores of miles in all directions, hand signals were used more often than not. . . . Other equipment included the hand-generator transceiver SCR 694, the Navy TBW high- and low-frequency transmitter, two TCS high-and-low receivers, the high frequency AN/ART13 transmitters, used in the planes which based at Little America, and the v.h.f. transceiver AN/ARC-1. There were also RBC-2 and RBM-1 receivers to pick up long-distance stuff.

MAJOR TROUBLE ENCOUNTERED in the Antarctic was that installations were actually one hundred or more feet above the ground. Literally, you had to put them on ice. Result was that shielding was difficult, grounding impossible. Generators interfered constantly, sometimes with damaging effect. The noise level was high until batteries were substituted for generators wherever possible. Battery chargers were substituted, for instance, for d.c. motor generators. More elaborate shielding than normal was also used for the dynamotors.

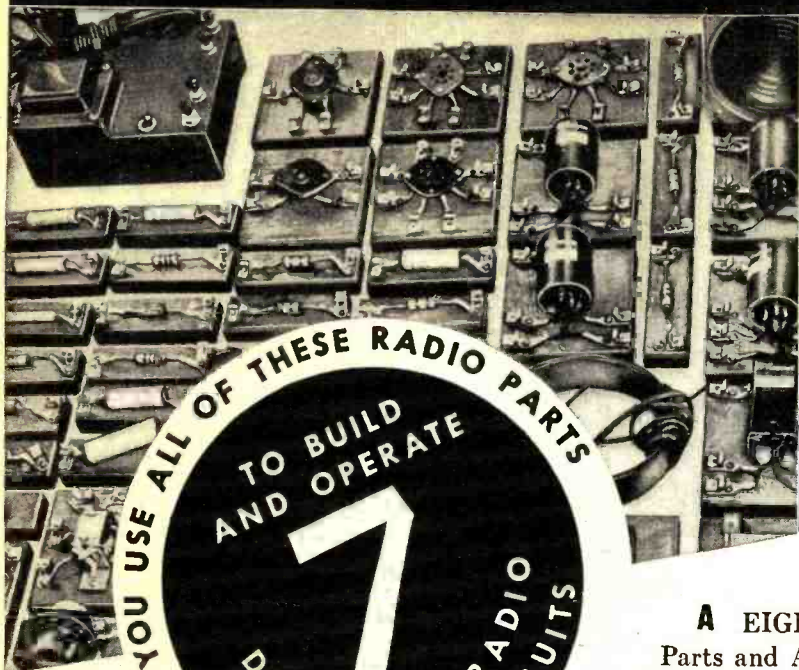
OTHERWISE TRANSMISSION was clear and the entire area practically static-free. Sun-spot silences were more frequent. The only additional major difference that Lieut. Nichols noted was that anything you did took more time. It was more difficult to start gas engines, getting from one place to another in the snow was tough, and warm clothing and gloves interfered with rapid-fire work. It follows that the lieutenant and his crew worked two 12-hour shifts and many of them were going eighteen or more. A couple of times, he worked clear around the clock. One thing that made you forget to go to bed was that it was daylight all the time. . . .

HAM RECEPTION at the South Pole, Lieut. Nichols reported, was "as clear as next door," and this was confirmed by another ham on the Highjump operation—Armory H. ("Bud")

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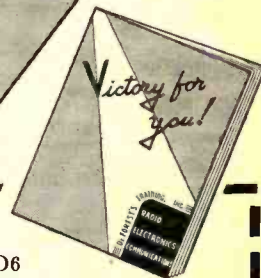
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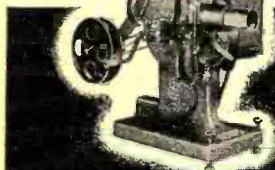


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SPOT RADIO NEWS

Waite, Jr. Mr. Waite was on the trip as a civilian observer for the Army Signal Corps, and it would have been difficult to pick a man with more experience. Formerly ham W2OAI (recently he's called at W2ZK) Waite joined the Navy in 1923 as a radio man and was with Byrd on the South Pole expedition in 1933-35, one of four operators who made the trip. In 1934 he ran "the world's southernmost station," KFY. He also tested winter equipment along the Alaskan highway in 1943 and set up facsimile and voice equipment for the invasion of France in 1944. Bud is a big anti-generator man himself as a result of his wide experience, but was along on the High-jump show only as an observer. He spent a lot of time at the 500-watt station two miles away from the main base and reports picking up anywhere you want to name with varying clarity. He logged more than a hundred ham stations during his stay.

RADAR AND V.H.F. were used for the first time in the Antarctic on the trip. Special airborne search radar was used on the twin-engine Douglas which flew from Little America. In the ships were v.h.f. receivers operating on a frequency of 140 mc., producing noise-free communications on line-of-sight ranges. Airborne also were radio altimeters and automatic direction finders. "Racon," portable radar beacons set up at either end of a runway which a radar operator in a plane picks up and uses to guide the pilot into the correct landing area when visibility is poor, was used, but only experimentally. It worked all right. So did another radar combination—dropping long strips of metalized paper "ropes" onto the ice and using the reflection obtained on the radar scope as a surveying marker. . . . All in all, radio worked successfully, and should prove a boon to future explorers of the Antarctic, according to these experts.

GETTING BACK to the U.S., latest word from the Federal Communications Commission is that the modified industry plan for short-distance mobile radio services, approved by FCC this spring, is being applied with apparent success. Although there are still some bugs in the program, FCC has allocated plenty of room for the units to operate. Other things being equal, the Commission predicts that everybody will get the service he wants as the program works out. A couple of words of warning were added, however; it will take about three years to get the program running smoothly all along the line; and certain short-distance services are still in an experimental stage.

BIGGEST BOTTLENECK in the program was awarding additional frequencies. This the FCC has broken. Modified assignment has been made of

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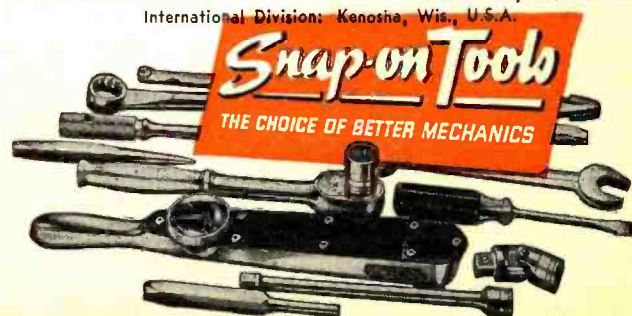
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136 already available frequencies in the band 30 to 40 megacycles for emergency and public utility short-distance communication, primarily to and from boats and vehicles. Police, forestry conservation services, fire departments, highway maintenance outfits, urban transit systems, vessels, busses, trucks and utilities will be among those benefiting by the allocations. FM will be favored to reduce receiver noise.

ALSO OKAYED are 166 additional frequencies higher in the spectrum—152 to 162 mc.—but here indications are that AM as well as FM will be used. AM works in these frequencies with almost a complete absence of natural static, electrical noise, and long-distance interference. Another important feature—a full sized antenna need be no longer than 18 inches. This is expected to prove a distinct advantage on both railroads and automobiles. . . . Although the FCC had previously allocated 60 of these 166 frequencies to the railroads, these 60 are now nailed down permanently for such use. Rails can therefore go ahead with long-term plans and a boom in railroad radio is expected to result.

FCC EMPHASIZED that while these frequencies are earmarked for "urban mobile" service, allocations to some specific services have not been permanently determined as this goes to press. Taxicab radio, and radio telephone service to automobiles, planes, and boats, for example, are still considered either experimental or developmental. Also the question of shared use of certain frequencies between relay broadcast stations and other classes of stations is a "matter of continued study." FCC will "discourage" any increase in "point-to-point radio stations operating on these frequencies to provide short-distance toll telephone service where wirelines are not available." The Commission adds that present installations of this type will be permitted to continue operation. But no new ones will be approved except "on such higher frequencies commonly termed microwaves." All new allocations became effective May 15.

SALES ARE BOOMING all along the radio front, according to latest word from the Radio Manufacturers Association. Significant because, by implication, it means that there will be a parallel demand for receiving sets, is the RMA survey indicating that manufacturers of broadcast transmitters received orders for \$26,476,087 worth of transmitter and studio equipment from broadcasters in 1946. A total of \$6,491,067 worth of orders were delivered. . . . The RMA survey, made among its members, showed that more than half of the orders, dollar-wise, were for AM stations. The rest were split evenly between FM and television. Sales billed for AM equipment

represented about three-fifths of the total deliveries, also dollar-wise, while total television sales exceeded those of FM stations. This is attributed to the higher cost of television transmitters.

LOOKING AHEAD RMA sees a record year for 1947 in set production. FM will play a leading role. Manufacturers are planning to produce approximately 2,600,000 FM receivers during the year. RMA's survey shows, although the majority will be AM-FM consoles due to higher FM manufacturing costs. The figure, it should be added, is a top estimate. A special RMA committee on FM takes a more cautious view, estimating that the production will be between 1,800,000 and 2,100,000. They explain the lower figures on the grounds that they anticipate production troubles before the end of the year. The Association confirmed FCC Chairman Charles R. Denny's forecast that there will be 700 FM stations on the air by the end of the year, and emphasized that radio manufacturers are as eager to keep production up with demand as are the broadcasters. But manufacturers must also serve the needs of AM broadcasters and their millions, it was pointed out. Publicity by some FM broadcasters advising listeners not to buy a radio set unless it has an FM band the manufacturers regard as "destructive to FM." Pointing out that it has taken some 25 years to develop today's AM programs and public, RMA stated that "it is obvious that the creation of such an audience for FM will take some time." Before that is accomplished, it will benefit both AM and FM if present AM listeners are given the best that the manufacturers can offer.

FM PRODUCTION, regardless of the round-figure predictions, is no cinch, the manufacturers emphasize. "Volume production of FM receivers takes plenty of engineering and production know-how," they state. "While the set manufacturer is integrating FM in his over-all program, he must maintain volume production in his plants to afford an FM organization. Without AM volume production, FM costs would be sky-high." Last year FM "lost millions of dollars" for manufacturers. Reconversion, supply shortages, and lack of trained labor tended to slow FM production. Improvements began showing early this year, and large-volume production is now well underway. . . . Breakdown of production trends indicates that biggest 1947 volume will be in AM-FM console models with phonographs—more than 1,500,000. Second largest volume will come in the AM-FM table models retailing over \$50—some 800,000. An estimated 43,000 AM-FM's will retail for less than \$50, and the rest of the total production will be covered by some 70,000 AM-FM consoles without phonographs. (Continued on page 154)

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KEN-RAD

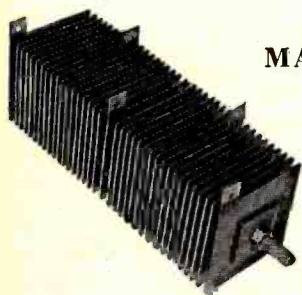
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cart, battery table, tools and instruction book—only \$149.50.



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A dependable instrument of wide utility—sensitivity 1000 ohms per volt. Ranges: Volts AC, DC, and Output Ranges, 0-10/50/100/500/1000; Ohms full scale, 500,000. Ohms center scale, 7200.

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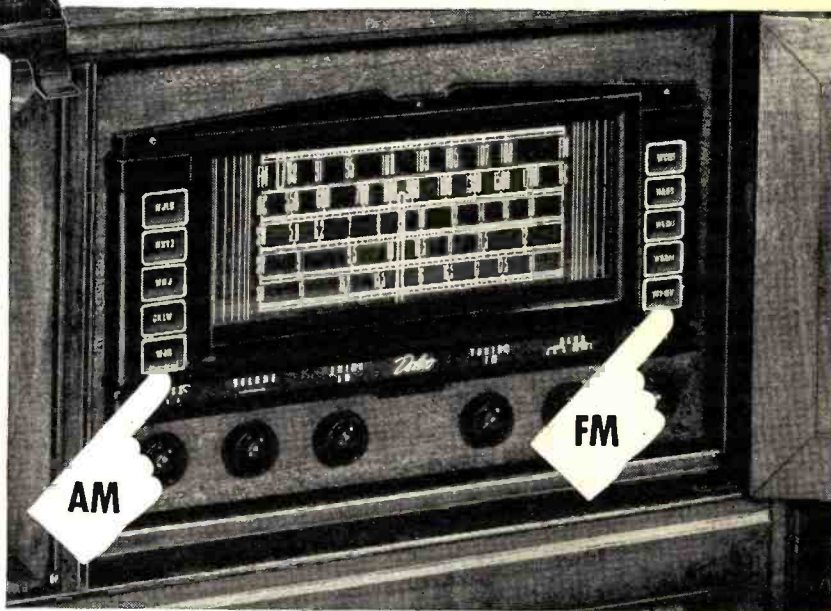
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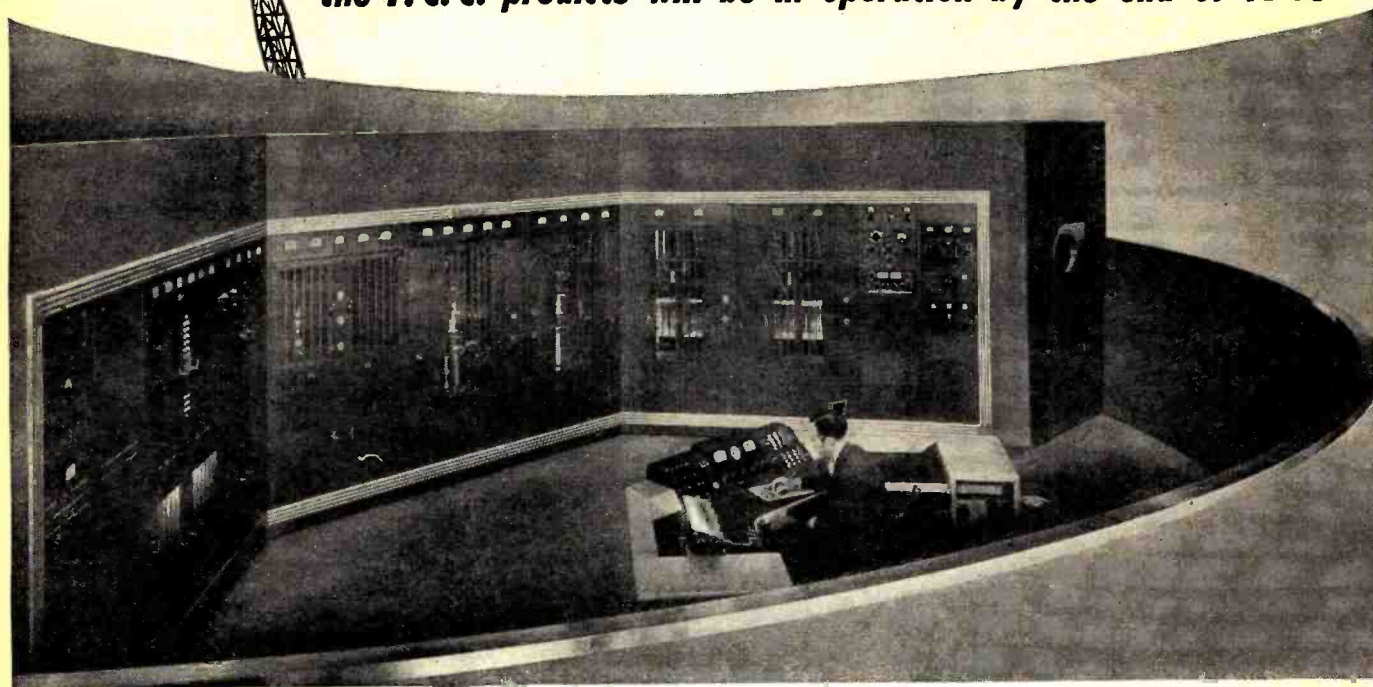
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FM is actually coming into its own this year . . . 700 new stations, says the F.C.C. Standard broadcast stations have already passed the 1200 mark. By next year there will be 3 times as many broadcasting stations (AM, FM and TV), as there were before the war. Television receivers are rolling off production lines.

Radio is not only expanding in job opportunities but it is also growing in technical complexity. Rapid developments in the field of radio-electronics are leaving many old-time radiomen far behind the parade. These are the men who fail to realize that their technical knowledge must grow with the expansion of radio itself.

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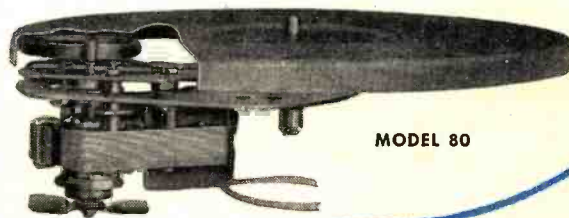
The famous Model 80 Even Speed Alliance Phonomotor operating on 110 or 200 volts is made for 40, 50 or 60 cycles, 16 watts input, 78 RPM. It has no gears—runs at an even speed—has a smooth, quiet, positive friction-rim drive. Amply proportioned bearings with large oil reservoirs assure long life. A slip-type fan gives cool operation—avoids any possible injury.

The Alliance Model K Phonomotor, a 25 cycle companion to the Model 80, operates on 110 volts, 25 cycles at 12 watt input. Motor and idler plate on Alliance phonomotors are all shock mounted to the cabinet mounting plate, to minimize vibration.

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—use *Alliance Motors* to drive vital component parts. Big advantages for the Alliance Powr-Pakt line are compactness, light weight, versatile performance characteristics, and *mass production* at low cost.

Alliance Powr-Pakt Motors are rated from less than 1/400th h. p. on up to 1/20th h. p. They'll supply just the *right amount of power at strategic points* to impart automatic action, instant control and greater usefulness for your products and processes.



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Within the
INDUSTRY

GARRARD MOUNTJOY has been named chief radio engineer for the *Stromberg-Carlson Company* of Rochester, New York.

Mr. Mountjoy formerly held the post of president of *Electronic Corporation of America* after heading the license consulting section of the *RCA* license laboratory.



During the war he assisted in the development of the loran system of navigation and other allied radar projects.

KENNETH C. PRINCE, executive secretary of the Association of Electronic Parts & Equipment Manufacturers, has announced that two Inter-Association Golf Tournaments have been scheduled for the Chicago area this year.

Reservations have been made with the Edgewood Valley Country Club to hold the first tournament on Friday, June 20th, while the second meet will be held at the Elmhurst Country Club on Friday, August 29th.

The tournaments are being sponsored by the Electronic Parts & Equipment Manufacturers, the Chicago Chapter of the National Electronic Distributors Association and the Chicago Chapter of "The Representatives" of Radio Parts Manufacturers, Inc.

EASTERN AMPLIFIER CORPORATION has announced several new appointments which are of interest to the trade.

S. K. Lackoff has joined the organization as chief engineer of the company while Gerson Lewis has been named executive assistant to Leon Alpert, vice-president and general manager of *Eastern*.

Walter B. La Chicotte will assist K. Streuber in the export division of the company.

SOLA ELECTRIC CO. has opened a New York sales office which is staffed with factory trained personnel and provides direct factory wire service.

The new sales office is located in the Hudson Terminal Building, Room 571, at 50 Church Street, New York 17, New York.

The company's plant is located in Chicago.

ALLIED CONTROL COMPANY, INC. of New York, manufacturers of relays, has sold its Chicago plant to the *General Transformer Company* and the

equipment and personal property to *S. L. Winternitz & Co.*

Allied relays will now be manufactured at the company plant in Plantsville, Conn., while sales will be handled from the present general sales offices located in New York City.

JOE MARTY, JR. has been named Manager of *Admiral Corporation's* Parts & Accessory Division.

In his new position, Mr. Marty will also act as assistant to Richard A. Graver, vice-president in charge of radio. For the past year, Mr. Marty has been serving as a field engineer for the company.

Prior to joining *Admiral* Mr. Marty was Associate Editor of *RADIO NEWS*. He was organizer and executive secretary of the Radio Servicemen of America, a national association of radio men.

B. C. LANDIS is *Solar Capacitor Sales Corp.'s* new industrial distributor representative in the metropolitan New York and northern New Jersey territory, according to a recent announcement.



Mr. Landis has been well known in the radio parts industry for the past 20 years, during 13 of which he was connected with the *Burgess Battery Company*. He has served as Eastern Division Manager for *Burgess* for the past seven years.

In his new position, Mr. Landis will maintain an office at 1472 Broadway, New York 10, New York.

J. O. SCHOCK has recently been appointed Sales Manager for *The Joyner Corporation*, Chicago manufacturers of a line of electrical and mechanical products and coils.

Mr. Schock is well known in Midwestern radio circles, having been a representative of the Navy Department to various manufacturers and component companies during the war.

He will maintain offices at the company's plant at 462 North Parkside Avenue, Chicago 44, Illinois.

SYLVANIA ELECTRIC PRODUCTS INC. has recently begun an intensive consumer advertising campaign on behalf of the radio servicemen in America and to stimulate the sale of replacement tubes for home receivers.

The campaign, which is sponsored by the Radio Tube Division of the company, will attempt to counteract

STANCOR

has the acceptance, the facilities and
the designs that make transformers
the profitable part of your business



THE NEW PLANT OF STANDARD TRANSFORMER CORPORATION
IN CHICAGO AT ELSTON, KEDZIE AND ADDISON



A. A. Ghirardi
POSITIVELY
GUARANTEES
to help you repair any
radio ever made **EASIER**
BETTER & FASTER

or refund every cent of your money!



GUARANTEED
TO HELP YOU LEARN
Professional RADIO-
ELECTRONIC REPAIR,
at home, without
an instructor

GUARANTEED
TO HELP YOU REPAIR 9
OUT OF 10 RADIO TROU-
BLES Twice as Fast, without
costly test equipment



THE ONLY COMPLETE, 1 VOL.
COURSE OF ITS KIND!

Once in a lifetime, a technical book is written that is so important, so complete and easy to understand that it is used almost universally by members of an entire profession—and Ghirardi's MODERN RADIO SERVICING is exactly that kind of a book. It gives a course in radio-electronic repair work by approved scientific methods. Included is a thorough explanation of Test Instruments, how they should be used and why—even how to build your own; Receiver Troubleshooting Procedure and Circuit Analysis; Testing and Repair of All Components; Installations; Adjustments, etc., etc.—also How to Start and Operate a Successful Radio-Electronic Service Business. 1300 pages. 706 helpful illustrations. Self-Test Review Questions with every chapter make study easy. Only \$5 complete (\$5.50 foreign).

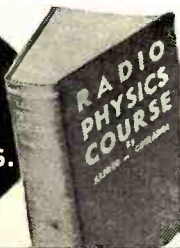
ELIMINATES USELESS TESTING

There's no magic about it! Just common sense! Over 400 pages of Ghirardi's 744-page RADIO TROUBLE-SHOOTER'S HANDBOOK contain tabulated and indexed listings of common trouble symptoms, their causes and remedies for almost every radio in use. Actually it gives specific trouble listings for over 4800 home receivers, auto radio and record changer models of 202 manufacturers! Just look up a defective radio's make and model. The HANDBOOK tells exactly what the trouble is likely to be—exactly how to fix it. 9 out of 10 jobs can be handled by this method—in 1/2 the usual time BECAUSE TEDIOUS TESTING IS ELIMINATED. Over 300 more pages contain service hints, alignment data, tube information, graphs, diagrams and charts to help you fix ANY RADIO EVER MADE in far less time and at greater profit! Only \$5 complete (\$5.50 foreign). 5-DAY MONEY-BACK GUARANTEE.

FOR BEGINNERS! . . . NO PREVIOUS EXPERIENCE NEEDED!

Sales records prove that more Radio-Electronic beginners have gotten their start from Ghirardi's 972-page RADIO PHYSICS COURSE than from any other book or course ever published. It's a complete radio course in book form—so head and shoulders above anything else that it is used as the basic text by thousands of students and by schools in 82 different countries of the world! Everything is explained as simply as A-B-C. Over 300 pages are devoted to Basic Electricity alone. 508 illustrations help you learn fast. \$5 (\$5.50 foreign).

GUARANTEED
TO HELP YOU LEARN
COMPLETE BASIC
RADIO-ELECTRONICS.
. . . for beginners!



Let Ghirardi's TROUBLESHOOTER'S HANDBOOK save you time on common radio service jobs! Let this MODERN RADIO SERVICING train you for complete, professional electronic work. Get BOTH BIG BOOKS at special price of only \$9.50 for the two. See coupon.

MAIL ORDER rush coupon!

Dept. RN-67, Murray Hill Books, Inc.
 232 Madison Ave., New York 16, N.Y.

- Enclosed find \$_____ for books checked; or send C.O.D. (no foreign C.O.D.'s) for this amount plus postage. It is understood I may return books for refund within 5 days if not fully satisfied.
- RADIO TROUBLESHOOTER'S HANDBOOK \$5 (\$5.50 foreign) MODERN RADIO SERVICING \$5 (\$5.50 foreign)
- MONEY-SAVING COMBINATION OFFER: Both of the above big books, only \$9.50 for the two (\$10.50 foreign).
- RADIO PHYSICS COURSE \$5 (\$5.50 foreign)

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

much of the unfavorable attention given the radio service industry by consumer magazines in the past.

* * *

COLLINS RADIO COMPANY of Cedar Rapids, Iowa, has completed installation of broadcast equipment for station KKLA, the new Los Angeles FM outlet.

Operating with a 10 kw. Collins transmitter, the new station, which is owned and operated by the Echo Park Evangelistic Association, will transmit on 93.7 mc. with an effective radiation power of 48 kw.

* * *

WILLIAM J. ROOKE has been named Director of the newly organized Service Department for the Hammarlund Mfg. Co. of New York.



This new service department supersedes the former repair department and is designed to extend field service to all parts of the country for hams and other users of the company's equipment.

Mr. Rooke, who served as a Lt. Commander in the South Seas during the war, is an old-time ham, having operated his own station, W2LC, in the Bronx since 1921. He served as commanding officer of a communications unit on Guadalcanal and was responsible for establishing radio transmitting equipment on enemy-held islands to guide fleets of navy and marine bombers.

Mr. Rooke will make his headquarters at the Hammarlund plant in New York City.

* * *

G. & E. EQUIPMENT SUPPLY has moved into their new quarters at Ogden Avenue and Fulton Street in Chicago.

Their new location will provide 20,000 square feet for the display and merchandising of refrigerators, electrical and radio parts.

* * *

INSULINE CORPORATION OF AMERICA has recently extended its manufacturing activities to Canada with the opening of their new branch plant, *Insuline Corporation of America (Canada) Ltd.* located at 9500 St. Lawrence Avenue, Montreal, Quebec.

Geared for production of the company's complete line of radio-electronic products, auto radio antennas and accessories, the Canadian branch will service the Canadian trade.

Sni-Dor Radioelectric, Ltd. will act as exclusive ICA sales representatives for the Canadian territory. The company has headquarters in Montreal.

* * *

FEDERAL TELEPHONE AND RADIO CORPORATION has begun the production of home radio receivers in their new quarter-of-a-million square foot plant at Harrison, New Jersey.

Operating as the new home of the Consumer Products Division of the company, the new plant will house the manufacturing and administrative

AIR KING

Crown Princess Console



Superheterodyne receiver with...full range tone control...built-in loop aerial...six tubes (including rectifier)...two dual purpose tubes give eight tube performance—Alnico V Permanent Magnet Speaker...Automatic volume control. Edge lighted slide rule dial.



Latest type record player with... Foolproof automatic changer for ten or twelve inch records... Featherweight low-pressure tone arm... Crystal pick-up... Permanent needle.



Cabinet styled by top designer to fit any decorative scheme... in satin walnut finish... storage space for 180 records.



MODEL 4708

A distinctive Console with a Popular Price

Here is an instrument of inspired design and precision engineering for the customer who wants the very best value for the money he has to spend. Air King is offering this exceptionally fine console at an amazingly low price. The Crown Princess Console combines a high fidelity radio receiver and the finest dual post automatic record player for quality reproduction of fine music. It is a set that your customers are looking for, a set you will be pleased to display. Produced by the skilled craftsmanship of Air King for naturalness of tone and lasting beauty—it will be a proud addition to any home.

\$134⁷⁵ tax included
5% higher zone II



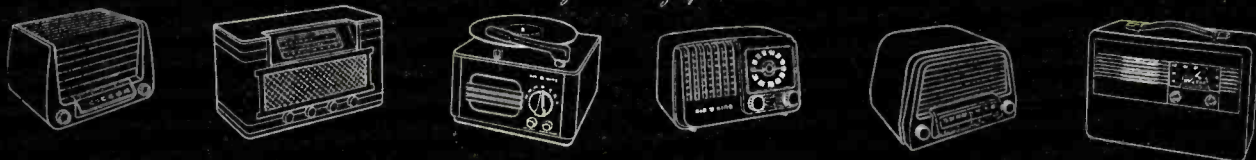
The Royalty of Radio Since 1920

AIR KING RADIO

Division of HYTRON RADIO & ELECTRONICS CORPORATION

★ WE HAVE A LIMITED NUMBER OF DISTRIBUTOR AND DEALER TERRITORIES OPEN ★
Write or wire: Air King Products Co., 1523-29 63rd St., Brooklyn, N. Y. Export Address: Air King International, 75 West Street, New York 6, N. Y.

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"Twenty-Six Years of Specialized Electronic Skill Behind Every Air King Radio"

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CONCORD

Radio

Catalog



**Radio Parts
Radio Sets
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Radio Hams • Servicemen • Engineers
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THIS CATALOG IS FOR YOU!

Mail COUPON TODAY!

Industrial Electronic and Test Equipment

It's here—ready for you now—the new, comprehensive, 1947 Concord Catalog displaying a vast, complete selection of everything in Radio and Electronics. Send for your copy now. Select your needs from value-packed pages showing thousands of items available for IMMEDIATE SHIPMENT—hundreds of them now available for the first time—featuring new, latest 1947 prices. See the new LOWER prices on finest-quality RADIO SETS, PHONO-RADIOS, RECORD CHANGERS, RECORD PLAYERS, PORTABLES, AMPLIFIERS, COMPLETE SOUND SYSTEMS, TESTERS. See complete latest listings of all the well-known, standard, dependable lines of radio parts and equipment—tubes, condensers, transformers, relays, resistors, switches, speakers—all available for IMMEDIATE SHIPMENT from huge stocks in CHICAGO and ATLANTA. Whatever your needs in Radio and Electronic Parts, Supplies and Equipment—before you buy—SEE THIS GREAT NEW CONCORD CATALOG. Mail coupon for your FREE copy now.



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Concord Radio Corporation, Dept. E-67
901 W. Jackson Blvd., Chicago 7, Ill.
Yes, rush FREE COPY of the comprehensive
new Concord Radio Catalog.

Name

Address

City State

staffs of the home receiver and appliance divisions.

WELLS SALES, INC. has moved their general offices and showrooms to a new location at 320 North LaSalle Street, Chicago, Illinois.

The showroom, which contains approximately 8500 square feet of space, is being used to display radio and electronic parts and equipment. Convenient "serve yourself" racks have been set up along with specifications, ratings and prices to facilitate buying of equipment by manufacturers, distributors, and amateurs.

A. "BUD" FIELDS has been recently named to the post of Assistant Sales Manager for *Merit Coil & Transformer Corp.* of Chicago, Illinois.



Before joining the *Merit* organization, Mr. Fields was associated with *Thordarson Electric Manufacturing Division* and *Bell & Howell Company*.

In his new position, Mr. Fields will act as general assistant to John I. Crockett, Jr., Sales Manager, and will have direct charge of sales for the company in the Chicago area.

RADIO CORPORATION OF AMERICA'S Test and Measuring Equipment Section has recently inaugurated a series of technical training courses on the use of laboratory measuring equipment.

The first session was open to 42 *RCA* Eastern distributors' representatives who attended a special five-day clinic.

Additional courses are planned for other sections of the country in the near future.

ILLINOIS CONDENSER CO. of Chicago has instituted a new "Get-Acquainted Plan" for the benefit of radio servicemen.

Under the terms of the plan, the company is offering a choice of either a 20 μ fd., 150v. or an 8 μ fd., 450v. condenser which will be mailed upon receipt of 15 cents in stamps to cover mailing and packing costs.

Orders for the condenser and a copy of the company's latest catalogue should be sent to *Illinois Condenser Co.*, 1614 N. Throop Street, Chicago 22, Illinois. The name of your local jobber must accompany your order.

RAYTHEON MANUFACTURING CO. has announced the removal of its Broadcast Equipment Division from Chicago to the company's main plant at Waltham, Massachusetts.

The new move will provide larger production space and facilities to allow the company to meet its present commitments. Removal of physical equipment will be accomplished gradually in order to avoid disruption of shipping schedules.

Never so much radio for so little money —

\$10⁹⁵

Including Tubes
Postpaid in U. S. A.

**SUPER-HETERODYNE
FOUR TUBES and
SELENIUM RECTIFIER
110 Volt AC-DC KITS**
direct from factory
to you —

Never before has BELLTONE packed so much quality and value in a \$10.95 complete package. This four tube and selenium rectifier super-hot kit of parts (chassis 10½"x5½"x7") has proven its selectivity, sensitivity and high quality radio reproduction in tens and tens of thousands of receivers sold during the past months. Today you can have this same chassis with all

post-war improvements

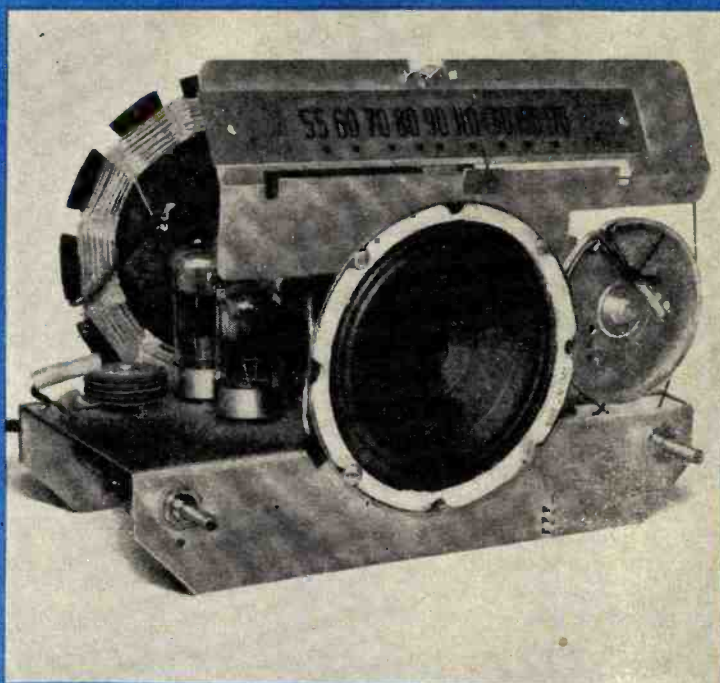
at virtually cost of component parts, drawings, instructions, packing and mailing costs —complete except for cabinet, wire and solder.

**three big assembly and
hook-up prints and
ABC detailed instructions
supplied**

including schematic circuit, picture wiring diagram, top chassis layout, dial cord instructions and cabinet layout suggestion—makes assembly, wiring and final adjustments easy, instructive and foolproof.

**direct from factory to you
only — no sales to jobbers,
dealers or surplus outlets**

no cabinet, wire or solder supplied



circuit improvements and parts include —

1. **SELENIUM RECTIFIER** — eliminates troublesome rectifier tube—it's unbreakable—lasts the lifetime of your set—starts instantly—increases sensitivity.
2. **PROTECTIVE FILAMENT RESISTOR**—prevents current surge through filaments—eliminates tube burn-outs and increases tube life.
3. **ALNICO PM SPEAKER**—1.47 ounce 5 inch speaker for high quality voice and music reception.
4. **GRIP-STRAIN RELIEF**—securely anchors power line cord to chassis—preventing short circuits.
5. **TUBES SUPPLIED**—one each 12SA7 - 12SK7 - 12SQ7 and 50L6 or 14A7 - 14Q7 - 14B6 and 50A5.

**ORDER YOUR BELLTONE
SUPER-HET CHASSIS KIT--TODAY
SHIPPED BY RETURN MAIL**

BELLTONE RADIO and TELEVISION CORP.
583 Ave. of the Americas, New York 11, N. Y.

Yes, I want.....BELLTONE chassis kits. Enclosed find

money order check for \$.....

SHIP TO

STREET.....CITY.....STATE.....

Save On Brand New RADIO TUBES!

ALL STANDARD
BRAND TUBES
IN CARTONS...

UP TO
80%
OFF!

No.	Price	No.	Price	No.	Price
OZ4	1.32	6BF6	\$0.90	12J5GT	\$0.81
1A5GT	.90	6C5	.90	12J7GT	.90
1A7GT	.08	6C6	.80	12K7GT	.81
1B4P	.08	6C7	.57	12K8	1.32
1B5/25S	.08	6D6	.80	12SA7GT	1.00
1C5GT	.08	6D7	1.08	12SC7	1.00
1C6	.08	6D8G	1.32	12SF5	.90
1E5GP	1.32	6E5	.90	12SH7	1.08
1E7G	.92	6F5	.90	12SH7GT	.90
1F5G	.08	6F6	.90	12SK7GT	.90
1F6	.32	6F7	1.32	12SL7GT	1.32
1G4GT	.08	6FRG	1.00	12SN7GT	1.08
1G5G	.08	6G6G	1.00	12SN7GT	.90
1G8GT	1.32	6H6	.75	12SR7GT	.90
1H4G	.81	6J5	.75	12SH7	.90
1H5GT	.90	6J6	1.59	12Z3	.81
1H6G	.08	6J7	1.08	14A7/12BT.	1.30
1J5G	.99	6K6	.80	14B6	1.32
1J6G	.08	6K7	.90	14H7	1.32
1LA4	.92	6L5G	.90	14Q7	1.08
1LC6	.92	6L6G	1.50	25L6GT	.90
1LB4	.92	6L7	1.32	25Z6GT	.81
1LH4	.92	6N7	1.32	26	.63
1LN5	.92	6Q7	1.08	27	.57
1N5GT	.08	6R7	1.32	30	.81
1R5	1.25	6SA7	.80	31	.81
1S4	.25	6SA7GT	.90	32L7GT	1.59
1S5	1.25	6SB7-Y	1.59	35	.81
1T4	1.00	6SC7	1.00	35L6GT	.81
1T5GT	1.32	6SF5	.70	35W4	.69
1V	.81	6SF7	1.08	35Z3	1.08
2A6	.81	6SG7	1.08	35Z4GT	.66
2H7	.75	6SH7	.90	35Z5GT	.69
2E5	1.08	6SJ7GT	.75	36	.81
3A8CT	.59	6SK7	.81	37	.69
3Q5GT	1.32	6SL7GT	1.10	38	.90
3S4	.25	6SN7GT	.90	39/44	.75
3T4	1.50	6SQ7	.80	41	.69
5U4G	.81	6SR7	.80	45	.66
5V4G	1.32	6SN7	.80	45Z3	.90
3W4	.90	6U5/6G5	1.08	46	.90
5X4G	.90	6U7G	.81	50A5	1.50
5Y3GT	.57	6V6	1.35	50B5	1.08
5Y4G	.63	6W7G	1.10	50L6GT	.90
5Z3	.90	6X5GT	.81	55	.90
5Z4	1.80	6Y6G	1.10	56	.66
6A4	1.32	6Y7	1.08	59	1.32
6A6	1.25	6Y7G	1.08	75	.69
6A8	1.59	6Y75G	1.00	76	.75
6AB5/6N5L	1.32	7A4	1.00	77	.75
6AB7/1853.	1.50	7A5	1.00	78	.75
6AC7/1852.	1.50	7A7	1.00	79	.44
6AD6G	1.32	7C7	1.08	80	.57
6AD7G	1.32	7E6	1.08	85	.75
6AE8GT	1.08	7E7	1.32	89	.50
6AEGG	1.08	7F7	1.32	117L7GT/	
6AF6G	1.32	7H7	1.30	117M7GT.	1.92
6AG5	1.92	7J7	1.59	117Z3	1.08
6AG7	1.92	7K7	1.32	117Z6GT	1.32
6AK6	1.32	7Q7	1.08	XXB	1.32
6AL5	1.08	7Y4	1.08	XXFM	1.32
6AQ5	1.08	12A5	.90	VR-90/30.	1.50
6AQ6	1.08	12A6	1.32	VR-105/30.	1.50
6AT6	.90	12BGT	.81	VR-150/30.	1.50
6AU6	1.08	12AH7GT	1.32	182B	1.92
6B4G	1.30	12AT6	.90	485	1.92
6B6G	.90	12BA6	1.08	1819	1.50
6B7	1.00	12BB6	1.08	2051	1.00
6B8	1.50	12C8	1.59		
6BA6	1.08	12F5GT	.81		
6BE6	1.08	12H6	.90		

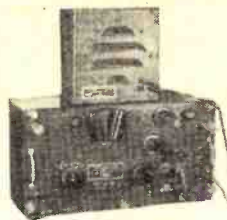
WAR SURPLUS EQUIPMENT

AT A FRACTION OF ORIGINAL GOVT. COST!



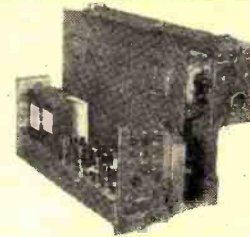
**Navy
V.H.F.
RADIO TRANSMITTER**

Here is one of the greatest offerings in war surplus! Hundreds sold at \$20 and now closed out at an amazingly low price. Brand New. Battery operated (67 1/2v B and 1 1/2v A). Frequency 80 to 105 mc. Complete with 2-1G4 tubes and full instruction manual. **\$6.95** Ready to go on the air.....less batteries



**LOW FREQUENCY
RECEIVER BC-344**

Just a very few left... Brand New, operates on 110v AC complete with 10 tubes, 1S3 speaker... tunes 150-1500 kc... Your last chance to get one of these "hot" low frequency receivers at this spectacularly **\$85.60** low price.....



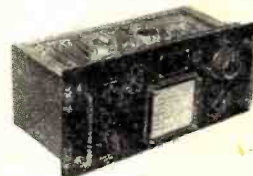
WAVEMETER

We're closing out the last few of these precision wavemeters which tune from 150-210 mc and which contain a high quality resonant cavity wavemeter, oscillator, heterodyne amplifier, electric tuning eye, complete with 19 tubes, 110v AC power supply. The tubes alone far exceed your close out cost of only..... **\$1795**



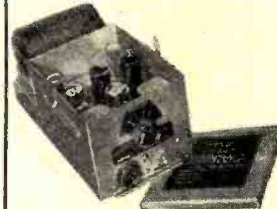
**HANDIE
TALKIE
CHASSIS**

An ideal unit for building up receiver or transmitter. Comes completely wired with 1-1R5, 1-1T4, 1-1S5, 2-354 tubes and 2 455 kc iron core I.F. transformers and antennae-less receiving and output coil and crystal.... **\$9.95**



R. F. TUNING UNITS

Still the best buy on surplus... Beautiful black crackled aluminum cabinet with two variable transmitting condensers and two vernier dials, one heavy duty ceramic four position wafer switch, mica condensers, 2,500 working volts and coils wound on porcelain ribbed forms. Available TU5B (1500-3000 kc) TU7B (4500-6200), TU8B (6200-7700 kc) and TU10B (10000 - 12500 kc). Please specify model. **\$3.89**



INTER-COM AMPLIFIER

Comes completely wired in aluminum cabinet with following: 2-12A6, 2-12J5 tubes, 1 bathtub condenser, 3 can filters, 12 precision resistors, 4 low loss octal sockets, shielded input and output transformers, 2 shielded R.F. chokes, 1 S.P.S.T. taggle, 28v D.C. dynamotor. Sun Radio furnishes the instructions for easy conversion to Hi-Fidelity 'phone or speech amplifier..... **\$8.95**

TUBES

Your Fastest Selling Tube Kit at the lowest price offered anywhere. COMPARE!!! At 60% off. 12SA7-12SK7-12SQ7-35Z5-50L6GTs. List..... **\$7.45**

*Net-\$2.98.
*Minimum order 100 sets—Standard Brand—Bulk Packaged.



D.C. MILLIAMMETER

Brand new General Electric 2" round panel meters **\$2.97** 0-300.....



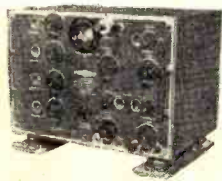
MICROPHONE

Brand new single button carbon hand mike by "Shure" with push to talk switch..... **\$1.79**



SUPERHETERODYNE RECEIVER

This crystal fixed frequency receiver comes with full conversion instructions for variable tuning of all ham bands and broadcast. A highly selective superheterodyne receiver, 110 V. A.C. power supply built in. Using the following tubes: 6K7-RF Amplifier; 6K8 Mixer and Oscillator; 6K7 I.F. Amplifier; 6F7; Detector and A.V.C.; 6C8 Output and Noise Suppressor; 80 Rectifier. Dimensions—3 1/2x19x11 1/2 inches. Comes complete brand new, with one set of coils **\$16.95** and two sets of tubes.....
Extra set of coils.....\$2.95



**SUN'S
GREATEST
OFFERS
While
They
Last**

BENDIX TRANSMITTER TA12-B

CHECK THESE VALUES—Three 807 tubes. Four 12SK7 11. One 2 inch 5 amp. RF meter. Four Separate Master oscillators. (These can be easily changed to cover 20-40-80 meters and by using crystal for the 10 meter band you will have a complete coverage transmitter.)

Four Separate output tanks—One 4 Position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11x12x15 inches, weighing 3 1/4 lbs. Complete, simple instructions for conversion furnished. Complete with tubes. **\$49.95**

RHOMBIC RECEIVING ANTENNAE

Complete with all accessories including 2200 feet of No. 14 copper weld wire, 50 feet of heavy twin X lead 72 ohm good up to 2 kw, dozens of insulators, pulleys, neon lighting arrestors, ground rods and everything to erect, less poles..... **\$24.95**

All items F.O.B., Washington, D. C. Orders \$30.00 or less, cash with order. Above \$30.00, 25 percent with order, balance C.O.D.

SUN RADIO
OF WASHINGTON, D. C.
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FOUR-11

MODULATOR

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RADIO NEWS

write for
Descriptive Booklet



From a Tiny Acorn Grew a Mighty Oak

By

FRANK E. BUTLER

Radar antenna aboard the liner "Queen Elizabeth." The antenna makes from 30-40 r.p.m. and has a 4 kw. de-icing heater. The interior of the wave guide is kept dry by forcing hot air through guide and conduit.



Eye-witness account of the first radio-telephony ship to shore transmission in 1907. Scientific marvels now used aboard the "Queen Elizabeth" reflect 40 years' progress.

WHEN the luxurious ocean liner *Queen Elizabeth* made her recent maiden peacetime voyage across the Atlantic Ocean she was proudly acclaimed the most modernly equipped vessel to ever sail the seas, the ultimate triumph of science in the field of safety, service, and convenience.

On this trip there was no cause for its passengers or crew to have the slightest fear of encountering a disaster similar to that which, a generation ago, befell the ill-fated *Titanic* when this palatial steamship was cutting its first pathway over the same treacherous sealane. Then, suddenly, and without warning a moun-

tainous iceberg loomed across the ship's path. A great white wall of ponderous, immovable ice. The next instant there was a terrific broadside crash . . . and the smashed *Pride of the Sea* sank quickly carrying 1517 defenseless human beings to a watery grave.

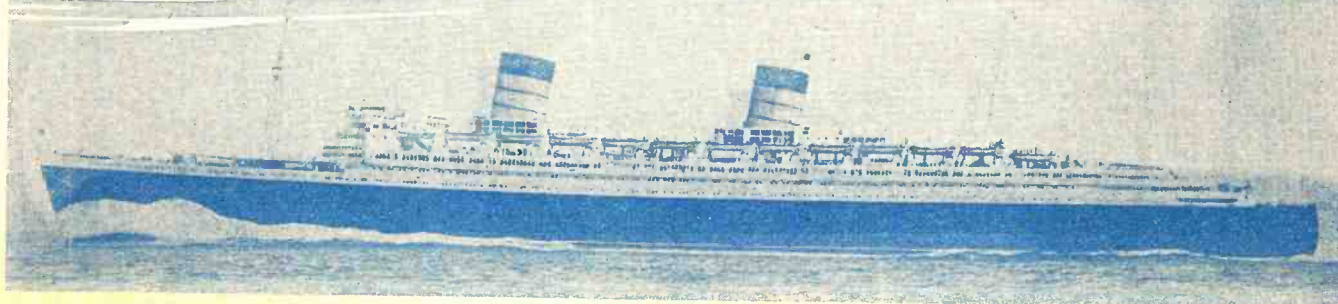
Such a tragedy could not happen to this latest maritime marvel as she is forearmed against that possibility by being equipped with the modern miracle of "radar." This newest creation of electronics gives to the ship's navigator the power to "see" on the darkest night with this magical gift of constant, clear, unerring vision. The ability to pierce the thickest fog; to

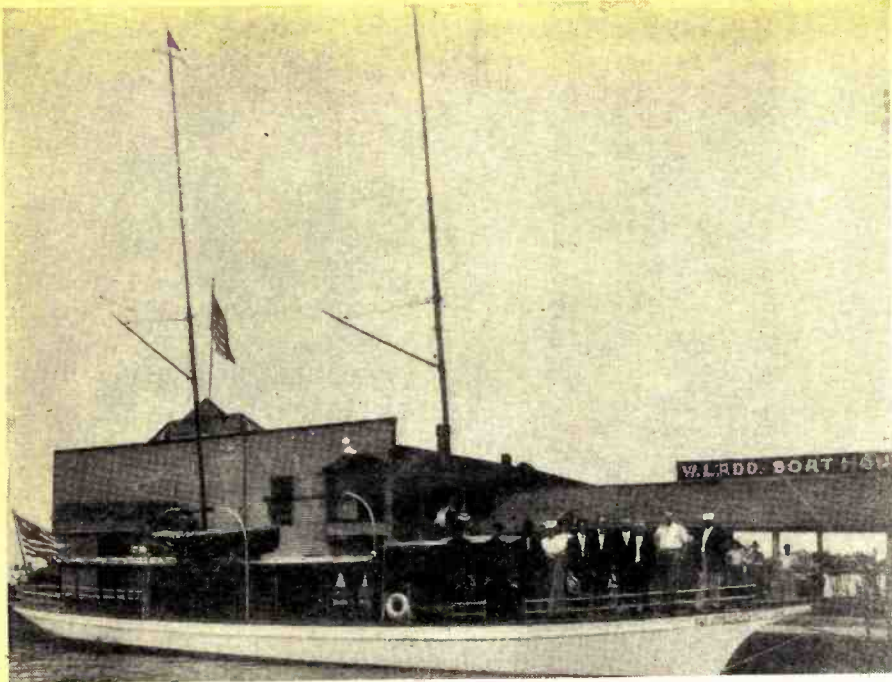
peer through the fiercest storm; to accurately spot any floating derelict or lurking, dreaded berg in the ice-infested regions of the ocean is given the modern navigator through radar.

Located high above the wheelhouse of the ship, where seawinds swirl with hurricane velocity and force, is mounted the "radar scanner" perched as a sentinel of safety, radiating unvarying and invisible radio waves; rotating forty times every minute; and casting its searching eyes in many different directions every sixty seconds.

But how? How, in the vernacular of the non-technical reader, does "radar" work? Upon what principle does it operate? It is quite simple! It is not new. It is merely an application of an advanced theory of echo and reflection. As a child roaming in the woods you probably recall the times when you shouted toward a cliff or a high hill. Sound waves echoed back. From the time interval and the returning echo's direction, you could locate the cliff. It's the same with radio waves as with sound waves. Radio waves echo too. The difference between the two is that "radar" uses radio waves to locate targets or obstructions at far greater distances and with far greater speed and precision than is possible with sound waves. Like a questing searchlight "radar" sprays all surrounding areas with sharp bursts of radio energy of ultra-high frequencies of the order of 9,000,000,000 cycles per second. When compared to normal radio broadcast frequencies of around one million cycles per second, you can fully appreciate the scope of such transmissions.

Radar waves are tailored and timed to an infinite degree, precisely shaped and accurately spaced. Their focused beam is narrowed to only two degrees in the horizontal plane in order to obtain good definition of objects, and fifteen degrees in the vertical plane so that rolling or pitching of the ship will





The yacht "Thelma" from which the first radio-telephony ship-to-shore transmission was made. Dr. Lee deForest is shown second from the right while the author, Frank E. Butler, appears sixth from the right in the group.

not cause the beam to miss objects. The radar energy is transmitted in pulses lasting but one-half of a millionth of a second and one thousand of these pulses are transmitted and the "echo" received each second.

As these radio pulses echo back, radar "listens" for each one. Then, electronically, all merge as a glowing pattern on a fluorescent screen to reveal distant and near objects. Radar waves can flash across the Atlantic Ocean in less time than sound can cross the street. Each radar flash must be extremely short and sharp or it would blanket its own returning echo. Each pulse must be of dazzling brilliance and strong power for at best its echo is very weak. The intensity of each flash is many times that of the brightest sunlight as the radio waves themselves are measured to approach the wavelength of light, while the responding echo is far less than the luminescence of a firefly. Thus does radar circumscribe itself within the wide range between *MIGHT* and *mite*. Its transmitter may be said to erupt volcanic "might" while its receiver or "eye," located only inches away, is a masterpiece of "mite" sensitivity and electronic intricacy.

In order to prevent the powerful transmitter from wrecking the delicate receiving "eye," the receiver is designed to *blink*—like an eye. In other words, when the transmitter sends out its blinding flash, the nearby "eye" blinks shut, much the same way as a human eye behaves subconsciously. Then, after the merest split second, it pops wide open ready to receive the almost imperceptible fleeting echo.

No physical thing, large or small can escape this all absorbing mesh of criss-cross barrage to do any destruc-

tive work. No floating or soaring object can escape the eagle eye of radar nor obstruct its recording on the electronic glass disc in front of the pilot. Every tireless pulse is reproduced visually in the form of a small glowing spot, accurately prescaled to actual conditions of distance, size and bearings within a range of from fifty yards to twelve miles distant, at sea level. This means that any object, such as ships, buoys, wrecks, icebergs or even coast lines appearing within range will instantly be detected and recorded on the bridge, thereby providing ample time for safeguarding and controlling the course of the ship.

Aboard the *Queen Elizabeth* is also installed the largest floating broadcasting station ever conceived or operated. It consists of four high power transmitters which effectively cover the short-, medium- and long-wave bands of radio transmission. Each is

remotely operated from a central control room, permitting the simultaneous transmission and reception of Morse telegraphic code, automatic high speed recordings, wireless teletype, radio-telephone calls, broadcasting programs and safety signals.

To talk to a person in any part of the world where there is a telephone exchange, a passenger on the *Queen Elizabeth* has only to pick up his ivory colored cradle telephone conveniently located at the bedside in his cabin—place the call in the ordinary manner and be "connected" quite as easily and quickly as dialing a local telephone number at home. Likewise, they may talk to passengers on other ships at sea which are likewise equipped for wireless telephonic service, or to transoceanic airplanes. In addition, passengers may hear their favorite radio programs as they emanate from transmitters in the United States or any other country. Compact, self-powered radio equipment is provided for lifeboats in case of disaster at sea, and finally, a radio direction finder or electronic compass is located on the bridge to guide the ship safely to its intended port.

All of these aforementioned branches of service and convenience are merely a part of an ever-growing electronic "oak" which has sprouted from an "acorn" known as the common radio tube like that used in every home receiving set. These modern miracles of electronics have been accomplished within the past 40 years, practically since the catastrophe of the *Titanic*, yet with all of these great scientific achievements; all of the glory and advantages associated with each new discovery . . . none of them, singly or collectively, can approach in importance, drama, and stature the humble beginning when, for the first time, man bridged etheric space with the human voice by "talking ten miles from ship-to-shore by wireless telephony"—a feat which laid the foundation of our present-day, world-wide instant communication system.

Entirely unheralded and quite without fanfare in its enactment, an event

THE QUEEN ELIZABETH—A BIG SHIP WITH A HEART OF RADIO

The *Queen Elizabeth*, the world's largest passenger ship, carries the most modern radio installation aboard any ocean-going liner. Specially-installed communications equipment aboard the giant liner provides complete contact with the entire world by means of radio-telephone and radiotelegraph.

The ship's radio station is divided into two locations. The main office, situated approximately amidship on the sun deck, is the centralized control point for the whole station and contains all the receiving, telephone network, and transmitter control equipment. The main transmitters, four in number, covering short, medium and long-wave, are housed in a separate room on the same deck just forward of the mainmast, about 250 feet from the main control room. All transmitters are remotely controlled from the main control office. This subdivision permits the simultaneous transmission and reception of messages, the handling of radiotelephone calls, yet allows the observation of safety precautions to proceed independently and without interference.

One of the outstanding features of the whole installation is the elaborate radiotelephone system whereby first class passengers may pick up their bedside telephones and call any country

whose telephone service is connected to an international exchange. Calls may also be made to passengers on other ships which are equipped with radiotelephone.

A specially designed all-wave receiver is installed in the main control room for the reception of broadcast programs and their rediffusion throughout the ship, irrespective of any transmission that may be taking place on the main equipment.

The magic of radar navigation is available to the skipper in the form of two radar units, which are installed aboard the luxury liner. The newer equipment was installed when the ship was refitted for civilian service. It is an experimental model Cossar radar designed specifically for merchant ship application. Its simplified operation does not require the services of a trained radar operator.

Another valuable aid to navigation aboard this floating luxury hotel is a complete Loran system of standard U. S. military design supplemented by British Gee equipment for determining the liner's position precisely at short ranges. A Bludworth Marine supersonic depth indicator for navigational aid in shoal waters rounds out the giant liner's "heart" of electronic equipment.

occurred in July 1907 on the privately owned yacht "Thelma" at Put-in-Bay, Ohio on the shores of Lake Erie, at the site of Commodore Perry's victory over the British fleet; an incident as viewed from the vantage point of 1947 and compared with the scientific marvels now daily used aboard the *Queen Elizabeth* looms as one of the great landmarks of human progress.

The occasion was the trying out for the first time, both the newly perfected radio tube and the *first* wireless telephone (now known as radio) by its inventor Dr. Lee deForest and his chief assistant Frank E. Butler. Their attempt at the time was to "cover" and report the races of the Annual Regatta of the Interlake Yachting Association; the plan being to install a wireless transmitter and receiver aboard the "Thelma" and another similar outfit at a point on shore. Then, as the yacht steamed a wide swath alongside the racers at a permissible distance, the observers aboard the yacht could "talk to land," giving the time, speed and location of contestants as each one rounded the judge's stake of the prescribed seven-mile triangular racing course.

The yacht was a trim little cruiser with a wooden hull, having an over-all length of 72 feet.

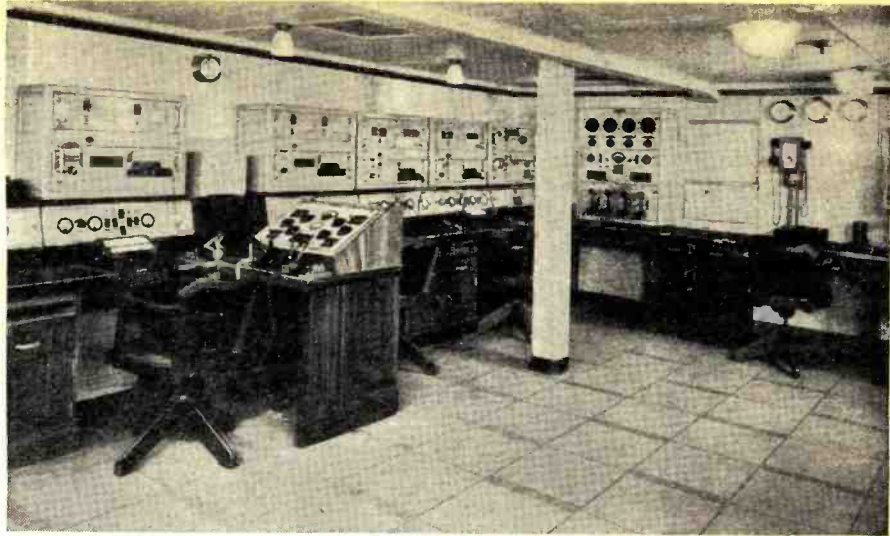
Both the foremast and mainmast required lengthening in order to obtain sufficient height for antenna function. The hull being of wood presented a major obstacle, because the obtaining of a suitable "ground" was of the utmost importance. Numerous methods were employed, but all resulted in failure.

The races were scheduled for one day hence. Reporters for magazines and newspapers were there, as were prominent yachtsmen from the five Great Lakes. Critical and doubtful eyes were upon deForest and Butler. Their claims were questioned, the all-knowing classified these two experimenters as "crackpots." After all the only basis these two fellows had for expecting or believing that wireless telephony was practical or even feasible was their own recent personal experience in "talking wirelessly" between one room and the next in their improvised attic laboratory in the Parker Building, New York, where the radio tube had been born only a few months previously.

On this last day, before the races, these men had sweltered in the intense July sun on the hot deck of the boat feverishly working to get the crude apparatus working. Every test failed. Both were completely exhausted, mentally and physically. Butler, wavering with discouragement and despair, so expressed himself:

"Well Doc! I guess we're licked this time. We can't send ten inches without a "ground" and we'll have to talk ten miles if we expect to cover the entire race course tomorrow. Surely that mahogany hull is no good for our purpose. There seems nothing we can do now."

"Listen boy!" replied deForest reas-



View of the main radio control room of the "Queen Elizabeth" through which are handled radiotelephone calls via New York and London to all parts of the world, radio programs for the United States and Great Britain, and radiogram messages to all countries. Designed and operated by the International Marine Radio Company Limited, an affiliate of the International Telephone & Telegraph Corp., the control room contains the most modern and complete merchant marine radio installation in the world today.

suringly as he glanced toward Lake Erie and pointed his finger in that direction: "Do you remember what Perry did out there and the slogan he won by? It was, 'DON'T GIVE UP THE SHIP!' Well, we're not going to give up the 'Thelma' either . . . not for sentiment, nor looks nor any damn thing—except success. With this yacht we've got to win. It's our only chance. We have one more card to play, and only one. We'll stack all our chips on it; risk friendship, reputation and everything on the turn of the card, perhaps go to jail for it . . . I don't know. Now, here's my plan! Tonight, when the Commodore and his crew go up town to buy provisions and refreshments for their regatta visitors we'll say we're too tired to go. We'll ask to

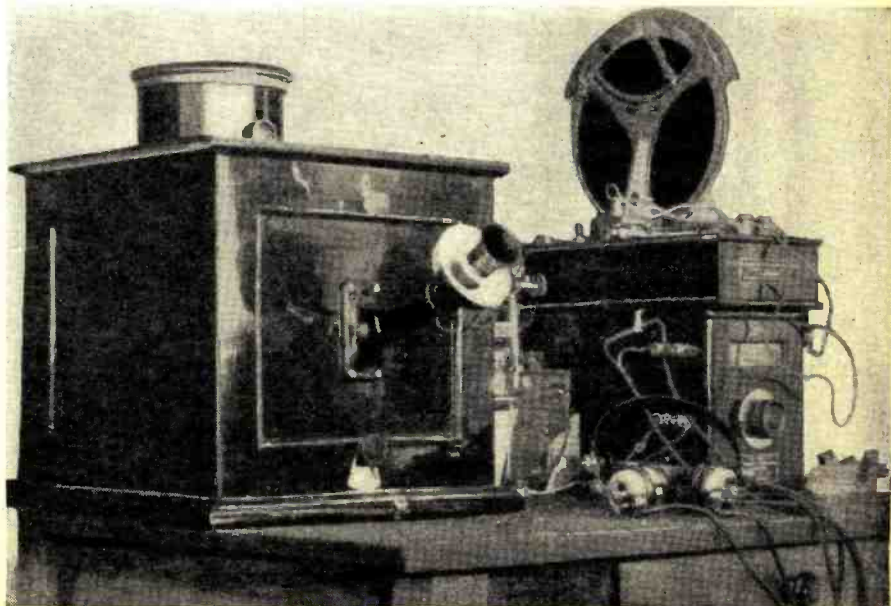
remain aboard—alone—to 'rest.' Then when they are safely out of sight and distance we'll swipe that little craft of theirs. We'll steal and steam away with it. You run the Lacy engines. I'll handle the wheel and steer it. We'll take her a few miles down the lake to the east till we find a deep spot near shore; anchor her and then jump overboard and, in the light of the moon nail these two big 100 inch square pieces of heavy copper I just bought to the sides of the hull—below the water line. That, surely, will give us a good ground."

Butler gasped in amazement at such willful and wanton destruction.

"But Doc!" he remonstrated, "that card you're playing is from the bottom

(Continued on page 106)

Original radiotelephone apparatus used on yacht "Thelma." The first transmission took place at Put-In-Bay on the shores of Lake Erie in July of 1907. This picture and the one appearing on the opposite page were reproduced from the original photographs which are today of great historical interest.



THE method of tuning a series of circuits to the same frequency is relatively well known to the radio art. Most high quality receivers use several r.f. amplifier stages simultaneously tuned to the same frequency by means of a single control. As long as the resonant frequencies of all circuits are identical, the problem is a relatively simple one. The designer provides a means for adjusting all inductances to identical values. A means is then provided for adjusting the fixed capacities across these circuits to an equal value. Having adjusted the inductance and fixed capacitance so that they are identical in each circuit, perfect alignment or "tracking" will be obtained for all circuits providing all sections of the variable tuning capacitor are identical with each other throughout the entire tuning range.

If the circuits are permeability tuned, perfect "tracking" will be obtained as long as (1) the fixed capacitance is equal in each circuit, (2) all inductances are equal, and (3) the change in inductance is equal in each circuit as the position of the iron cores is changed.

The problem of single dial tuning

New method of providing tracking of tuned circuits in multi-band exciters with identical tuning capacitors.

By **JAMES N. WHITAKER,**
W2BFB

Eng. Dept., Hammarlund Mfg. Co.

MONO-SEQUENCE TUNING

of a radio transmitter is considerably more complex than is encountered in receiver design.

It is much easier to obtain good stability from an oscillator operating at

a low frequency than from an oscillator operating at a high frequency. This is perhaps one of the main reasons why a low frequency oscillator is normally used in a radio transmitter.

Fig. 1. Schematic diagram for mono-sequence exciter. Iron core coils are used to permit adjustment of inductance.

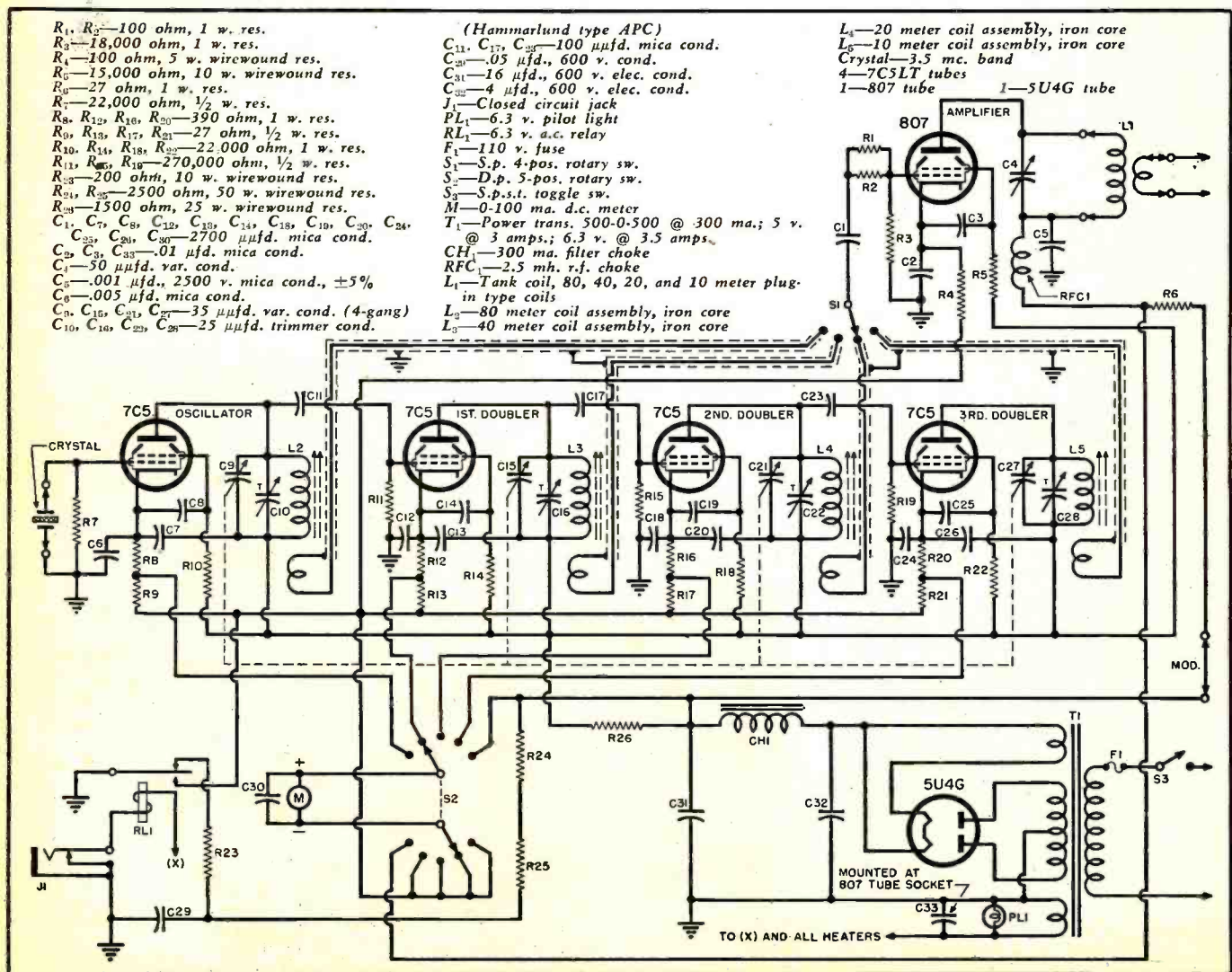
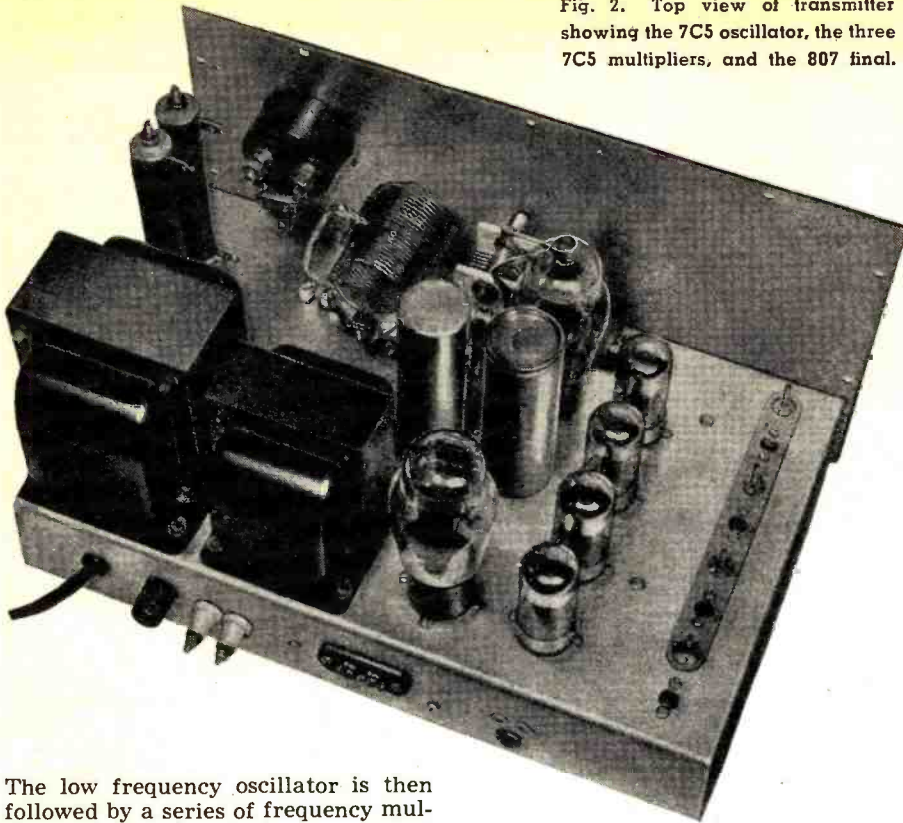


Fig. 2. Top view of transmitter showing the 7C5 oscillator, the three 7C5 multipliers, and the 807 final.



The low frequency oscillator is then followed by a series of frequency multiplier stages to obtain the desired output frequency.

A system incorporating a low frequency oscillator followed by successive frequency multiplier stages lends itself admirably for amateur services where it is desired to obtain output on any one of several harmonically related frequencies, such as 3.5 mc., 7 mc., 14 mc., or 28 mc.

The oscillator and multiplier circuits must be sharply resonated in order to obtain the highest efficiency. Since the oscillator and each multiplier stage operates at a different frequency, the conditions for single dial tuning as in a receiver, for instance, (where all circuits are tuned to the same frequency) do not apply. As an example, in a system where the oscillator must cover a frequency range of 3.5 mc. to 4 mc., the first doubler must cover a range of from 7 to 8 mc., the second doubler must cover a range of from 14 to 16 mc., and the third doubler must cover a range of from 28 to 32 mc. In this example, we find that while the first circuit covers a range of 500 kcs., the last circuit is required to cover a range of 4000 kcs. Also we find that if we wish to obtain r.f. energy at 3.5 mc., 7 mc., and 14 mc. as well as 28 mc., we must use a minimum of four tuned circuits, each of which must resonate at twice the frequency of its preceding stage, except in the case of the oscillator, which is generating the initial frequency.

One method of simulating single dial tuning without actually tuning all stages is to tune the oscillator only and use broadband amplifier techniques in the multiplier system. This method has some advantages, but un-

fortunately it also has many disadvantages. The efficiency of such circuits is relatively low, as compared to sharply resonant circuits. Larger tubes must be used with a resultant higher power requirement, if equivalent power output is desired. The gain per stage must be greatly reduced to prevent spurious oscillations. The fundamental oscillator frequency may be quite pronounced at any output frequency because there are no

sharply resonant circuits responsive to a single frequency or a very narrow band of frequencies to provide the desired filtering action.

Several systems have been developed in the past to provide for simultaneously tuning the oscillator and multiplier stages with a single dial. One system uses a gearing arrangement to provide a definite ratio of rotation between all variable capacitors. This system is rather costly, and cumbersome. It also requires the use of a gear chain essentially free from backlash.

Another system involves the use of dissimilar variable capacitors operated from a common shaft. Here again the production costs are excessive. The mechanical shaping of condenser plates is also a problem, and the ultimate result still leaves much to be desired.

The ideal solution is the mono-sequence tuning system.* This system permits the use of identical variable capacitors in the oscillator and each multiplier circuit. There is no longer need for special gearing mechanisms, specially formed variable condenser plates, or special variable condenser sections of unequal capacity. With the mono-sequence tuning system, a series of stages operating at multiples of a common frequency may be tuned by one control as easily and as accurately as a series of amplifier stages operating on the same frequency.

All fixed capacities across each tuned circuit (tube capacities, wiring capacities, etc.) must be equalized, as in the case of the gang tuned amplifier. Likewise each section of the variable tuning capacitor must be equal. The inductance in each stage is quite different, but may be calculated quite easily, using the standard
(Continued on page 90)

Fig. 3. The modulator unit shown is a companion to the "Four-20" transmitter.



* See U.S. Patent No. 2,388,233.



Illustrated by Joe Tillotson

By JOHN T. FRYE

Whether you like it or not your servicing business success is in the hands of your housewife-customers. Learn to sell yourself and your service to the ladies.

WHAT member of the family do you think uses the radio the most? If you need a hint, just consider at whom the greatest percentage of broadcasting time is aimed. Dad has his sports and mystery programs; Brother has his early-evening adventure serials; and Sister can usually search around until she finds a dance band; but at whom are the soap operas, participation shows, interviews, and home-making programs directed? You guessed it. The housewife is the Mrs. Big of radio.

By the same token, she is the most-important person to the radio serviceman. Whether you like it or not, you are servicing the majority of your sets for the critical inspection of the lady of the house. If she likes you, you will get her work. If she does not, you will not; and the fact that you and her husband are bosom lodge brothers will not alter this in the least.

I can hear your hollow groans as this terrible fact is pressed home upon you, and I know exactly how you feel. You are remembering Mrs. A. who always insists that her radio needs a new carburetor, or you are thinking of Mrs. Z. who did not mince words in saying that if you *really* knew your business you would be able to take the summer static out of her radio, at least while the World Series was being played.

Women are difficult to do radio service for, chiefly because they are not mechanically minded. When you try to explain to them the practical limitations of their a.c.-d.c. midgets, such explanations are interpreted as fumbling excuses to cover up lack of ability. What is worse, their idea of good service embraces considerably more than the return of the receiver to its original operating condition. They expect you to combine the skill of the cabinet maker and the dirt-

abhorring fervor of a Dutch housewife along with your incidental knowledge of radio theory. Finally, they have the exasperating habit of expecting as a matter of course little "extras" of service that a man would cut off his hand before expecting.

Still, if a woman is pleased with your work, she is the best little old advertiser you could want. She will take great pride in telling her bridge-club, sewing-circle, or church-group just how she discovered the most wonderful serviceman, and she will likely be so carried away with this discovery that she will embroider your good qualities a wee bit. When it comes to that most valuable "word-of-mouth" advertising, the talkative sex cannot, *must* not be ignored.

And really, fellows, if you grit your teeth and buy aspirin in the big money-saving bottles, trying to please women is not so bad. Just remember that they are human beings like anyone else except that they are a trifle eccentric and have to be humored. For instance, everything is personal as far as a woman is concerned. She does not care a snap of her fingers about your training, experience, and equipment. What she notices is simply how you handle *her* receiver.

(Continued on page 102)

The Sweep-Frequency SIGNAL GENERATOR

These test instruments are particularly useful for observing the frequency response characteristics of i.f. and video amplifiers.

By
ROBERT ENDALL

IN THE DESIGN, development, and servicing of most types of electronic apparatus, one of the major factors in the final preparation of the equipment for actual use is the alignment of the various circuits of the equipment to insure that they have the desired frequency characteristics. Conventional methods of obtaining frequency response and bandwidth measurements are slow and cumbersome, and consist mainly of taking point-to-point gain or output measurements at a number of selected points within the desired frequency range and plotting the results on a graph for observation. The disadvantages of this method will become especially noticeable when it becomes necessary to align large numbers of wide-band instruments, such as i.f. and video amplifiers for black-and-white and color television receivers. The alignment of television video amplifiers, where it is necessary to have good response over the entire frequency band from low audio frequencies to as high as 10 mc., is an extremely tedious process by conventional methods.

A method of obtaining frequency response characteristics which eliminates most of these disadvantages, is the use of a sweep-frequency signal generator to make possible visual observation of the frequency response on the screen of an oscilloscope. The sweep generator is a signal generator which produces a signal of constant amplitude, whose frequency varies periodically over the entire range of frequencies throughout which the response of the circuit is desired to be known. It is an extremely valuable instrument for alignment and general servicing. The output of a sweep generator for video amplifier testing should vary from about 100 kc. at the low end to 10 or 12 mc. at the high end of the band. (It is not necessary for it to supply frequencies below 100 kc., since the low-frequency response of video amplifiers is generally adjusted by observing the response of the amplifier to a low-frequency square-wave.) For i.f. and r.f. ampli-

fier measurement, the signal should vary by $\pm 5-6$ mc. about a center frequency which is adjustable over as large a range as practical, to provide maximum flexibility in testing circuits at different r.f. and intermediate frequencies. With such a ± 5 mc. (i.e. 10 mc. total) sweep width, it is possible to test both narrow-band receivers and wide-band television receivers. Generally the variable frequency sweeps from one end of the band to the other at a rate of 60 times per second, synchronized to the a.c. line frequency.

The basic setup for visual alignment by use of a sweep-frequency generator may be understood by reference to the block diagram in Fig. 2. The output of the sweep generator, which varies periodically from the lowest to the highest frequency at which the response is to be determined as indicated in the diagram, is applied to the input of the circuit under test. The response of the circuit is observed on the screen of the oscilloscope by applying its output to the vertical input of the oscilloscope, and synchronizing the horizontal deflection to the rate at which the frequency of the input signal is varied. If the output of the circuit being tested consists of a rectified r.f. or video signal, it may be applied directly to the input of the oscilloscope amplifier, otherwise it should be rectified by a diode detector whose output is connected to the oscilloscope. (The reason for the use of the diode detector is quite simple:

If the output of the circuit, for instance a video amplifier where the response must be measured to 5 or 10 mc., were applied directly to the oscilloscope input, it would be necessary for the oscilloscope vertical amplifier to have good response up to the highest frequency used—10 mc., in this case. However, when the response is measured by first rectifying the output by a linear diode rectifier and observing the rectified output, the ordinary low-frequency oscilloscope may be used since now its amplifier need only be good enough to pass a 30-cycle square-wave satisfactorily.)

The manner in which the frequency response characteristic is formed on the face of the oscilloscope tube is illustrated in Fig. 3. The instantaneous frequency of the sweep-generator signal varies gradually from minimum to maximum frequency in exactly the same manner during each cycle. Since the horizontal deflection is synchronized to the rate of frequency variation of the sweep generator signal, as the spot moves across the face of the cathode-ray tube the frequency of the signal applied to the circuit changes gradually through the entire band over which the response is to be measured, and the same horizontal position on the cathode-ray screen will represent only one frequency. At the same time, this variable-frequency signal is applied at constant voltage to the circuit under test, and the instantaneous output of the circuit is fed to the vertical

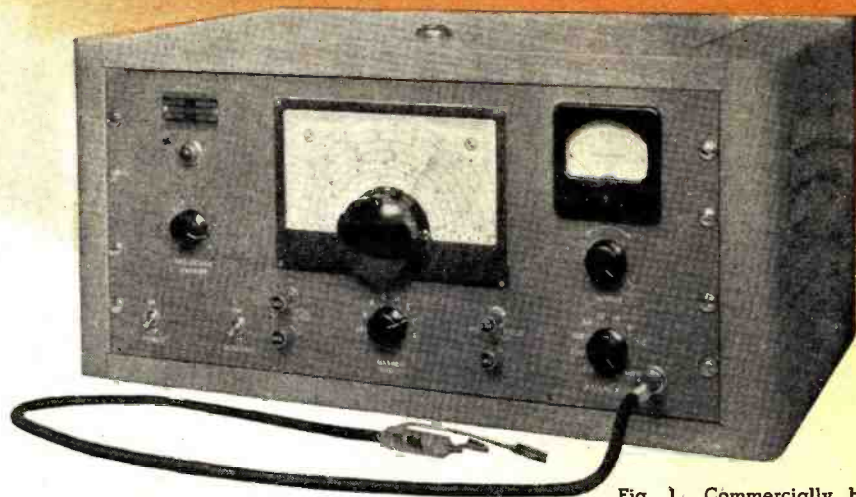


Fig. 1. Commercially built sweep frequency generator.

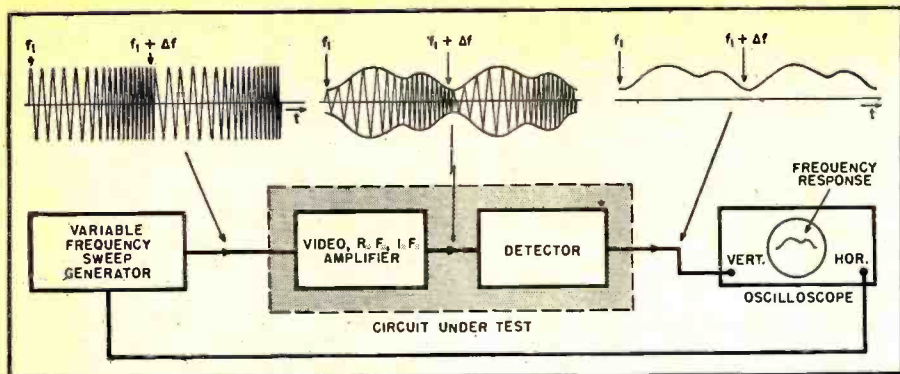


Fig. 2. Block diagram illustrates method of visual determination of frequency response by means of a sweep generator and an oscilloscope.

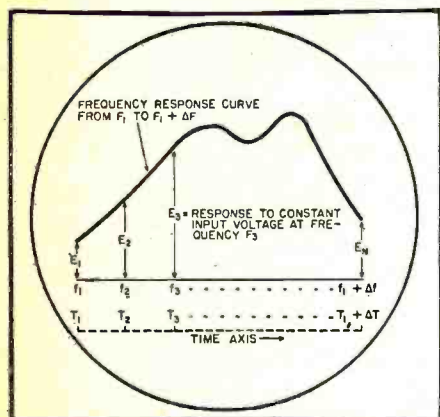


Fig. 3. Simulated formation of frequency response curve as it appears on the screen of the oscilloscope.

input of the oscilloscope. Thus the instantaneous vertical deflection of the spot for each horizontal position represents the relative response of the circuit at the frequency corresponding to that particular position. In other words, the picture on the oscilloscope screen is thus seen to represent the response of the circuit for constant input voltage at different frequencies, which is the frequency-response characteristic of the circuit.

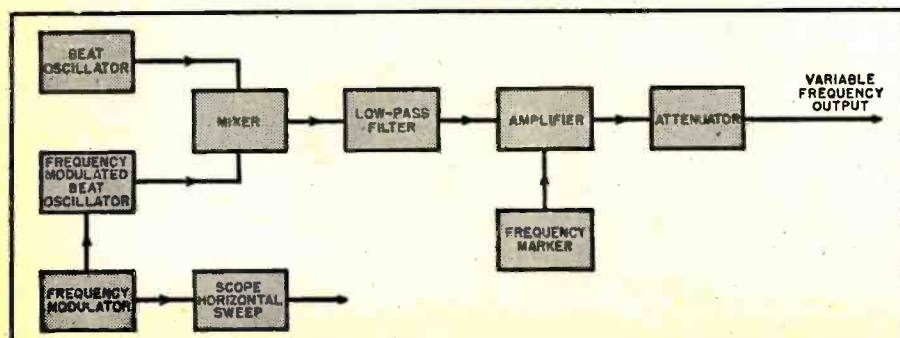
By means of this method, the task of measuring the frequency response of any video, i.f. or r.f. circuit is tremendously simplified. The mechanics of performing a measurement consist merely of feeding the variable-frequency signal through the circuit to the oscilloscope, and the entire response curve over the desired frequency band (r.f., i.f., or video fre-

quency) becomes immediately visible upon the screen of the cathode-ray tube. One of the major features of this visual method of testing response is the rapidity with which the results of an adjustment may be determined, since the entire response curve is continuously visible.

The principles involved in the design, construction, and operation of the sweep-frequency generator should be of great interest to radio engineers, servicemen and technicians, who may expect soon to be making considerable use of this type of equipment. A block diagram illustrating the principles of operation of the sweep-generator is given in Fig. 4. This diagram summarizes the principles of operation of most of the different types of sweep generators which are commercially available at the present time.

Because of several major considerations, the output signal is almost always produced in a beat-frequency type of circuit. Generally, the required bandwidth and frequency deviation are too great to permit tuning of the fundamental frequency of an oscillator. By use of the beat-frequency method the required tuning range of the variable oscillator and the percentage frequency modulation are considerably decreased, and are brought within practical limits. The frequencies of both oscillators are well above the highest output frequency of the instrument—the center frequency of the frequency-modulated oscillator is kept constant, and the frequency of the beat oscillator is adjustable so that the center frequency of the output signal varies over the desired signal range. Another impor-

Fig. 4. Block diagram illustrates the principle of operation of the sweep generator.



tant advantage of the beat-frequency principle is that the output voltage is much more easily kept constant over the entire output frequency range. (It should be noted, however, that in the design and construction of all beat-frequency oscillators it is necessary to take great care to minimize the relative oscillator drift, since if the two oscillators drift apart by a comparatively small percentage of their operating frequency, this drift will represent a much greater percentage variation in the signal output frequency.)

The periodic variation in output frequency is obtained by means of frequency modulation of the fixed oscillator. This may be accomplished by any of the standard methods of frequency modulation, depending upon the purpose for which the sweep generator is to be used and upon the design considerations of the individual instrument. In general, a tuning reactance is varied periodically, either by means of a reactance tube or by an actual physical variation of one of the elements. For simplicity in design, the variation takes place at a rate of sixty times per second, synchronized to the power line frequency.

The signals from the beat oscillator and the frequency-modulated oscillator are applied to a conventional mixer circuit, where the sum and difference frequencies are produced. Only the difference frequency is selected, by taking the output of the mixer through a low-pass filter. With suitable precautions in the design of the beat-frequency oscillator, the output is substantially constant over the entire frequency range. Since the beat-frequency output of the mixer is obtained at fairly low level, an amplifier may be included to raise the signal to a sufficiently high output level.

In all sweep-frequency signal generators, since there is no way of knowing accurately what absolute frequency is represented by each horizontal position on the cathode-ray tube trace, a marker whose frequency is accurately calibrated must be included in the design of the instrument to serve as a reference frequency. The simplest type of marker which can be used for a frequency reference is a calibrated, absorption-type, tuned-circuit wavemeter coupled into the output signal. There will then appear a dip in the amplitude of the sweep signal at the frequency to which the wavemeter is tuned, due to the absorption of energy by the tuned circuit. Another method of indicating a reference frequency is by superimposing the output of an oscillator of known frequency on the sweep signal. When the output of the marker oscillator is added to the variable frequency output, an interference pattern in the form of a slight pip is superimposed on the response curve where the two frequencies are equal, thus indicating the point on the curve which corresponds to the marker fre-

quency. The marker oscillator may be either a calibrated variable oscillator, or it may be a series of simultaneous oscillations (or their harmonics) at fixed frequencies throughout the range of the instrument. If the marker frequency is variable, the frequency corresponding to any point on the curve may quickly be determined by setting the marker until the interference pattern coincides with the point whose frequency is desired to be known, then reading the frequency directly from the marker calibration. If the reference oscillations are at fixed frequencies, the frequency corresponding to any point on the response curve is determined by interpolation between the two adjacent known reference points.

Video Sweep Generator

The commercial sweep generator shown in Fig. 1 has been designed for use in testing video amplifiers, and has a sweep range of 100 kc. to 8 mc.

The sweep signal is produced by a beat-frequency oscillator consisting of a push-pull, frequency-modulated r.f. oscillator, and a 6SJ7 operating as a fixed-frequency, electron coupled r.f. oscillator and doubler. The signal produced by the frequency-modulated oscillator varies approximately from 42 to 50 mc., while the output frequency of the oscillator-doubler is 50 mc. Frequency modulation of the push-pull oscillator is accomplished by a vibrating condenser of special construction, at a sweep rate controlled by the frequency of the a.c. (usually 60 cycles).

Although the use of a mechanically vibrating component would at first seem undesirable in a piece of electronic test equipment, this type of arrangement is found to possess certain very definite advantages which make it more desirable to use in this case. The major advantage is that in addition to simplifying the circuit, the use of a moving variable condenser makes possible a much wider linear frequency modulation of the variable oscillator than is possible with a reactance-tube modulator. The heterodyne oscillators may then be operated at a much lower frequency, thus minimizing difficulties due to oscillator drift and "pulling-in" effects due to coupling between the two oscillators.

The signals generated by the frequency-modulated oscillator and the fixed oscillator are heterodyned to produce the sweep-frequency output signal, by a 6AC7 used as the mixer. The FM signal is applied to the grid, and the fixed oscillator to the cathode, thus generating in the plate circuit a beat-frequency signal which is constantly swept 60 times a second over the range .1-8 mc. The sweep-frequency voltage appearing in the plate circuit of the mixer is then amplified by means of a conventional video amplifier and cathode-follower output circuit to a sufficiently high output

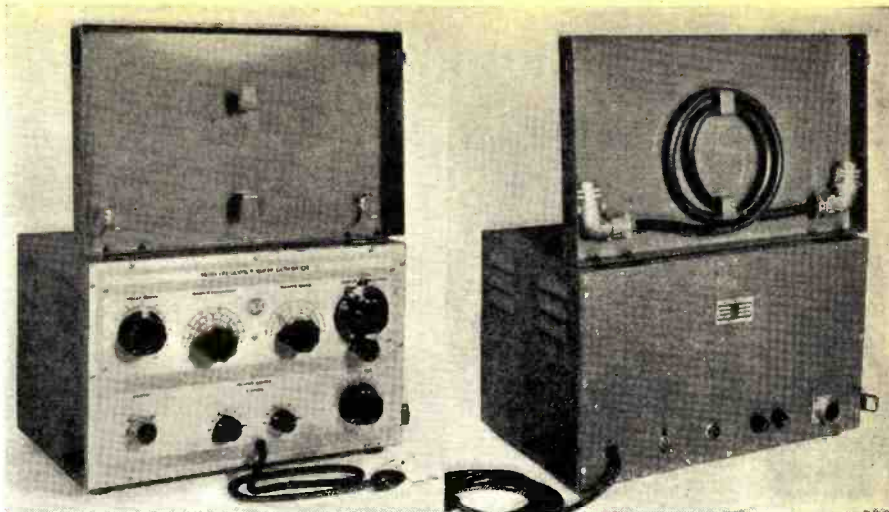


Fig. 5. An RCA high frequency sweep generator with its separate power supply.

level. An attenuator in the output circuit makes it possible to decrease the output to the desired level; by use of the attenuator, the output voltage can be varied in nine steps over a voltage range from .001 volt r.m.s. to a maximum of .85 volt r.m.s.

In order to measure accurately the voltage of the sweep-frequency output signal, a 6SN7 double triode is used as a detector and vacuum-tube voltmeter. The first section of the tube acts as a rectifier, the signal being applied to its grid through a coupling condenser from the output of the cathode follower. The second triode section together with the 0-200 microammeter and other associated components, forms the vacuum-tube voltmeter circuit. The output of the detector, in addition, may be used as a monitor for oscilloscope observation of the characteristics of the output signal voltage during testing of apparatus or when adjusting the sweep generator. (The

output of the detector appears for this purpose at the "Monitor Output" jacks on the front panel.)

Reference frequencies are obtained by means of the range marker circuit, which consists of a precision calibrated absorption-type wavemeter covering the over-all frequency band in seven ranges. The marker frequency, which serves as a reference point in the response curve on the screen of the cathode-ray tube, is calibrated according to the settings of the tuning condenser and is read on the dial in the center of the front panel.

The equipment also includes a blanking circuit in order to produce a zero-level reference base line in the oscilloscope pattern. Blanking is accomplished by applying a high negative voltage to the grid of the fixed oscillator tube to stop its oscillation every 1/120 of a second. This high negative control voltage is obtained by apply-

Fig. 6. High frequency signal generator built by the United States Television Mfg. Corp. The schematic diagram of this instrument is shown in Fig. 9.



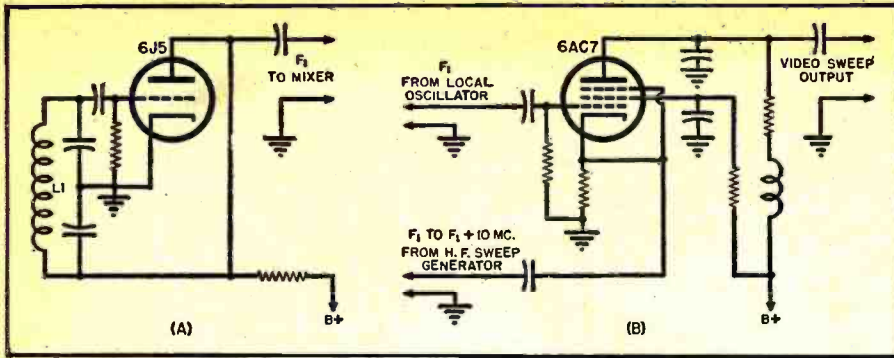


Fig. 7. Diagrams of the local oscillator and mixer shown in block diagram of Fig. 8.

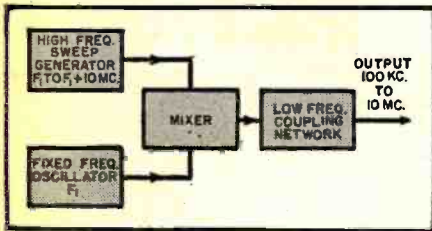


Fig. 8. Block diagram shows set-up by which a high frequency sweep generator can be used to produce a video sweep signal.

ing the 60-cycle voltage from the high-voltage secondary of the power transformer through a phasing network to the grid of a 6SQ7 tube, which is employed as a voltage amplifier and d.c. restorer. The positive voltage peaks of the 60-cycle voltage, applied to the grid, appear at the plate as a high negative voltage which, when applied to the grid of the 6SJ7 fixed oscillator, cause the plate current to be cut off

for 1/120 of a second and the oscillation to stop. When the oscillation stops, the sweep-frequency output signal disappears, thus causing the vertical deflecting voltage of the oscilloscope to be zero and the base line to appear. When the 60-cycle voltage is positive at the plate of the 6SQ7, rectification in the diode section of the tube restores the bias of the fixed oscillator to normal. Thus oscillations are resumed for another 1/120 of a second, and the full pattern of the signal under test appears on the oscilloscope. The application of the blanking voltage may be controlled by means of an "On-Off" switch on the front panel.

When using the sweep generator, the horizontal sweep of the oscilloscope should be a 60-cycle sinusoidal voltage accurately synchronized with the signal frequency variation. A voltage of variable phase, which may be used for horizontal deflection of the oscillo-

scope spot, is obtained by means of a separate transformer connected across the a.c. line with a variable resistance-capacitance phase-shift network across the transformer secondary.

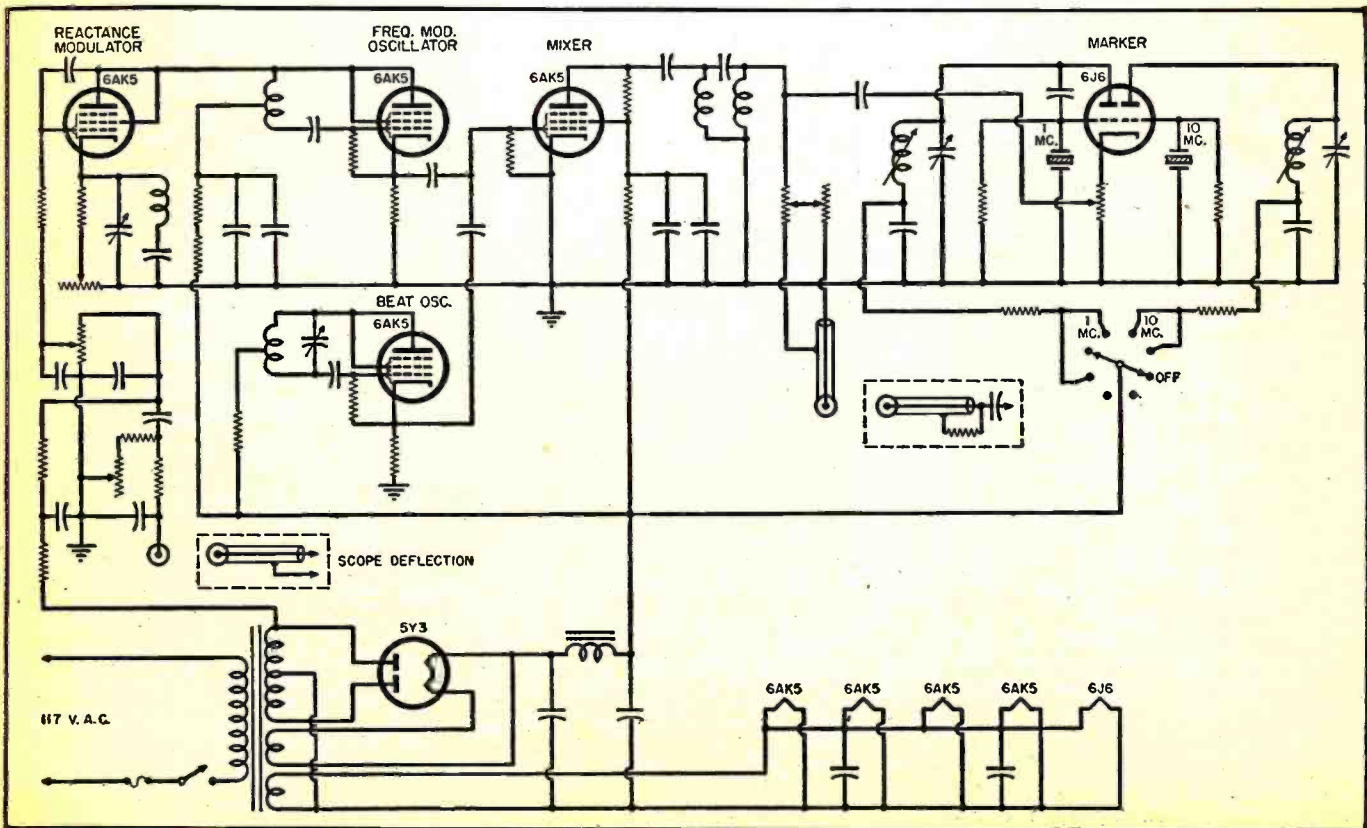
In earlier video sweep generators, a motor-driven rotating condenser was used instead of the vibrating condenser used in this equipment. With this method the horizontal sweep of the oscilloscope could be synchronized by means of a small induction-type impulse generator which was directly coupled to the shaft of the sweep condenser and carefully adjusted to have the correct phasing and alignment with respect to the condenser. The periodic pulse thus produced controls the frequency of the oscilloscope sawtooth oscillator. A commutator which is also coupled to the sweep condenser shaft and accurately adjusted, enables cyclic suppression of the fixed oscillation when a zero-level base line is desired in the oscilloscope pattern. The more reliable and flexible electronic blanking and horizontal deflection circuits have now replaced this mechanical arrangement.

High-frequency Sweep Generators

The commercial equipment shown in Figs. 5 and 6 are high-frequency sweep generators for use in testing high frequency r.f. and i.f. circuits.

The sweep-frequency signal generated by the unit shown in Fig. 5 has a center frequency which is adjustable from 5 to 65 mc., and a frequency excursion adjustable from .2 to 20 mc. The circuit consists of two push-pull
(Continued on page 108)

Fig. 9. Schematic diagram of the high frequency sweep generator shown in the photograph of Fig. 6.



R.F. Power Supplies

By
J. C. McGUIRE,
W9ZGR

This simple unit produces a high voltage, low current power source which is particularly applicable for use with cathode-ray tubes.

RADIO frequencies can be used to advantage to generate high voltages at low current for the anodes of cathode-ray tubes used in television, radar, oscilloscopes and for keep-alive voltages for T-R tubes.

This article will deal with a power supply of 1 to 1.5 kv. although supplies of this kind are practical on much higher voltages, such as 10 kv. and up. The regulation can be near 100% at low current drain and the efficiency can approach 100%. The circuit used is a modified *Meissner* oscillator and the frequency used is about 250 kc. Because the feedback is taken from the secondary, the circuit, if tuned, would oscillate with the grid or plate connections reversed, but one frequency of oscillation would be the low frequency and the other the higher, or about 280 kc. The lower frequency will produce lower output but is the most efficient and is the one to use. The 6V6 oscillator is operated at about two and one-half times cutoff and is quite stable. The filament of the 8016 diode rectifier is heated by r.f. picked up by the one turn loop placed over the primary coil. A larger choke would be better but since the bypass condensers used are a dead short to the frequency of oscillation, two and one-half millihenries will be satisfactory. The 6.3 volts for the filament and the "B plus" are taken from a source in the unit in which the power supply is to be used. A well regulated power supply is the best to use since a change in the "B plus" will change the output voltage. A variable potentiometer is usually used in this lead to adjust the output to a suitable value. Overcoupling of the primary (L_1) and secondary (L_2) gives a broad double-hump resonance curve (Fig. 1). As the load increases the initial operating point will move across the flat part of the curve towards the 280 kc. side. In other words the primary is peaked at approximately 250 kc. but the secondary is peaked at about 280 kc. and due to the overcoupling and the point of operation excellent output

Plexiglas or phenolic panels are used to mount all components.

regulation may be obtained over a limited range. The secondary (L_2) with its rectifier and capacities determines the operating frequency of the unit. The filter circuit consists of the two .003/1600 volt buffer condensers and the 100,000 ohm, 1 watt resistor. No ripple could be detected.

The Coil

The coil in this particular unit was so designed that no tuning of the primary was necessary for proper operating point.

Winding the coil is the hardest and most critical part of construction, although if a coil winder is available, with a little practice one can turn out a perfect coil each time. First mark off the spacings and wind on the three sections for the secondary. Be sure to

observe the starting position and get 125 turns on each pi; leave 6" leads. Now wind the primary pi of 120 turns and observe the starting position. Finally the grid or feedback winding is wound on one pi of 35 turns. The
(Continued on page 148)

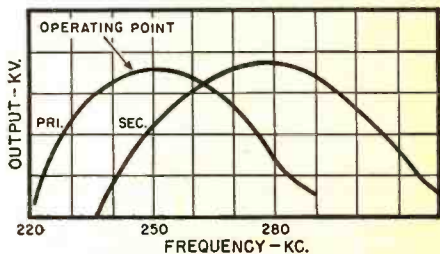
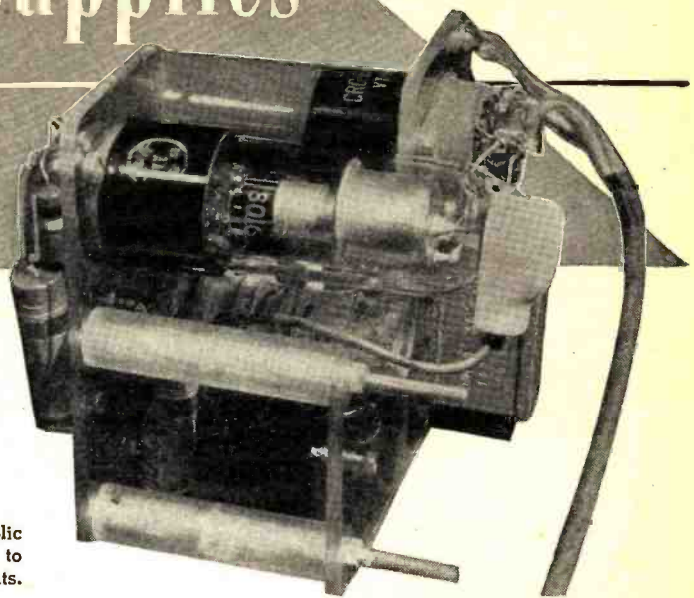
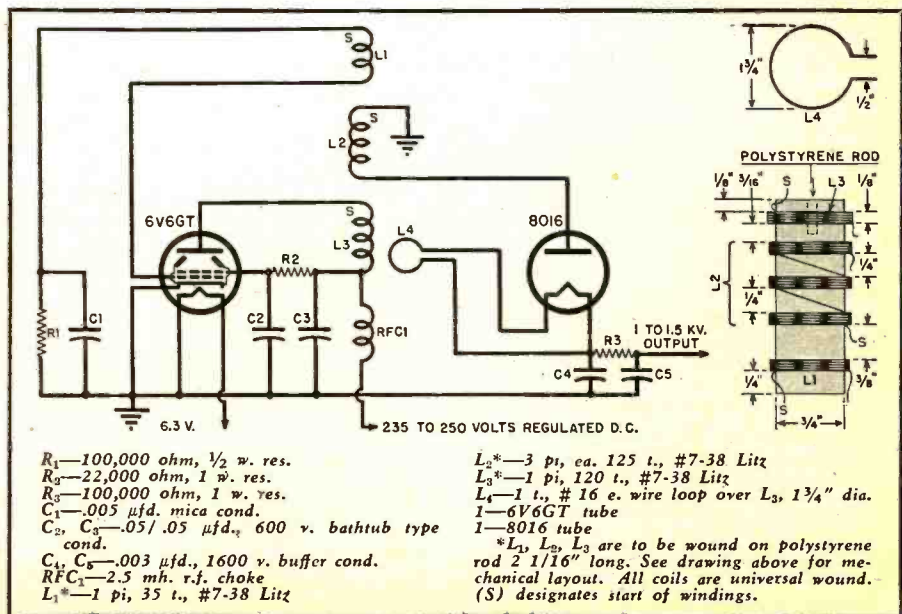


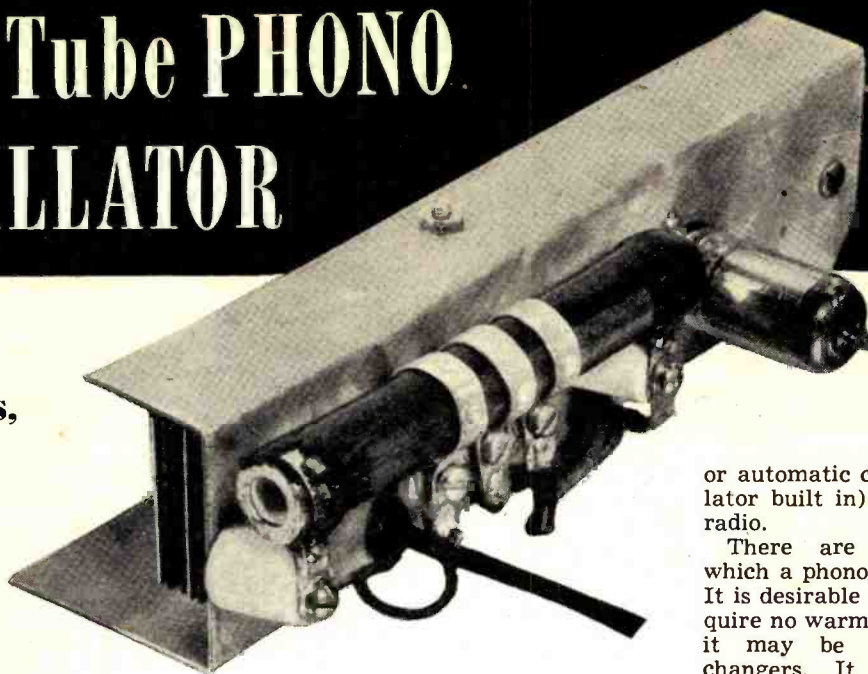
Fig. 1. Curve shows desirable double-hump effect resulting from overcoupling of primary and secondary coils.

Fig. 2. Schematic diagram and mechanical layout of coil assemblies for power supply.



One Tube PHONO OSCILLATOR

By
A. WILLIAMS,
W7HYA



The author built his unit on a channel type chassis. However, any shape or size of chassis may be employed.

Complete details for building your own phonograph oscillator. It will work with any standard receiver.

IN THE life of every radio man there comes the sad day when someone asks, "Will you build me a phonograph oscillator?" When my best friend asked me this question I was in a very embarrassing position since my previous experience with these gadgets was nil. During the days of Chinese copying, trial and error, and frantic experimentation that followed, there was plenty of time to reflect on the shortcomings of radio as a career and myself as a radio man. The first model (two tubes) had poor fidelity, the second model (four tubes) had severe distortion, the fifth model (six tubes) had extreme distortion,

etc.—etc.!! But the final result was an oscillator which was really good.

In spite of its inherent faults, the phono oscillator is a very nice gadget. It will enable any phonograph to which it is attached to be played through any radio without direct connection, merely by tuning the radio to the frequency of the oscillator's signal. This means that you can utilize the beautiful tone quality of your large console radio or the convenience of any small portable for enjoying recorded music with no changes whatever in the radio. This is especially nice for parties and dances since you need carry only a small phonograph

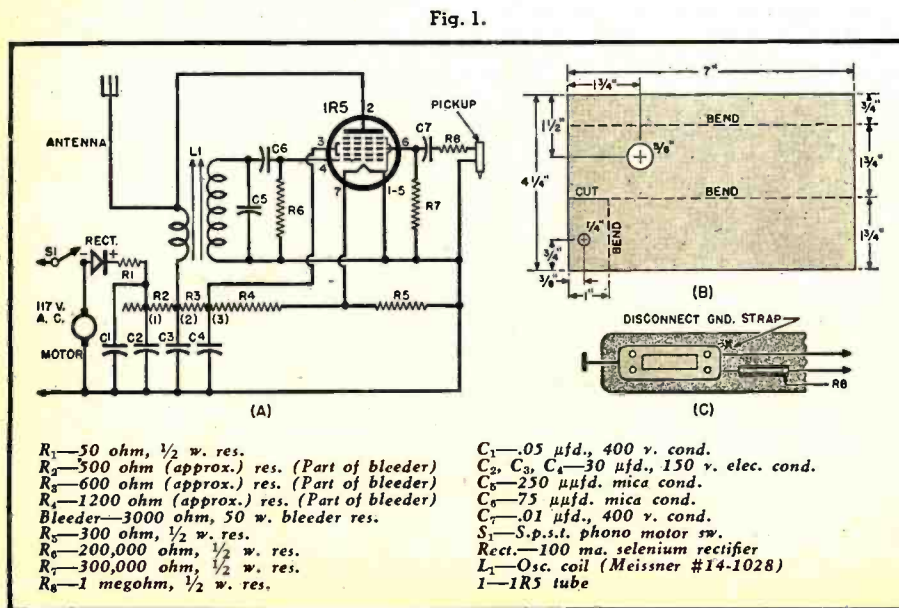
or automatic changer (with the oscillator built in) and use any available radio.

There are several requirements which a phono oscillator should meet. It is desirable that the unit should require no warm-up period in order that it may be used with automatic changers. It should be kept simple because the more parts, the more to get out of adjustment. Last, and most difficult, it should have fidelity—or lack of distortion. This means the modulation percentage must be kept low, and r.f. output kept high. But if modulation percentage is too low there will be an annoying hiss in the radio, and if the r.f. output is too high the FCC won't like it. Now the only problem is to combine these features in one phono oscillator.

This phono oscillator meets these requirements quite nicely. The power supply circuit, shown in schematic diagram Fig. 1, incorporates the new *Federal* selenium rectifier, which requires no warm-up time. Since the instant heating 1R5 filament is supplied by the rectifier, the oscillator goes into operation as soon as the switch is turned. A single 3000 ohm, 50 watt bleeder is used as both filter resistor and filament dropping resistor, and is also tapped to provide 67.5 volts for the screen supply. Adequate filtering is provided by a three section 30 μ fd. filter condenser. The third section of the condenser proved of more value at the screen grid tap rather than across the filament, as used in conventional circuits.

The oscillator circuit has been kept simple by the use of a single tube as a modulated oscillator. A *Meissner* 14-1028 oscillator coil, of the ordinary broadcast band, adjustable iron core variety, provides coverage over approximately 550-750 with the mica condenser shown. The value of this condenser may be changed to provide a different tuning range. Maximum modulation without distortion is insured by the voltage divider circuit formed by the one megohm resistor in series with the crystal pickup, and the 300,000 ohm audio grid leak. These values are not variable, since, due to its small output, the 1R5 should be

(Continued on page 167)



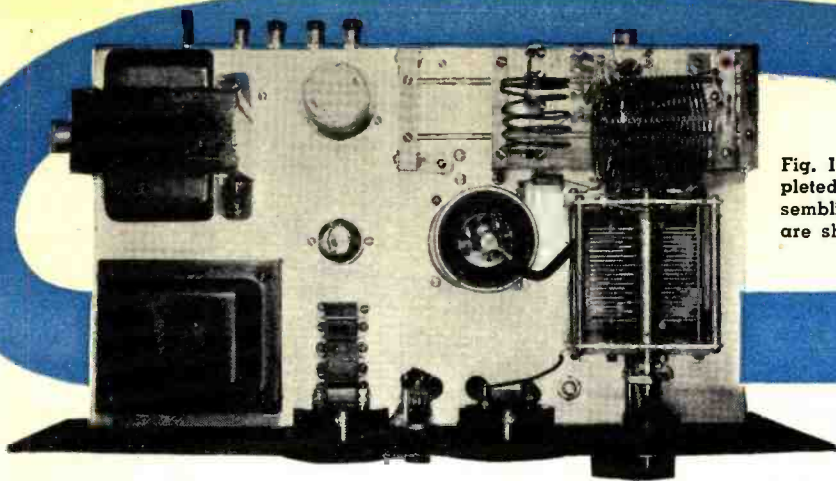


Fig. 1. Top view of completed transmitter. Coil assemblies, L_3 , L_4 , L_5 , and L_6 , are shown in upper right.

TRANSMITTER with EFFICIENT BAND SWITCHING

By RUFUS P. TURNER, W1AY

There is no need for operator to go inside of this complete, single-package transmitter. Complete coverage from 10-80 meters, with all front panel controls, is possible. Features crystal switching, e.c.o. input, and all other trimmings without having to change coils.

TRANSMITTER band-switching is both convenient and safe. Convenient because it does away with the load of plug-in coils usually necessary to cover several bands, and enables rapid band changing without acrobatics. Safe because it keeps the operator out of the dangerous innards of the rig.

But ordinary coil switching is notoriously inefficient. For this reason it is seldom used in amateur final amplifiers unless the operator is willing to sacrifice some of his precious plate watts. Amplifier plug-in coils accordingly linger with us even when the rest of the transmitter is switched. Oscillator and doubler stages are another story—a few lost watts in the exciter are of little consequence, since the power normally delivered is considerably more than the grid watts required by a modern final amplifier.

Sometime back, we cast about mentally for a band-changing system we could use in the final amplifier plate circuit. What we were after was a mechanism affording plug-in coil efficiency and although it would not be a selector switch, it would be manipulated by a front panel knob. We came up with the gear-driven coil carriage shown in the transmitter described in this article. The system is not new. It has been used for almost 10 years in the *National NC* series of receivers. But, to the best of our knowledge, it

has not been used before in a transmitter.

The coils are mounted in a sliding carriage which, being moved horizontally along rods or rails by a geared shaft extending back from the front panel, actually plugs one coil in and removes the other from the circuit. By using a large tuning capacitor, only two coils are necessary for 10-80-meter coverage, one covering the 80 and 40-meter bands and the other 20 and 10 meters. The mechanism is smooth acting and positive.

While we chose to apply our complete band-changing arrangement to a 2-stage 807 transmitter, the same scheme may be applied equally well to

a higher-powered rig, especially one employing a modern high-powered beam tube. It should be necessary only to use heavier contacts and coils in the amplifier band-changing mechanism in order to accommodate the higher d.c. plate current and r.f. tank current.

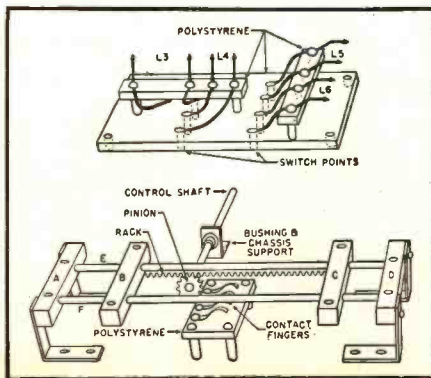
Amplifier Band-Changer

Mechanical details of the gear-driven "coil carriage" of the output amplifier are shown in Fig. 2. A close-up photograph of the mechanism is shown in Fig. 6. The carriage may also be seen in Figs. 1 and 5.

The operating principle of the mechanism may be grasped by studying these photographs and Fig. 2. The control shaft, turned by a front-panel knob, operates a small pinion gear which engages a gear rack attached to the two bars (B and C in Fig. 2) to which the coil base is attached. This allows the coil base to be moved horizontally to the right or left over the four contact fingers. The latter are mounted just below the coil base on a polystyrene strip and they make contact with the coil switch points, or rivets, secured to the bottom of the coil base.

Parts A, B, C, and D are $\frac{1}{2}$ " x $\frac{1}{2}$ " x 3" brass blocks. E and F are brass rods, each $\frac{1}{4}$ inch in diameter and 9 inches long. Blocks A and D are drilled and tapped for set-screws which hold the two brass rods. Blocks B and C likewise are drilled for mounting screws for the coil base and provided with clearance holes for the brass rods. B and C also hold the gear rack. Blocks B and C (and the coil base assembly) travel along the two rods. The coil base is made of $\frac{1}{4}$ -inch thick polystyrene, 6" x 3" in size. The two coils are mounted directly on polystyrene strips, $\frac{1}{2}$ " x 3" in size and

Fig. 2. Mechanical arrangement of 807 amplifier band-changing mechanism.



these, in turn, are mounted on the main base by means of short metal studs. The contact fingers are flat springs of phosphor bronze bent into the shape shown in Fig. 2. The base on which they are mounted is made of 1/4-inch thick polystyrene, 2 1/2 inches long and 1 inch wide.

The drive shaft is 1/4-inch diameter brass rod. The chassis-supported bearing through which it passes (See Fig. 2) is made from a small brass angle (dime store variety) and a standard radio panel shaft bushing. The brass pinion gear attached to the drive shaft is a standard catalogue item. It has 18 teeth, 3/4" p.d.—1/2 inch diameter with hub. The brass rack is 1/4 inch square, 24 pitch. A 6-inch length of this rack is used. The gear is catalogue number G-257 and the rack G-579 of *Boston Gear Works* (Boston, Massachusetts).

The coil switch points (See Fig. 2) were dug out of the author's junk box, having been used previously in a resistance decade box. These points may be obtained from radio hardware com-

panies; or, in their place, rivets or screws (fillister head or flat-top binding head) may be used. It is desirable, but not imperative, that both switch points and contact springs be silver plated. At any rate, the contact springs must be bent upward at a sufficiently high angle to insure tight, rubbing contact.

The coils L_3 and L_4 were made from some of the *Barker & Williamson* air-wound inductor material which may be bought by the foot at radio stores. Two turns were removed in order to separate the celluloid-bound winding into singly-supported tank and link coils. If desired, these coils may be wound by hand. L_5 and L_6 were hand wound with No. 12 enameled solid copper wire.

It cost less than five dollars to build the entire amplifier band-changing mechanism.

Oscillator Band-Changer

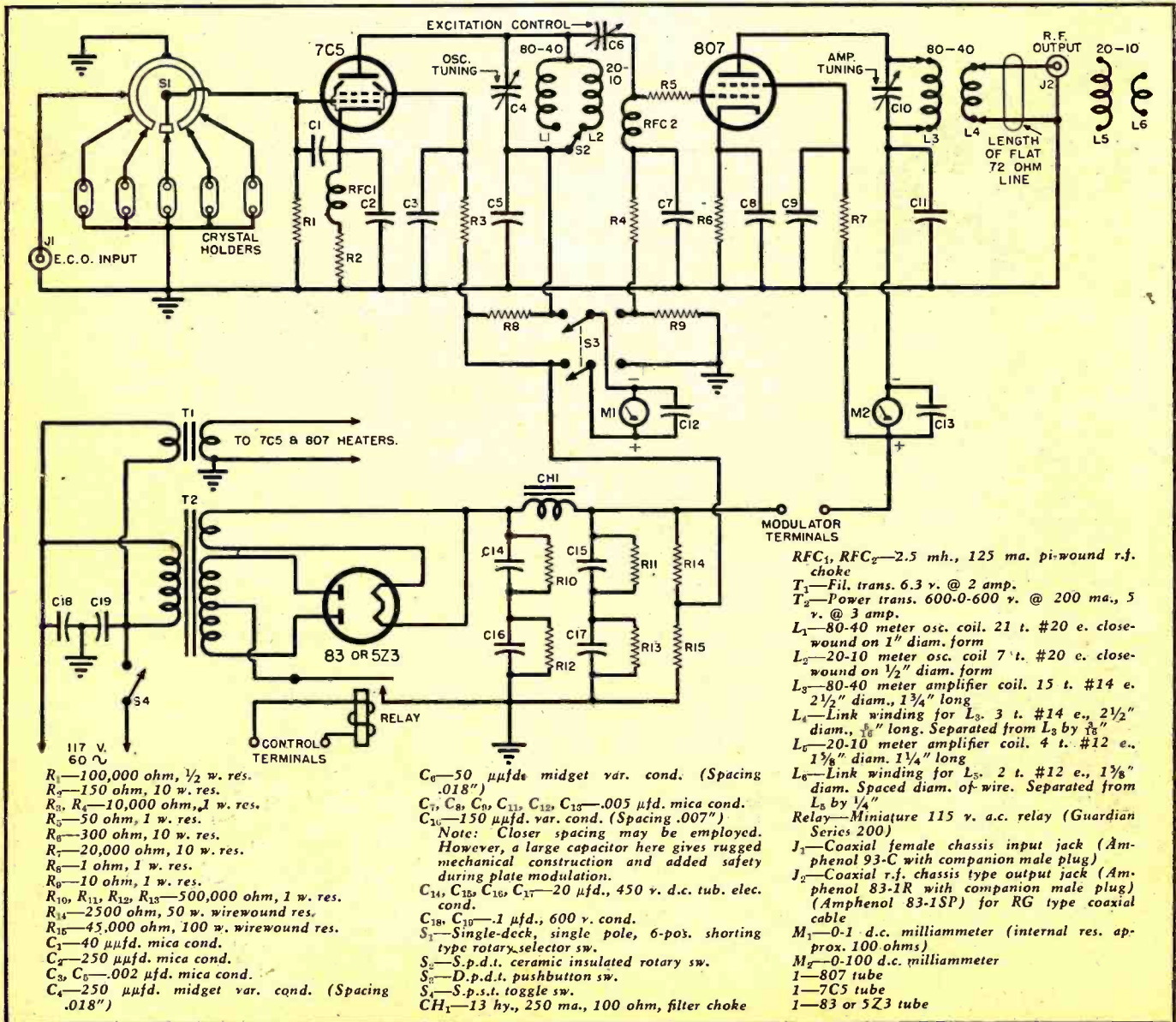
Small plate losses can be tolerated in the oscillator circuit, since the circuit used can be depended upon to

deliver a lot more power than is required by the 807 amplifier. A coil switch (S_2 in Fig. 3) consequently is used in this stage. By employing a 250 μfd . tuning capacitor (C_4), only two coils are required, as in the amplifier, for 10 to 80-meter coverage. L_1 covers 80 and 40 meters, and L_2 20 and 10 meters.

Excitation Control

Proper operation of the 807, and its life as well, depend a great deal upon keeping its d.c. grid milliamperes to the values recommended by the tube manufacturer (3.5 milliamperes for c.w. telegraphy and 4 ma. for plate modulated telephony). For wide control of grid current, a variable coupling capacitor (C_6 in Fig. 3) is provided as an excitation control. This component is mounted close to the 807 socket (see Fig. 7) and is rotated by means of a belt and pulley system (similar to the belt drive used on receiver dials). The belt and wheels, which may be seen in Fig. 7, allow the excitation control knob to be placed

Fig. 3. Circuit diagram of transmitter. All contacts on L_3 , L_4 , L_5 , and L_6 are in amplifier plate band-changing mechanism.



at the proper point to maintain front panel symmetry (see Fig. 4).

Crystal Switching and E.C.O. Input

Five crystal sockets are mounted on the chassis. These are selected by means of the rotary switch, S_1 . In the extreme left-hand position of S_1 , the 7C5 grid circuit is connected to the front-panel coaxial jack, J_1 , for e.c.o. input. It will be noted that S_1 is a *shorting type* switch. This makes possible the *automatic* grounding of all crystals not in use (and of *all* of the crystals when e.c.o. is being used), to prevent unused crystals from "taking off" accidentally.

Metering

It has already been mentioned that the 807 (and most beam tubes) is very fussy regarding its grid mills. Milliammeter, M_1 , accordingly has been wired-in to "rest" normally in the 807 grid circuit. When the d.p.d.t. pushbutton switch, S_3 , is depressed, however, this meter momentarily is switched to the 7C5 plate circuit for reading oscillator plate current. If a 0-1 d.c. milliammeter (with internal resistance of approximately 100 ohms) is employed, shunt resistor R_8 will convert the scale to 0-100 milliamperes for oscillator plate readings, and shunt resistor R_9 will convert the scale to 0-10 milliamperes for amplifier grid readings.

Meter M_2 (0-100 d.c. milliamperes) is permanently connected in the 807 plate circuit.

Both meters are bypassed for r.f. Mica capacitors C_{12} and C_{13} are connected to the meter terminals *at the meter* by the shortest possible leads.

Chassis Terminals

The r.f. output of the 807 amplifier is delivered to a heavy-duty coaxial jack (J_2 in Fig. 3) mounted on the back of the chassis. This jack is connected by means of a short length of *Amphenol* 72-ohm *flat* line to the contact fingers engaging the link-coil switch points. The jack may be seen in Fig. 7, and also the "line" extending through a grommet-lined chassis hole. A companion coaxial plug (see parts list of Fig. 3) fits into the jack and permits the transmitter to be link-coupled, through a heavy-duty coaxial line (such as *Amphenol* RG 8/U), to a suitable antenna coupler, or coupled directly through such a line to the center of a doublet antenna. If the transmitter shown here is employed as an exciter, it may similarly be coaxially coupled to the grid tank of the succeeding stage.

The *modulator* terminals, also mounted on the rear lip of the chassis, are connected in series with the "B-plus" (plate and screen) line of the 807 stage for plate-screen modulation. When the unit is used as an exciter or as a c.w. telegraph transmitter, these terminals must be connected together externally by means of a jumper.

The control terminals are connected

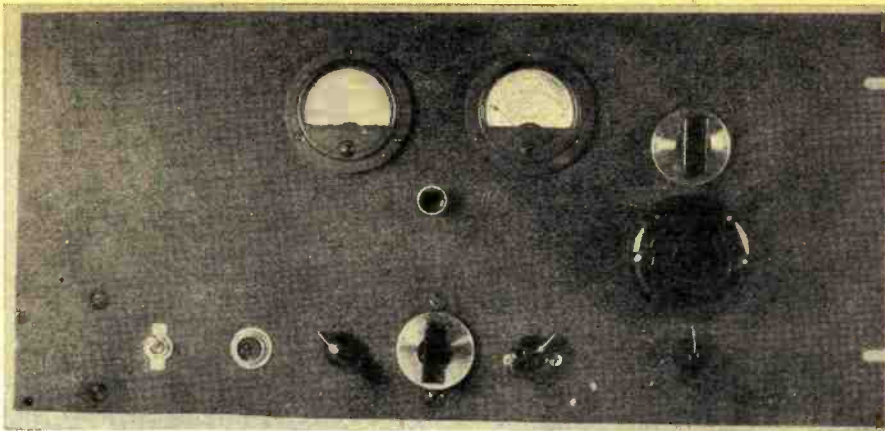


Fig. 4. Front panel view of transmitter. Controls from left to right along the bottom are; line switch, S_1 ; e.c.o. input jack, J_1 ; crystal switch, S_2 ; oscillator plate tuning, C_1 ; and oscillator band-change switch, S_3 . Controls from top to bottom on right are; amplifier plate tuning, C_{10} ; amplifier band-change switch; and amplifier excitation control, C_6 . Meter, M_1 , is to the left and meter, M_2 , is shown at right. Switch, S_4 , is placed in the center of the panel.

directly to the 115 volt a.c. coil of the "push-to-talk" relay. Line voltage fed to these terminals through a push-to-talk switch or pushbutton closes the relay to switch-on the plate and screen voltages to oscillator and amplifier.

Power Supply

The complete, self-contained power supply is shown in the lower left-hand corner of Fig. 3. Power supply may be seen on the chassis in Figs. 1 and 5.

A separate filament transformer, T_1 , was employed by the author because the only power transformer available at the time had no 6.3-volt winding. However, this winding may be included on the main power transformer if the individual builder desires.

While both 5Z3- and 83-type tubes have been tested with excellent results in the transmitter shown here, some builders may prefer to use the newer, octal-based 5R4-GY rectifier tube in this capacitor-input filter circuit. This

tube is rated to give somewhat better results at 600 volts when a filter of this type is employed.

The $\frac{1}{2}$ -megohm resistors, R_{10} to R_{13} , equalize the voltage drops across the individual electrolytic capacitors and insure their longer life. These resistors *must* be included.

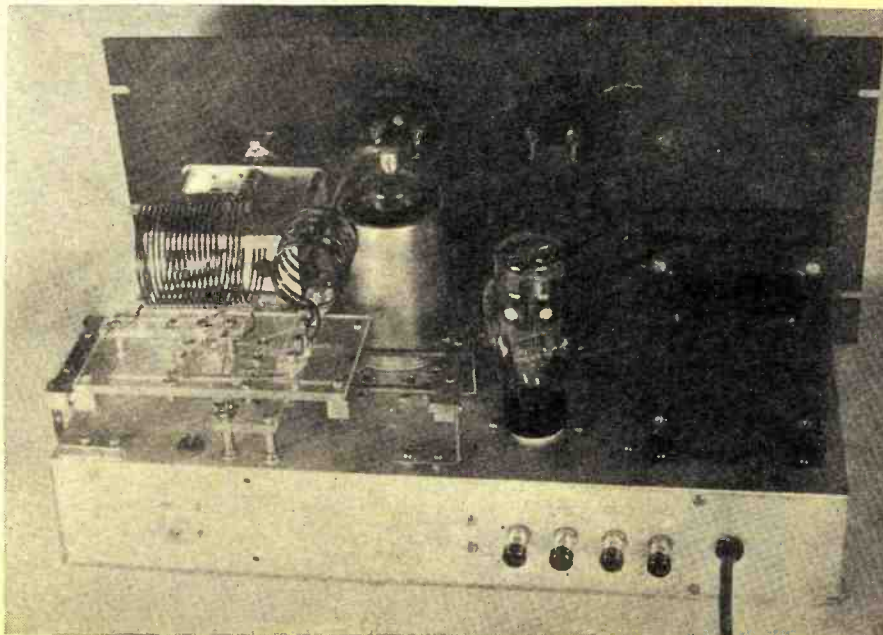
Operation

Without having resorted to any elaborate precautions, the entire transmitter has been found to perform in a clean-cut manner—without parasitics and other faulty operations. The 50-ohm "suppressor" resistor, R_8 , in the 807 grid lead, and the aluminum 807 shield ($2\frac{1}{2}$ " outer diameter and $3\frac{3}{4}$ " height) take care of any instability in the amplifier stage.

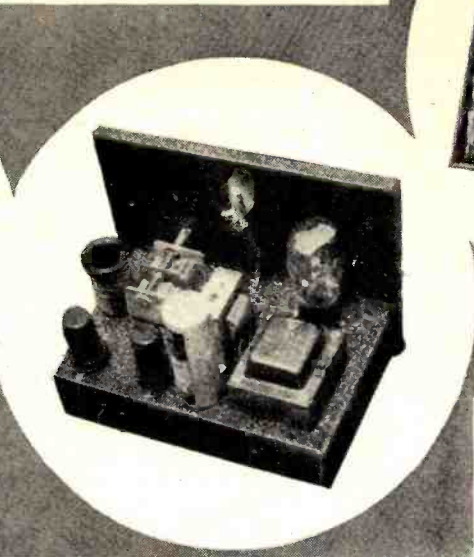
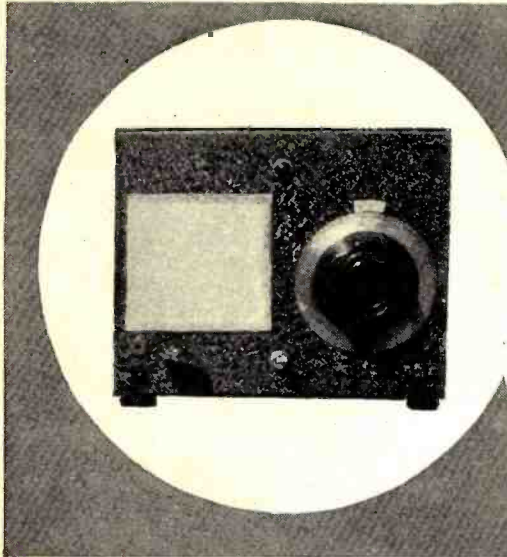
Both oscillator and amplifier plate tuning capacitors (C_1 and C_{10} respectively) hit 80 meters at their high-capacitance settings and 40 meters at

(Continued on page 149)

Fig. 5. Rear view of transmitter showing amplifier band-changing mechanism. The rear chassis flange mounts r.f. output jack, J_2 , and modulator and control terminals.



A Modulated R.F. SIGNAL GENERATOR



Three views of the home-built signal generator. Although the fundamental range of instrument is 425 to 1000 kc., harmonics of usable strength up to 30,000 kc. are available for receiver checking.

By H. HAYMAN, W2FYW

This inexpensive signal generator, providing both audio and r.f. output, was built of junk box parts.

SINCE a signal generator is still difficult to obtain and those available very expensive it was decided that one could be constructed of parts available in the junk box. However, if it proves necessary to

purchase the parts the builder should be able to secure these at a cost of about \$15. The generator thus constructed can give modulated signals on a fundamental range of 425 to 1000 kilocycles, and harmonics of usable

strength up to 30,000 kilocycles. Audio energy of approximately 500 cycles can be obtained from the same output jack for use in trouble shooting.

A transformer type power supply was used to prevent accidental shorting of the power line when using the generator with a.c.-d.c. sets. However, this same signal generator may be built with a transformerless power supply. With the transformer that was available 390 volts "B plus" was obtained.

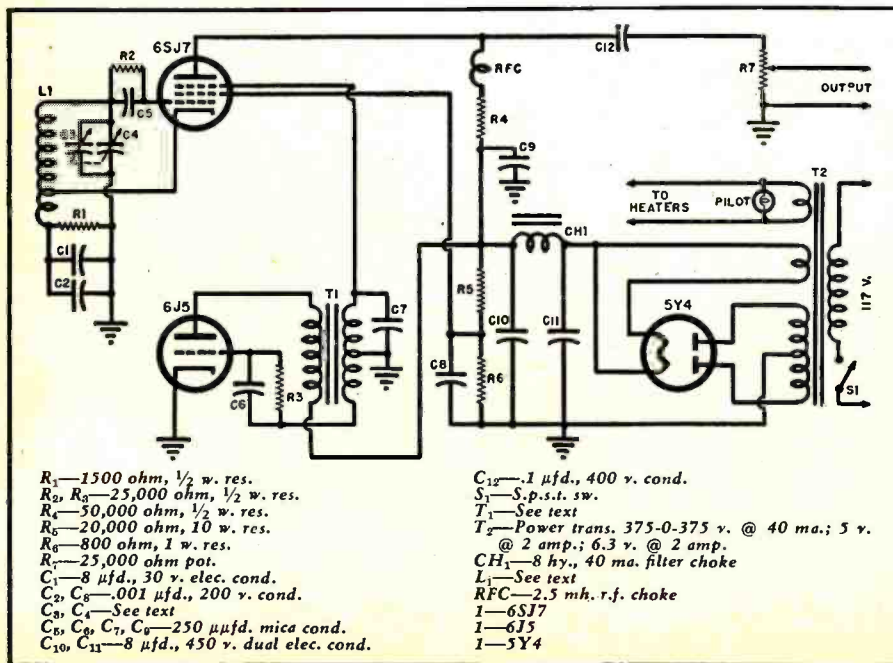
The electron coupled Hartley oscillator is a 6SJ7, suppressor grid modulated. R_1 provides suppressor bias. C_1 bypasses the audio to ground and C_2 bypasses the r.f. component to ground. Grid leak bias is obtained from C_3 and R_2 . C_3 - C_4 is a two-section variable condenser taken from a midjet receiver. Both sections are used in parallel. L_1 is wound on a four-prong coil form. It consists of 100 turns of No. 26 s.s.c. close wound, with the cathode tap thirty turns from the ground end.

C_5 returns the screen grid to ground and C_7 is the r.f. return for the suppressor grid. To provide isolation for both r.f. and a.f., "B plus" for the plate is obtained through the combination of an r.f. choke and a 50,000 ohm resistor. A .1 μ f. condenser isolates the plate from the output jacks. The screen is at plus 12 volts and the plate at plus 350 volts. The low screen voltage was necessary to keep the r.f. output at a low level.

The calibration chart can easily be made with the use of any accurate receiver. It is mounted on the front panel to the left of the dial. Fre-

(Continued on page 130)

Diagram of signal generator. Parts should not exceed \$15 if purchased new.



THE GOOD OLD DAYS

Andrew Young of "Mutiny on the Bounty" fame with a typical old time spark transmitter.



By
DON M. WHERRY, WØDEX

SO YOU want to know how I got started in ham radio, huh? Well, son, that's quite a story. How long have you had your ticket now? Three months, hmmm—things sure have changed some, I'm not really an old timer—but then—yep, guess things have changed some.

Let's see now, it was just a little while after we straightened up that other mess over there in Europe. What? Nope—I was a little too young to get in on that. My first outfit? Well now as I remember it I had a wire strung from the top of the house to the top of the barn. My transmitter was a Ford spark coil tuned to 300 to 800 meters inclusive I guess, and my receiver was a mass of wires in a pretty doubtful circuit, with an even more doubtful piece of galena for a detector, with a cat whisker on a still more doubtful sensitive spot. What's a cat whisker? Well, son, that's a little piece of spiral wire with one end stuck on a sensitive, you hope, spot on the crystal. That was the first rig. DX? Young feller you shouldn't have brought that up. I had that outfit for about a year and didn't work anyone. I did hear a guy though—a local, cross town, came in about R7. He was a big high power feller. Let's see, 9AFW was his call—he had a California KW of those days—wound his own transformer, gosh only knows how much voltage, around thirty thousand I expect. Anyway he was my DX reception, course I could probably have heard him just as well by sticking my head out the upstairs window—if I had had a favorable wind anyway. Son that spark gap of his sounded worse than some of those 144 mc. boys. A neigh-

bor of his had a radio and every time he would fire up his rig he would burn a spot in the guy's crystal detector. Not only that, but believe it or not, in dry weather you could draw sparks from the nails in the siding on his house when he had it going. Boy, those were the good old days for sure, son.

Well, anyway, the next winter I made a big step forward—yes, sir—I got a tube-WD11, no other. Made myself a one tube regenerative and believe it or not it worked. Yeah, my transmitter was still the old coil. Did a little better with that rig too. Worked a couple of guys down the street a few blocks. And say, son, I worked a guy on fone too. You know I—what? How'd I work on fone with a spark coil? Well, son, it was easy. I just turned the regeneration up on my receiver until it oscillated and then put a telephone mike in the ground lead. Simple huh?

Then there was a pal of mine down the street about two blocks who got on the air about that time with a pair of five watters and a brand new call 9AEF. I laid awake nites trying to figure out how to get to run his station when I finally got a break. I got him in a crap game and put up

my counterpoise against permission to be second op at AEF. And, boy—I won! I think that was the last natural I ever threw, anyway I really took advantage of it and just about lived at his place. It wasn't so bad for him as it sounds though because we would both try to copy what the other guy was sending and maybe between us we would get the general drift of what he was saying. Gosh, I'll never forget one day when we had a message going east and we hooked a guy, I forget his call, and asked him his QRA. Well, he told us but that was one of the times neither one of us got what he was saying. Anyway, we decided to take a chance and said R R R and gave him the message—he came right back, about seven words per (about our speed) with, "Say, I said my QRA was Seward, Nebr., what in—is the idea of giving me a message to Chicago?" Well, son, that was really the 64 dollar question but we both proved our ability as real hams right then and there—we soft soaped him with something about how he had a terrific signal there in Iowa and he sounded like a cinch for the east coast at least, and how Chicago must be

(Continued on page 120)

Preliminary Steps in ESTABLISHING a RADIO and APPLIANCE STORE

By **RAYMOND SCHUESSLER**

Going in business for yourself involves a great many details which are too often overlooked. You can weather business storms by careful planning.

FEW other businesses were so drastically disrupted by the war as the electrical appliance and radio group, but as a natural consequence it can now expect a greater customer demand than any other retail business.

Because of rationing and wartime restrictions the quantity of electrical goods has not been large enough to absorb earnings or meet the demand for ordinary household necessities.

Nevertheless, as lucrative as the field may appear, it is necessary to unearth all the technical aspects of this business before any venture can be contemplated in order to ensure an even chance of success. Consumer demand is no guarantee of success in any retail line. Research into every phase of the industry, past, present, and future, is imperative.

First of all it will be necessary to look over your own qualifications. Selling experience is an essential attribute. Thirty-four per-cent of the retail failures can be blamed on incompetence. Those who have had some sort of experience selling will have a considerable advantage. Have you a technical background in electrical appliances and radio? Are you aware of the great changes that have taken place in retailing techniques during the last few years? What are the legal and financial requirements for starting a business and how does one

combat the red tape? What are the postwar trends in merchandising and what are the new products? These are the questions which must be answered.

In the opinion of experts television for the home offers a tremendous market for the appliance and radio dealer. One recognized authority estimates that the demand for television receivers during the first ten postwar years will reach 25 million units, representing a retail value of 3 billion dollars. The public is expecting these sets and they are ready to buy them. However, and this is an important aspect, the price must be in the neighborhood of \$250 before a mass market for this product will be secured—so invest wisely.

All in all, there will be a huge market for all appliances. Fluorescent lighting, air conditioning, cove lighting, humidifiers, reversible heating and cooling units just out of the embryo stage will soon offer a steady market. These and many other products in the electronic merchandise field, such as aural radio, inter-communicators, hearing aids, etc., will supplement the ingenious retailer's inventory. Technical advances will result in improved merchandise in ever increasing quantities.

Although it is a great feeling to be your own boss don't be overanxious to start on such a dream without the

proper knowledge which will back you to an even break.

Whether you decide to settle in an already established business or open a new store it will be necessary to examine the financial requirements and operating legalities which must be met in order to ensure economic stability and sufficient operating capital.

Primarily, the business stability of the neighborhood should be investigated as this can be of inestimable value in determining your own chances of success in that particular district. The information is not as difficult to unearth as it may appear. A glance through *Dun and Bradstreet*, chats with the local Chamber of Commerce and especially a visit to the electric dealers' trade association in your town, will elicit some of the data you will need.

Whether to buy or rent a building is another important question. According to percentages of business failures it would be wise not to buy until your business is well established. Since your business is liable to grow it might be wise to choose a building that could be altered to meet your requirements.

As for the lease, it will pay you to have a lawyer look over such documents before you sign in order to make sure that all angles of the question of who pays for insurance, repairs, taxes and alterations, etc. are clear.

In proportioning space, twenty-five square feet should be allotted for displaying each major appliance. A sample calculation of space requirements might read as follows.

	Square Feet
Aisles, show windows and desk space	225
2 washing machines	50
2 electric ironers	50
1 electric dishwasher ...	25
3 refrigerators	75
2 ranges	50
5 console radios	125
1 record sales shelf.....	30
1 record booth	30
1 television demonstration booth	60
2 open counters for small radios and traffic appliances	60
Storage space and service area	220
	<hr/>
	1000

This would necessitate a building of approximately 20 x 50 feet. One suggested arrangement for a store of this size is given in Fig. 1.

At this point an estimate should be made of the complete fiscal outlay that must be made for the first year or at least the first six months. Every item, from the basic rent, light, heat, and inventory should be estimated to the best of your ability. In this way a fair idea of the amount of capital you will require can be determined. Never underestimate these basic financial requirements. Lack of capital ranks

number one among the reasons for business failures.

To determine fairly accurately how much working capital you need, a copy of the "1940 Retailers' Operating Cost Survey for Electrical and Gas Household Appliances Stores" should be obtained from the Department of Commerce in Washington. Expected operating cost can be computed from the chart given on pages 20-24. Check your figures against the listed ratio applicable to your community. By following this chart through the first few months of operation you should be able to determine whether or not you are progressing satisfactorily or are heading for oblivion.

During the first year your personal income derived from your business may be very small. This does not indicate that you or your business are failures. It is only after this initial period that you can expect to receive an adequate "salary" from your enterprise.

The importance of adequate working capital cannot be over-estimated. In a recent Department of Commerce survey it was found that *one out of three* business failures can be attributed to a lack of capital. This item exceeds even incompetence as a cause of business fatalities. A list of the prime causes of failures by percentages is shown in Table 1.

Another drain on your cash reserves are the so-called "extra-curricular" expenses for advertising, for cash discounts, for carryover periods during

natural stagnation, and other unforeseen items. It is therefore well to allot a sort of kitty for these items. The larger the sum which can be allotted for these exigencies, the safer will be your business.

Fortunately, the electric and radio

	Per-cent
Lack of Capital.....	34.9
Incompetence.....	34.5
Specific conditions.....	14.8
Inexperience.....	5.2
Fraud.....	3.6
Competition.....	2.4
Unwise credits.....	1.4
Failure of others.....	1.3
Neglect.....	1.1
Extravagance.....	.5
Speculation.....	.3
	100.0

Table 1.

appliance business has the slight advantage of being able to operate on less capital than other retail ventures because of easy paper finance. Nevertheless caution should be observed. Too much dependence must not be placed on the easy credit arrangements which may be available. They have a nasty habit of eating up profits faster than they can be accumulated. It is of utmost importance that all of your bills be met as promptly as possible to maintain a spotless business reputation and a good credit rating. A reputation as a poor credit-risk will

travel via the business grapevine from coast to coast and dog your footsteps wherever you wish to do business.

Gradually as your organization progresses you can find methods to cut down on excessive capital backing by constantly analyzing sales and costs records and seeing that too large a percentage of current assets is not turned into inventory stock. But until you are firmly entrenched in your community, as large a working capital as you can manage is an absolute essential.

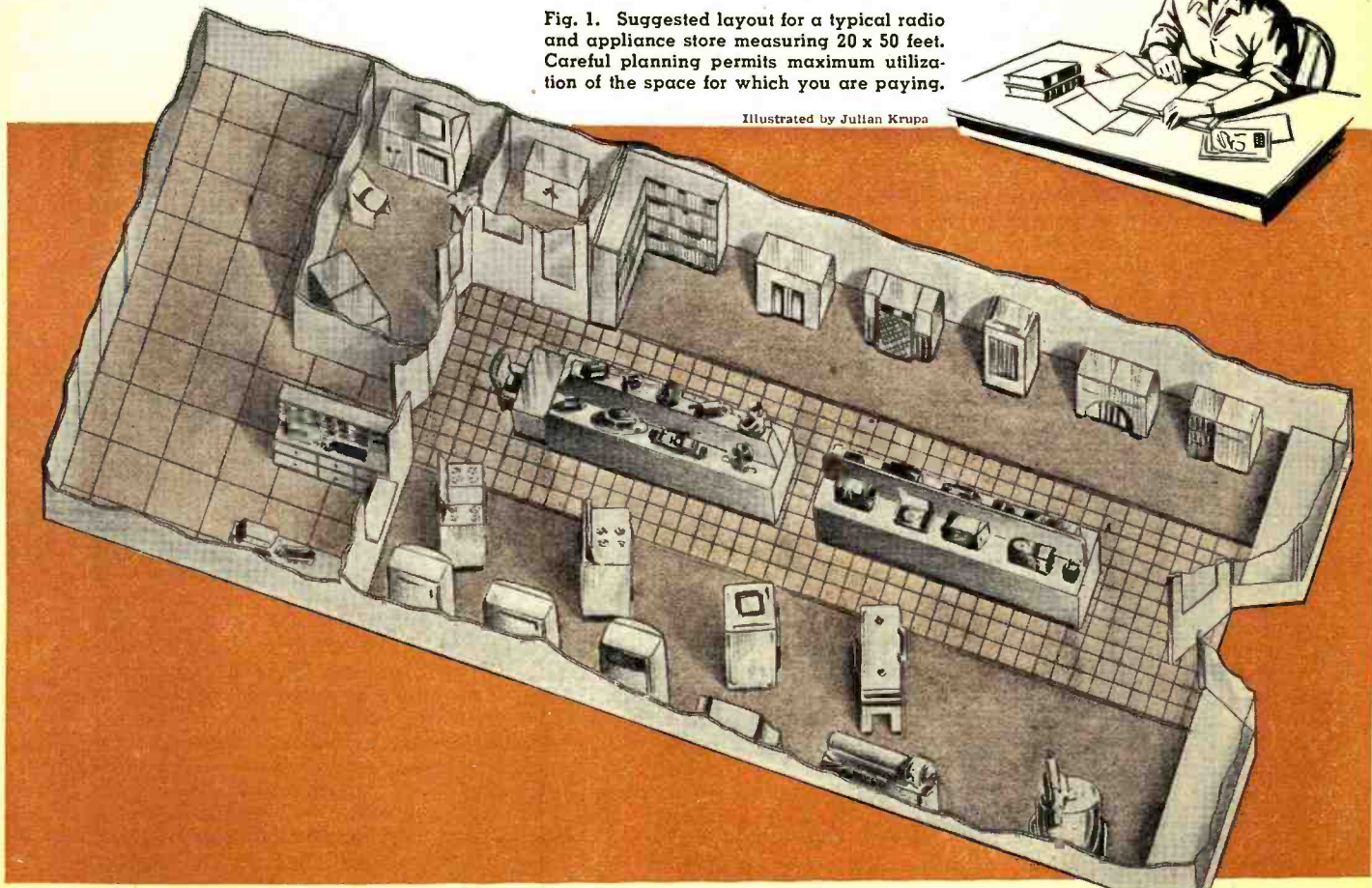
Now that you have *begun* to operate in a business-like manner you will have to continue to conduct your business on such a basis. This means you will have to open a checking account not only to provide you with a depository for excess funds and to allow you to pay your bills by check, but also to give you the prerogative and convenience of collecting on checks given you by your customers. Besides these advantages, doing business with a bank can pay off. The bank can be of help in extending credit for expansion in years to come, advise you on business affairs, and collect notes for you. A heart-to-heart talk with your banker now may later facilitate a pocket-to-pocket beneficence. You can talk freely with your

(Continued on page 151)



Fig. 1. Suggested layout for a typical radio and appliance store measuring 20 x 50 feet. Careful planning permits maximum utilization of the space for which you are paying.

Illustrated by Julian Krupa



Practical TRANSFORMER DESIGN and CONSTRUCTION

By C. ROESCHKE

Part 1. The design and construction of iron core transformers and reactors. Save money by rebuilding obsolete transformers to your own specifications.

IRON core transformers and reactors are fundamental units employed in circuits operating at power and audio frequencies.

It is very desirable for an amateur or serviceman to have a practical understanding of this equipment for three reasons. First, because it is sometimes possible to use a transformer for an application different from that for which it was originally intended. Second, because it is frequently possible to rebuild an available transformer and thus avoid the necessity of buying a new one. Third, because a technician can design and build his own units at very low cost.

This article is intended to provide

practical information to aid the technician in building and using equipment of this type.

Power Transformers

Before we go into a description of the actual design applications, let us review the fundamentals of electricity and magnetism which determine the operation of a transformer.

When a power transformer primary is connected to the power lines, the a.c. flux produced by the current flowing in the primary induces voltage across the secondary windings. The voltage appearing across each secondary winding depends on the number of turns of wire contained in the primary and in each secondary. It

depends on the ratio between the number of turns in the primary to the number of turns in each individual secondary.

For example, let us assume that the supply voltage is 100 volts a.c. and assume that the primary winding consists of 100 turns of wire. Now, this means that for each primary volt, there is one primary turn, or, one turn per volt. Since there is one turn per volt in the primary, there is also one turn per volt in each secondary. Then if one secondary delivers 300 volts, there must be 300 turns in that secondary winding. It is to be noted here that the potential of 300 volts mentioned is the open circuit, no load, voltage of the winding. When the transformer is fully loaded, this value would drop about 5 or 10 per-cent depending on the regulation characteristic of the unit.

Mathematically, the turns per volt in a given transformer is equal to:

$$\frac{\text{Number of turns in the winding}}{\text{Voltage appearing across that winding}}$$

Iron cores are used to concentrate

the magnetic flux along the desired paths where it will be most effective. Then, practically all lines of flux are caused to aid in inducing voltages in the secondary coils when alternating current flows in the primary circuit. If an iron core were not used, most of the flux would be lost in air and the power transfer efficiency would be too low for practical use. Such an air core transformer for use at power frequencies would have to be tremendous in size if any appreciable amount of power were to be taken from it.

The core material is not of solid construction, but made up of many flat pieces, called "laminations," which are piled one on top of the other to make up the core of required thickness or "stack." By employing thin laminations to make up the core, eddy current losses in the core are reduced thus minimizing the development of heat and power loss.

Manufacturers have developed for the radio and electronic industries laminations of sizes and shapes most applicable to the required voltage and power handling capacities. These are of the familiar "E" and "I" shaped design. Fig. 1 is a chart showing the

Fig. 1. Table gives various dimensions of most commonly used "E & I" laminations.

LAMINATION SIZE	A	B	C	D	E	F	G
1/2"	0.500"	1.625"	1.062"	0.813"	0.25"	0.312"	0.25"
5/8"	0.625"	1.875"	1.25"	0.938"	0.312"	0.312"	0.312"
3/4"	0.750"	2.250"	1.500"	1.125"	0.375"	0.375"	0.375"
7/8"	0.875"	2.625"	1.750"	1.312"	0.437"	0.437"	0.437"
1"	1.000"	3.000"	2.000"	1.500"	0.500"	0.500"	0.500"
1 1/8"	1.125"	3.375"	2.250"	1.687"	0.562"	0.562"	0.562"
1 1/4"	1.250"	3.750"	2.500"	1.875"	0.625"	0.625"	0.625"
1 1/2"	1.500"	4.500"	3.000"	2.250"	0.750"	0.750"	0.750"

These are only a few of the iron sizes available. Some differ only slightly from the above dimensions. There are, of course, larger laminations having center leg "A" dimensions of 1 3/4", 1 7/8", 2", 2 1/4", etc.

physical dimensions of these laminations.

The various sizes are identified by the width dimension of the center leg. Thus, a lamination having a center leg which is 1 inch wide is called a "1 inch lamination." One with a center leg $\frac{1}{2}$ inch wide is called a " $\frac{1}{2}$ inch lamination" or " $\frac{1}{2}$ inch iron," etc.

When laminations are placed into a coil to make a power transformer they are "interleaved," that is, the first "E" piece is inserted into the left end of the coil, the second into the right end of the coil, the third into the left end, and this alternating process is continued until all "E" pieces are in place. Then the "I" pieces are inserted into the spaces left between the "E" pieces.

In the actual design of a power transformer there are five principal factors to be determined. They are:

1. Size of lamination required.
2. Cross section core area required.
3. Sizes of wire required.
4. Number of turns of wire required in each winding.
5. Thickness of insulating paper required throughout.

Fig. 2 may be used as a rough guide for determining the lamination size required for a transformer of given power output capacity. Observe that the output power is given in volt-amperes or v.a. This power value is obtained by multiplying voltage by current for each secondary and then adding these values together. As an example, consider a filament transformer having two secondary windings. The first delivers 6.3 volts at 3 amperes and the second secondary delivers 5 volts at 2 amperes. For secondary No. 1, v.a. = $6.3 \times 3 = 18.9$; for secondary No. 2, v.a. = $5 \times 2 = 10.00$. Then by adding 18.9 to 10.0 we get 28.9 v.a. which is the total output provided by this transformer. Now, according to Fig. 2, the lamination required would be about 1" size iron. But this chart is, of necessity, only an approximation since the power output determines the core area required as well as the lamination size. Therefore, a transformer of given output rating might be constructed using 1" iron with a stack, or core thickness, of $1\frac{1}{4}$ ". This would give a cross section core area of $1\frac{1}{4}$ ". However, you could employ $1\frac{1}{4}$ " iron with a 1" stack of laminations which would also give a core area of $1\frac{1}{4}$ ". See Fig. 3 for the method of determining the cross section core area. As indicated, core area is equal to dimension width of center leg times the thickness of stack of laminations.

From this discussion one can see that the matter of design is a "cut and try" process wherein one juggles the size of the coil and core to arrive at a combination that will fit. In the above design, one might find that the coil would not fit into the space provided in the 1" lamination but would fit nicely into the $1\frac{1}{4}$ " iron. Let us state here that it is not necessary to actually wind the coil and then try to fit it into a given core. This determination can be made beforehand.

June, 1947

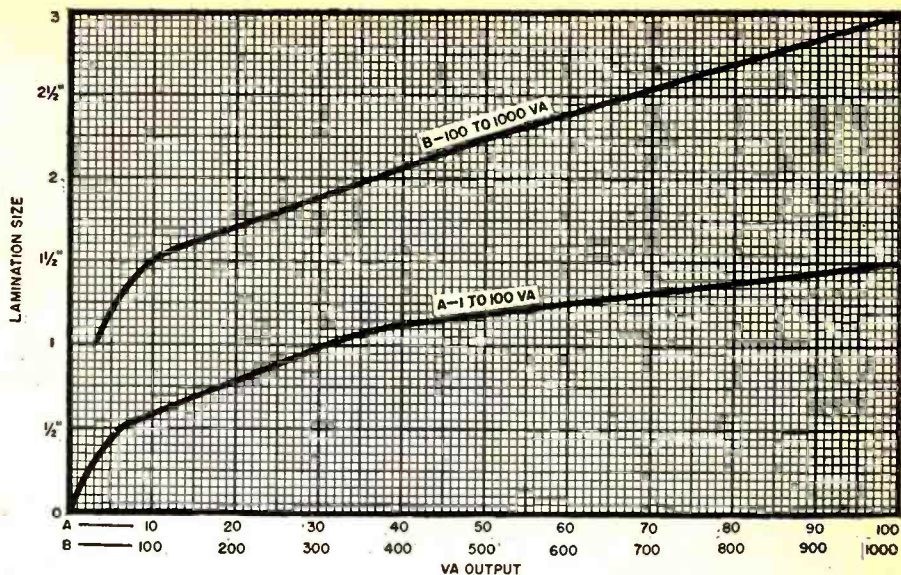


Fig. 2. Approximate volt-ampere (v.a.) output for various lamination sizes. Chart may be used to determine lamination size for transformer of given power output capacity.

The cross section core area that must be used is dependent on the power capacity of the transformer, smaller power units having smaller core areas than ones to handle larger amounts of power. Also, the efficiency of the unit and the amount of heat developed in the core depend on a.c. flux density at which the core operates. Transformers designed to operate at high flux density develop more heat in the core while those designed to operate at lower flux density run cooler. Actually, the flux density depends upon the number of turns in the primary winding and the cross section core area. Thus for a given number of primary turns higher flux density will be present if small core area is employed and lower flux density is obtained by using a larger core area.

(Continued on page 159)

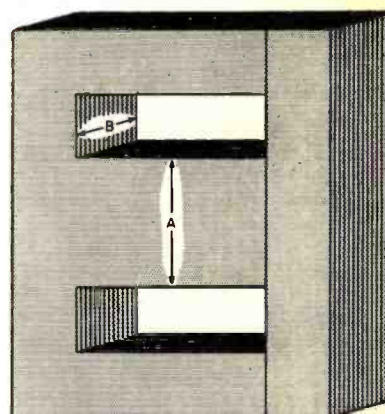
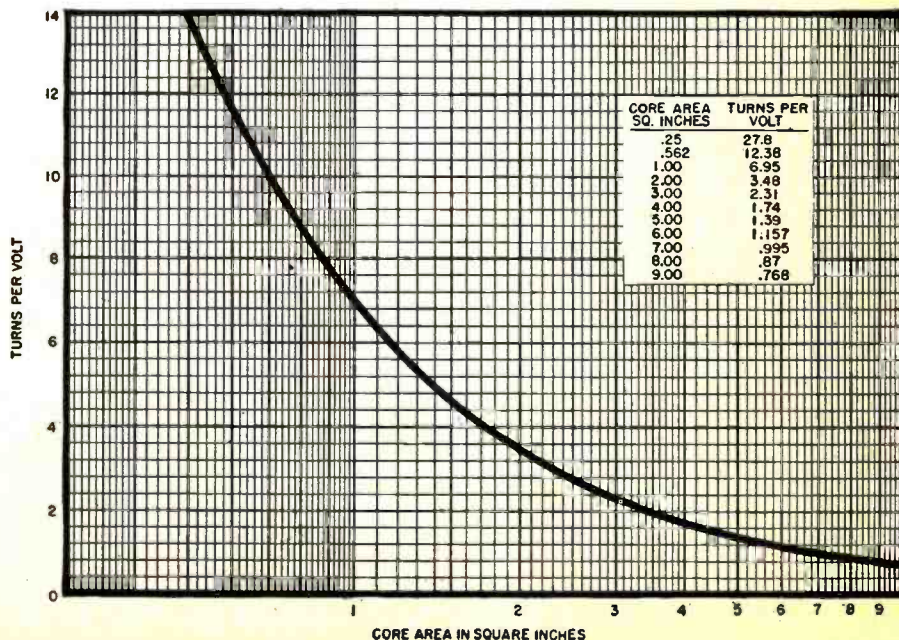


Fig. 3. The cross section area of the core in square inches can be determined by multiplying the thickness of the stack (B) by the width of the center leg (A).

Fig. 4. For 60-cycle operation, the flux density of a power transformer should be approximately 60,000 lines per square inch. Graph is based on this figure and may be used to determine the turns-per-volt value from a given core area.



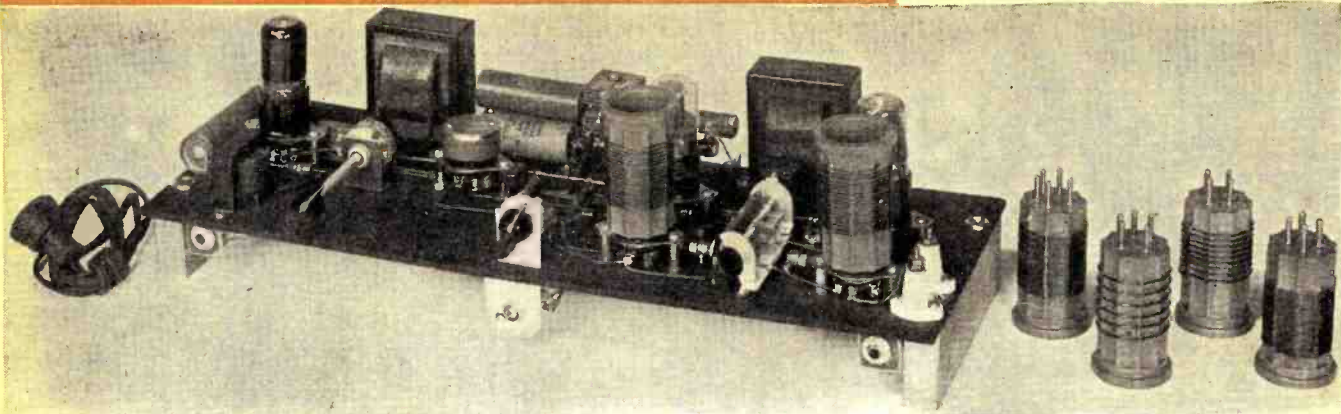


Fig. 1. Over-all view of completed transmitter. Breadboard type construction was used to simplify the building operation.

A Beginner's TRANSMITTER

Designed for the beginner, this phone transmitter operates on either 3.5, 7, 14, or 28 mc. Home-built companion receiver was described in last month's issue.

By **RAY FRANK, W9JU**
Amateur Radio Editor, RADIO NEWS

THE beginning ham who desires to operate on phone, is either limited to the higher frequencies, or the 28 mc. band. While the high frequencies have many advocates, the desire for an occasional DX contact detracts somewhat from the advantages these bands offer. In many parts of the country, there are few amateurs within range of the high frequency equipment, leaving only the 28 mc. band for the phone operator.

While it is not difficult to design and build a rig for this band, the current parts shortage often makes this rather time consuming. The beginner seldom has the patience to wait until the material is obtained. Accordingly, it was decided to see what could be done with the material currently available.

The power output of this transmitter is low, being in the vicinity of 12 watts. With this low power, consistent phone communication will not be possible under crowded conditions. Many times however, conditions are such that phenomenal results are obtained. In addition the rig may be used later as an exciter for a higher power stage. With the proper coils and crystals, this transmitter may be used on the 3.5, 7, and 14 mc. bands as well as the 28 mc. band.

The tube lineup is as follows. One half of a 12SN7 acts as a Pierce oscil-

lator, with the second half acting as a buffer or multiplier. A 50L6 is used as the final amplifier. Another 50L6, driven by a single button microphone, furnishes the necessary audio for modulation.

The necessary plate voltage is obtained from a voltage doubling circuit using two of the new selenium rectifiers.

The output voltage of the voltage doubler circuit under load is 255 volts. This is sufficient to give a reasonable output, and at the same time eliminates the need for a hard-to-obtain power transformer.

The heaters of the two 50L6's are connected in parallel and, in turn, in series with the heater of the 12SN7. A 180 ohm, 20 watt resistor is connected in series with this combination, and the entire string placed across the 117 volt line. In this manner the need for a filament transformer is eliminated.

The entire transmitter is constructed using a standard 7" x 17" Masonite panel as the baseboard. A piece of plywood or other thin lumber would serve as well. Strips of 3/4" lumber, 1 1/2 inches in width are placed under the ends of the Masonite panel to give clearance for wiring and parts mounted underneath.

The use of a Masonite chassis has

two advantages. Metal chassis are in rather scarce supply at present, and working with metal requires tools not always in the possession of the beginner. With the use of Masonite or wood, ordinary woodworking tools may be used.

If a metal chassis were used, it would be necessary to use a floating ground on the chassis or have one side of the a.c. line connected to the chassis with its attendant danger. True, if care is taken in observing the correct polarity of the line plug, this danger is not present, but too often this precaution is not observed.

The audio section consisting of the microphone transformer, 50L6 modulator, the gain control R_5 , and the modulation choke CH_1 , is mounted at the left end of the baseboard.

The crystal, the amplifier tuning condenser C_1 , the 12SN7 tube, and the coil L_1 are mounted in the center. The two rectifiers and the filter condensers are mounted in the rear center.

The right hand end contains the final amplifier condenser C_{11} , the output tank coil L_2 , the filter choke CH_2 and the antenna terminals. The microphone jack is mounted under the chassis at the left hand end, the standby switch S_1 just below C_1 , and the key jack J_1 at the right hand end. The on-off switch S_2 is on the rear of the gain control R_5 .

Small angle brackets, formed of scrap metal, are used to support the two jacks and the standby switch S_1 as well as the gain control and C_1 . Controls are laid out symmetrically to permit the use of a front panel if desired. Sockets for the crystal, coils and tubes are mounted by means of metal spacers to clear the baseboard.

Placement of the various other components may be seen by examining the photographs. A ground bus consisting of #12 tinned wire is run the entire length of the chassis to provide a convenient ground point for the various ground returns.

When the unit was constructed there was a slight tendency for the 50L6 final amplifier to oscillate. Ac-

cordingly a neutralizing condenser C_{10} was constructed of two small plates about $\frac{3}{8}$ " square and spaced approximately $\frac{1}{4}$ ". This neutralizing may or may not be necessary, depending upon the parts placement.

Current for operation of the microphone is obtained by using a portion of the cathode bias developed across the 50L6 modulator cathode resistors R_6 and R_7 . The voltage developed at this point is such that there is little danger of overmodulation with the average carbon microphone.

Wiring in all cases is made as short as possible. It is essential that the condenser C_{12} from screen to cathode of the 50L6 be used or it will not be possible to obtain sufficient audio output for full modulation. Care should also be taken in wiring the rectifier and filter circuit, to observe the correct polarity on the rectifiers and filter condensers.

When construction has been completed, appropriate coils and a crystal should be put in place. The lead from the top end of CH_1 to the plate and screen of the 50L6 final should be temporarily disconnected.

S_1 should be opened, and S_2 closed until the tubes reach operating temperature. At this point it would be well to check the output voltage of the rectifier, to learn if any mistakes have been made.

Assuming that all is normal, coils and a crystal for either 3.5 or 7 mc. should be plugged in and S_1 closed. A neon bulb, touched to the stator plates of C_4 , will indicate r.f. when resonance is reached.

The neutralizing of the final should now be checked. If a 0-5 or 0-10 ma. meter is handy it may be placed in series with the ground end of the final amplifier grid leak, R_3 . Grid current of from one to two ma. will be indicated when C_4 is resonated.

Neutralizing may be checked by tuning the final tank condenser C_{11} through resonance, carefully watching the grid meter. If the stage is neutralized, there will be no flicker of the grid meter as the final is tuned. If a flicker is noticed, the two plates of the neutralizing condenser should be bent until the grid meter is absolutely steady as the final is tuned.

After the stage has been neutralized, the lead to the plate and screen of the final may be reconnected. A 0-100 ma. meter should be plugged into the jack J_1 .

Minimum unloaded current as measured in this jack will be 15 to 20 ma. on the 3.5 and 7 mc. bands and about 20 to 25 ma. when doubling in the final. The current measured at this point is a combination of the grid, screen, and plate current of the final amplifier. Optimum loading for the final is approximately 70 ma. measured at this jack.

With an active 3.5 mc. crystal it is possible to quadruple in the second section of the 12SN7 and obtain output on 14 mc. Only the most active 7 mc. crystals will furnish sufficient

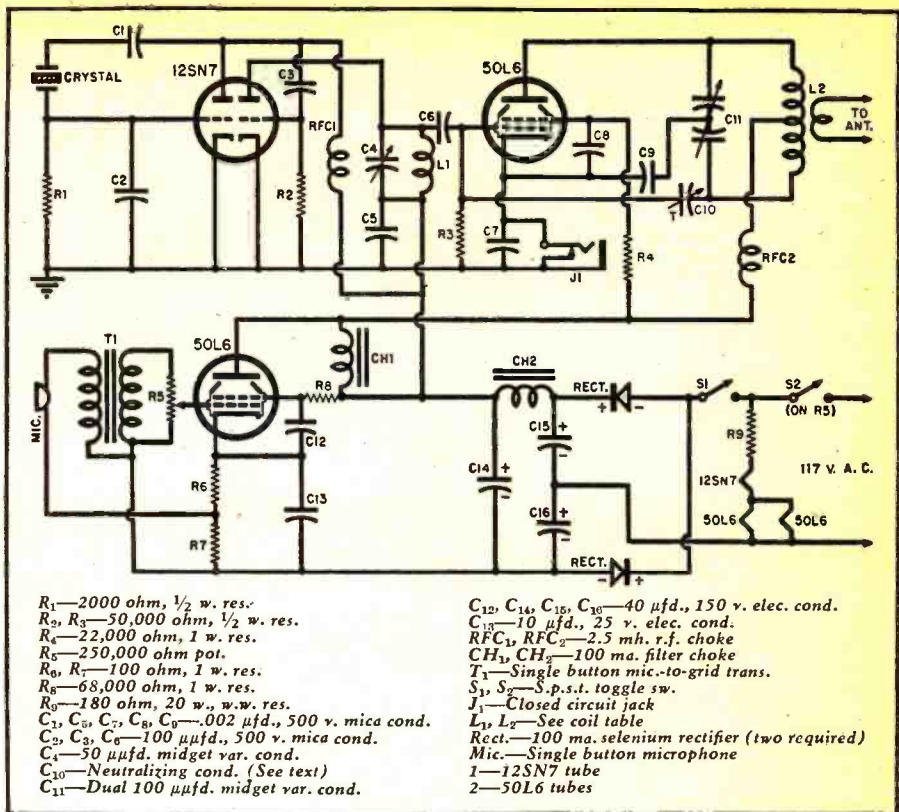


Fig. 2. Schematic diagram of the home-built transmitter. The selenium rectifier voltage doubler power supply furnishes a total of 255 volts.

output for quadrupling. The best method for operation of the 28 mc. band is by the use of a 7 mc. crystal, doubling in the second section of the 12SN7 and again doubling in the 50L6 final amplifier.

Care should be taken, however, to insure against 14 mc. output from the final amplifier in this case. A 14 mc. crystal may be used in the oscillator with the second section of the 12SN7 doubling to 28 mc. and the final amplifier working straight through.

The antenna links are designed for coupling into a 300 ohm line and if a different antenna system is used it may be necessary to vary the number of turns in the link to obtain proper loading. Fewer turns will be needed for a low impedance line and more turns for lines of higher impedance.

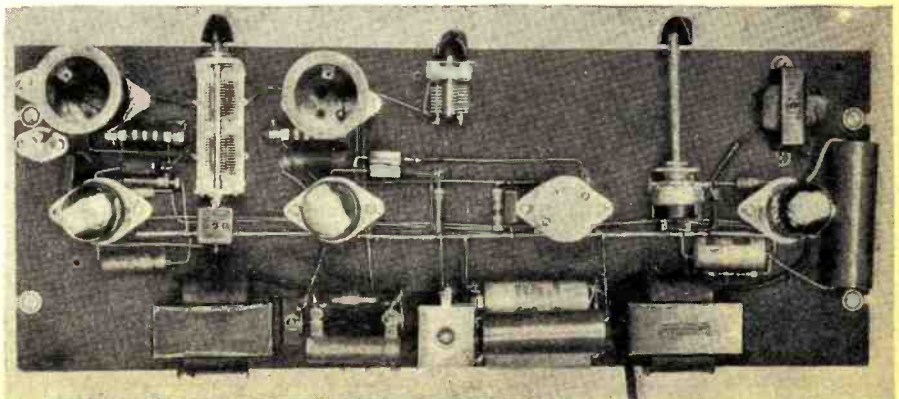
If it is desired to use an antenna with Zepp or other resonant feeders,

	3.5 mc.
L_1	—36 t. #26 e. $1\frac{1}{2}$ " long
L_2	—38 t. #26 e. $1\frac{1}{2}$ " long, center tapped
Link	—8 t. pushback around center of L_2
	7 mc.
L_1	—19 t. #22 e. $1\frac{1}{2}$ " long
L_2	—19 t. #22 e. $1\frac{1}{2}$ " long, center tapped
Link	—5 t. pushback around center of L_2
	14 mc.
L_1	—10 t. #22 e. $1\frac{1}{2}$ " long
L_2	—10 t. #22 e. $1\frac{1}{2}$ " long, center tapped
Link	—4 turns pushback around center of L_2
	28 mc.
L_1	—7 t. #16 e. $1\frac{1}{2}$ " long
L_2	—6 t. #16 e. $1\frac{1}{2}$ " long, center tapped
Link	—3 turns pushback around center of L_2
All coils wound on $1\frac{1}{2}$ " dia. forms	
3.5, 7, 14, or 28 mc. crystals may be used	

Table 1. Coil data for transmitter.

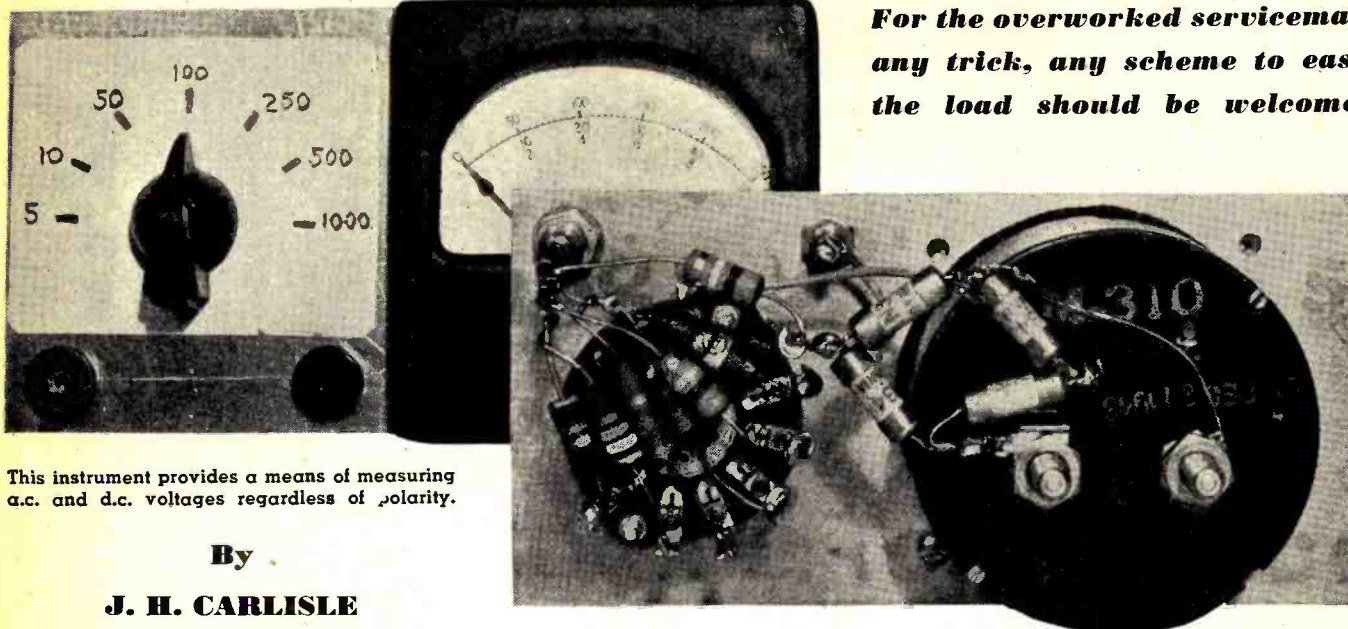
some form of antenna tuner will be necessary. The links as specified will permit the use of condensers to tune the feeders in most cases. Either series or parallel tuning will be needed depending on the frequency and feeder length.

Fig. 3. Top view of completed unit shows placement of component parts.



A Universal VOLTMETER

**For the overworked serviceman
any trick, any scheme to ease
the load should be welcome.**



This instrument provides a means of measuring a.c. and d.c. voltages regardless of polarity.

By
J. H. CARLISLE

THE measurement of voltages in a receiver to be serviced will include positive plate potentials, negative bias voltages, and a.c. voltages. Some of the newer electronic voltmeters include a "plus-minus" switch, so that the leads to the voltmeter need not be reversed when shifting from a positive to a negative measurement. It is not often that the polarity is to be determined, but rather the amplitude of the unknown voltage. There are exceptions, of course, such as the determination of the polarity of the voltage on the grid of an audio amplifier tube. A positive potential would indicate a shorted or leaky coupling condenser.

It is possible to devise a circuit which will ignore polarity of applied d.c. voltage, so that the indicating meter will always read in the right direction and, in addition, read a.c. Furthermore, this circuit is simple enough to be easily added to any existing volt-ohm-milliammeter. It is, of course, feasible to construct a voltmeter which can be switched to read in a normal manner, ignore polarity, and read a.c. Incidentally, the a.c. scale will not be limited to power frequencies, but will not introduce any frequency error at frequencies as high as 50 kc. or higher.

The basic circuit, comprising four half-wave rectifiers in a bridge ar-

range, together with a meter, is shown in Fig. 2. When a voltage is applied to points "A" and "B," the circuit operates according to the polarity of that voltage.

Let us assume that point "A" is connected to a positive potential and point "B" to the negative. In this case, rectifier D_1 conducts and current flows through D_1 and through the meter to rectifier D_2 , which is also of the right polarity to conduct. The meter, therefore, indicates the magnitude of the potential. Rectifiers D_3 and D_4 are connected so as to not conduct, so, electrically, they are out of the circuit for the condition of a positive potential being applied to point "A."

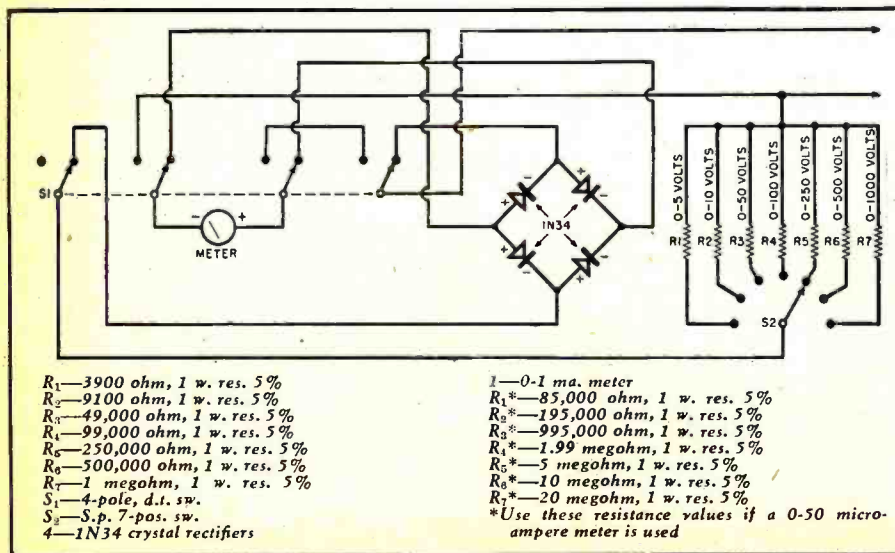
Now let us apply the negative side of the same potential to point "A" and the positive side to point "B". The rectifier D_2 then conducts and current flows through D_2 through the meter to D_1 , which conducts, also, while D_3 and D_4 , being of opposite polarity, are, electrically, out of the circuit. We, therefore, have a voltmeter which ignores polarity and reads in the proper direction, irrespective of the polarity of the applied potential. If we apply a.c., the voltmeter then reads the average voltage of both peaks.

To construct a voltmeter of this type, what kind of rectifiers shall we choose? The usual copper oxide meter rectifier does not have sufficient difference between the forward and back resistance, and it is good only for power line and low audio frequencies. This latter characteristic is important only if we desire to use the same rectifiers for a.c. measurement.

We could use vacuum tube diodes such as a 6H6, but that would require

(Continued on page 146)

Fig. 1. Schematic diagram of voltmeter. Note that an additional switch, S_1 , is shown, however it has not been incorporated in the above photograph. By adding this switch the instrument becomes more versatile in that current measurements can also be made. It can be added or omitted at the discretion of the builder.



The RECORDING and REPRODUCTION of SOUND

By
OLIVER READ
Editor, RADIO NEWS

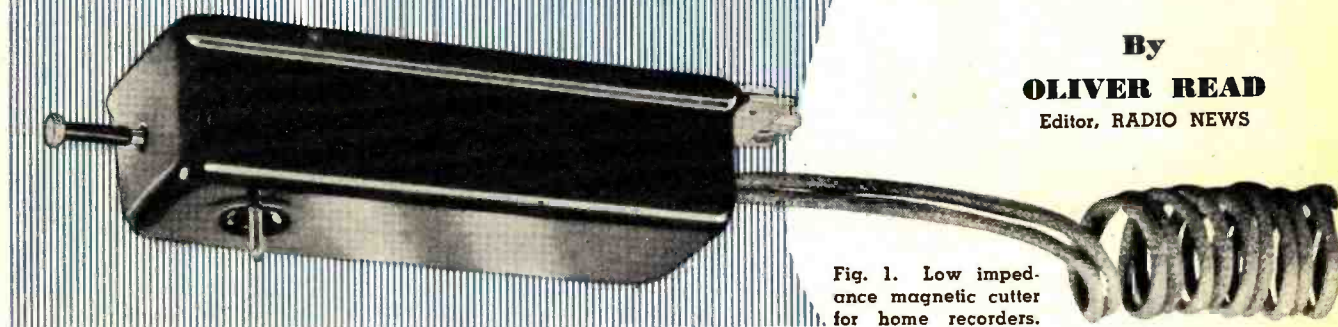


Fig. 1. Low impedance magnetic cutter for home recorders.

Part 4. A discussion of two representative magnetic cutters, one designed for home recording and the other for high-fidelity broadcast transcribing.

THERE are two widely used types of cutters for the engraving of sound on instantaneous discs, the magnetic and crystal.

The capabilities of each as regards frequency range, sensitivity and other refinements depends largely upon the type of construction and, equally important, upon the finished workmanship of the particular unit. There are expensive professional magnetic cutters for professional use as well as the inexpensive units designed primarily for home recording. It is an established fact, however, that many inexpensive magnetic and crystal cutters are quite capable of high fidelity cutting provided that the associated equipment is carefully designed and that particular attention is given to the mechanical construction, mounting, and circuits employed in using this cutter.

Construction varies with different makes and models but, like a motor car, accomplish similar results. Space does not permit a discussion of each of many excellent cutters, hence our discussion will be limited to representative types for home and professional applications.

Function

Most magnetic cutters are high-quality, wide-range recording units designed especially for instantaneous recording on nitrate, acetate and similar blanks. Ruggedness, stability, and high sensitivity make these units ideally suited for use with home recording equipment.

Magnetic cutters are low impedance devices and, as such, can be con-

nected to the voice-coil side of the output transformer. The fact that switching is performed on the low-voltage side of the output transformer simplifies circuit design and makes possible considerable economy in equipment costs.

Structure

The Shure Model 96 (Fig. 1) transducer has a balanced-armature, non-pivotal moving system which does not depend for its alignment or centering upon damping material. The high-permeability elastic armature has a stiff supporting and centering member, rigidly clamped to the frame, which maintains the whole moving system in exact alignment with the pole pieces, (Fig. 2.) This permits the use of a highly stable damping material solely as a dissipative medium instead of using it also to perform a centering function.¹

¹ Shure Brothers, "Application Notes. Magnetic Recording Head." November 12, 1940.

The elastic armature and compliant supporting member, damping material, and needle chuck, constitute a mechanical wave network which provides unusually high sensitivity and smoothness of frequency response.

Magnetic cutters are exceptionally rugged and stable, and will give long and satisfactory service under all climatic conditions. Their cutting level and response characteristics are independent of temperature over a wide temperature range.

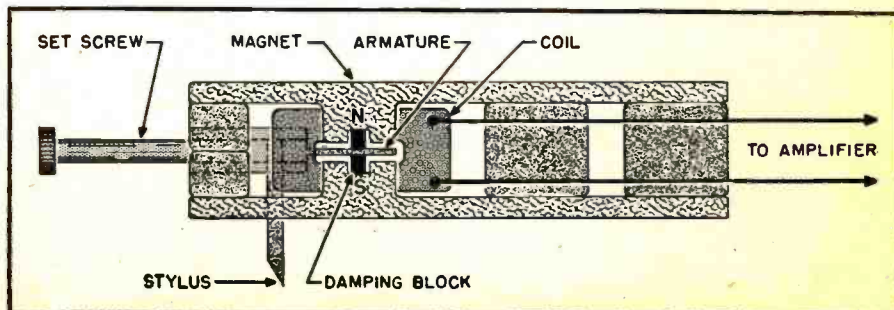
The rigidly clamped armature support will maintain its alignment indefinitely in both the rotation and axial modes, which was not the case with earlier mechanisms whose alignment depended on rubber bearings and damping blocks.

Electrical overloads will not readily damage the cutter or alter its characteristics.

Mounting

The magnetic cutter should be mounted in the recording arm or feed carriage so as to have complete vertical freedom, but no horizontal motion relative to the arm. Experience has shown that there are advantages in pivoting the cutter as close to the surface of the record as possible. The mounting, or arm, should preferably

Fig. 2. Details of assembly and structure of Shure Model 96 magnetic cutter.



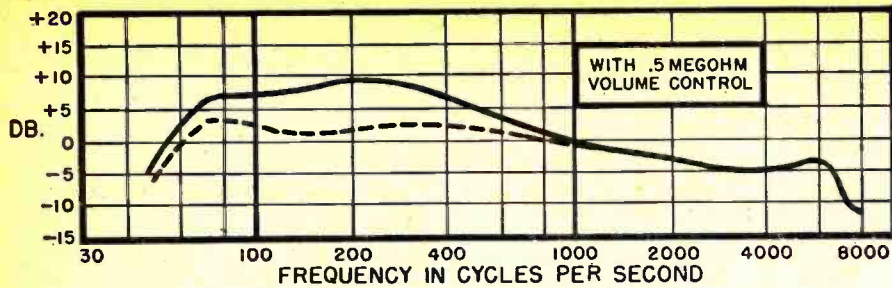


Fig. 3. Solid curve shows response of conventional crystal pickup when used without correcting filter. Dotted line shows response when filter of Fig. 4 is used.

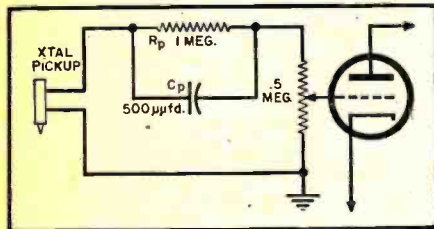


Fig. 4. Simple filter network that is often used for bass attenuation.

have means for adjusting the cutter pressure and the cutter angle. Under ordinary circumstances, the cutter will perform most satisfactorily if held parallel to the surface of the record; however, slight adjustments may be desirable with a given recording material or a given stylus. The pressure at the stylus point should be independent of the up-and-down motion of the cutter to insure groove uniformity on recording blanks which may be slightly warped.

Motorboard Vibration

It is particularly important in recording to reduce *rumble* and *feedback* to a minimum, inasmuch as records are often produced with insufficient volume thereby emphasizing background noises. Vibrations of the recording arm relative to the turntable will be recorded on the record and will appear during playback. The intermodulation of these vibrations with the recorded speech or music may have an undesirable effect on the quality of the record. The *motorboard* assembly should, therefore, be free of any appreciable vibration.

In many instances, a motorboard will be less subject to vibrations if it is tightly clamped to the recording cabinet. Elastic mounting of the motorboard (on springs or by similar means) may, under certain conditions,

emphasize motorboard vibration and stylus chatter.

Then again, motorboard vibration may reside in an unbalanced driving motor, in idler wheels, or in turntable rims which in some cases are not perfectly round.

Severe motorboard vibration can sometimes be completely corrected only by elimination of the above causes.

Cabinet Vibration

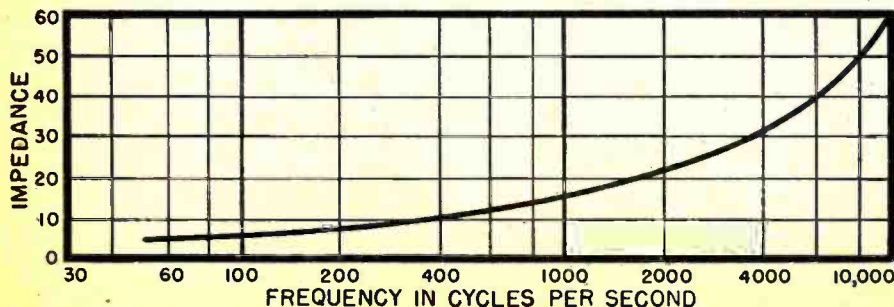
Since no cabinet is perfectly rigid, the speaker vibrations will carry through to the motorboard. Two separate effects may result from this vibration:

1. During recording, sound originating at the monitoring loudspeaker may cause vibration of the motorboard, thus changing the quality of the recorded signal.

2. During playback, cabinet vibration may be responsible for mechanical feedback between the playback pickup and the loudspeaker.

Both effects will be small in cabinets which are solidly constructed. In some instances, extensive experimental work may be required to eliminate the effects of cabinet vibration. Usually it is advisable to mount the loudspeaker elastically. In severe cases of mechanical feedback the motorboard may also be mounted on elastic pads, although this should be done with care to avoid the possibility of motorboard vibration and rumble. Often, an excessive low-frequency response of the playback pickup causes feedback and emphasizes motorboard rumble. Conventional crystal pickups have a rise at low frequencies (Fig. 3) when played on a standard test record (such as the *Audiotone* No. 78-1), and hence in a great majority of cases it is desirable to use these pickups with a simple correcting network, Fig. 4.

Fig. 5. Curve shows actual relationship between cutter impedance and frequency.



Recording Styli and Cutting Pressure

Styli made of steel, styli tipped with special alloys, or sapphire-tipped styli, may be used with the magnetic cutter. The life of the stylus depends upon the cutting properties of the record material. Because they are fragile and relatively expensive, sapphire-tipped styli are recommended only for the highest quality professional work, and generally are not used in the home. On nitrate or acetate blanks, a good quality steel stylus will usually retain satisfactory cutting qualities for about one-half hour of recording time. The so-called "short" styli having an over-all length of $\frac{5}{8}$ " and a diameter of .060" to .070" are recommended. The stylus should be fastened in the needle hole of the cutter with the flattened part of the shank toward the stylus screw. In the cutter being discussed the needle hole is properly designed to permit secure fastening of the stylus without the necessity of applying excessive torque to the stylus screw.

The correct stylus pressure must be determined by experiment, for it depends on the type and sharpness of the stylus, the method of pivoting the cutter, and upon the type, age, and temperature of the record blank.

The stylus pressure should be adjusted so that the width of the groove is .005 to .006 inches. This may be checked easily by observing the cut through an eyepiece having a magnifying power of approximately 10. The width of the unmodulated groove (in home recordings) should be approximately the same as the width of the "land" (or space between grooves) when viewed by diffused lighting. After the groove width has been properly adjusted, the required stylus pressure may be measured by means of a spring scale.

The following figures indicate the range of pressures which have been encountered on relatively inexpensive record blanks at a temperature of 75° F.

TYPE OF RECORD	STYLUS PRESSURE
1. Paper-Base Coated Record, Manufacturer A (hardest of the three)...	1½ oz.
2. Metal-Base Coated Record, Manufacturer B (medium hardness)...	1 oz.
3. Paper-Base Coated Record, Manufacturer C (softest of the three)...	¾ oz.

The correct width and depth of the groove is of considerable importance. A cut which is too shallow may cause the playback pickup to leave the groove during loud passages. A cut which is too deep may cause adjacent grooves to run into each other causing "overcutting" and "echoes," and may increase the difficulty of thread clearance.

Recording Level

Experience has shown that for most satisfactory results the groove modulation in instantaneous recording blanks should be somewhat less than that in commercial pressings. The soft coating of instantaneous recording blanks usually cannot withstand severe overmodulation without producing distortion and echoes. This is

particularly true with equipment recording at 110 grooves per inch. Good home recordings are obtained with a level approximately 4 to 8 db. lower than that of commercial pressings. To obtain a groove modulation having a level approximately 6 db. below commercial recordings (as exemplified by the *Audiotone* No. 78-1 test record), it is recommended that the voltage peaks measured with a sensitive rectifier-type meter connected across the cutter should be approximately $\sqrt{Z/5}$ volts where Z is the 400 cycle impedance of the cutter.

The following table lists the suggested voltage peaks across cutters (such as the Model 96) of various impedances, as measured by a medium-speed volume indicator connected across the cutter terminals:

DC RESISTANCE	400 CYCLE IMPEDANCE	VOLTAGE PEAKS
1/2 ohm	1.2 ohms	1/2 volt
1 ohm	2.5 ohms	.7 volt
2 ohms	5.0 ohms	1 volt
3 ohms	7.5 ohms	1.2 volts
4 ohms	10.0 ohms	1.4 volts
5 ohms	12.0 ohms	1.6 volts
6 ohms	15.0 ohms	1.7 volts
8 ohms	20.0 ohms	2 volts
12 ohms	30.0 ohms	2 1/4 volts

The values in this table may serve as a rough guide for settings of recording level indicators (described in detail in later articles) or in conjunction with the table in Fig. 5, Part 1.

Impedance Matching

Considerable experience in the application of magnetic cutters to commercial home recording equipment has emphasized the fact that the cutter impedance must be correctly related to the output impedance of the audio system if good quality reproduction is to be obtained. This is particularly true with pentode type output tubes. The correct impedance relationship can be obtained by revision of the output transformer secondary winding, or by selection of a cutter of required impedance. Cutters of the following impedance values are generally available:

DC RESISTANCE	400 CYCLE IMPEDANCE
1/2 ohm	1.2 ohms
1 ohm	2.5 ohms
2 ohms	5.0 ohms
3 ohms	7.5 ohms
4 ohms	10.0 ohms
5 ohms	12.5 ohms
6 ohms	15.0 ohms
8 ohms	20.0 ohms
12 ohms	30.0 ohms

The total impedance reflected into the output stage by the cutter and the associated circuit components (such as the monitoring loudspeaker, level indicator and dummy loads, if any) should be equal to the optimum load value recommended by the tube manufacturer. This impedance may be calculated approximately with the aid of the values given in the paragraphs below; however, it is suggested that an impedance bridge be used for final determination of the total load imposed upon the output stage. Inasmuch as the load impedance will, to a certain extent, vary with frequency, it is suggested that matching be done at 400 cycles per second, which is the frequency of probable power peaks of speech and music.

June, 1947

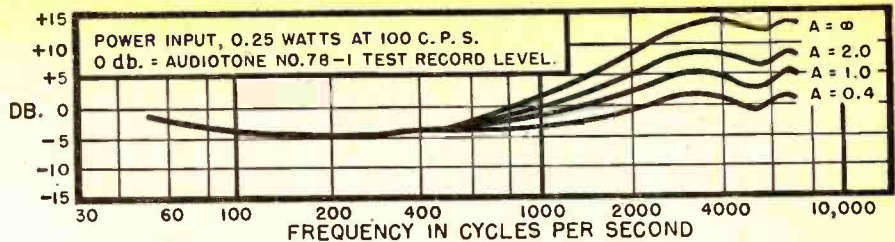


Fig. 6. Effect of resistance across cutter in pentode circuits. The ratio of the parallel resistance to the cutter impedance is represented by A.

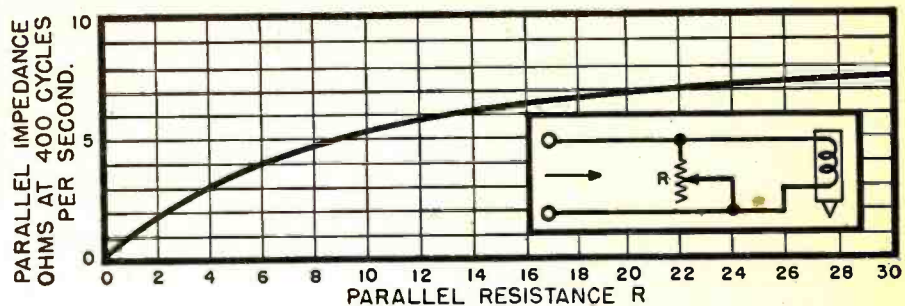


Fig. 7. Chart used to determine parallel 400 cycle impedance.

Cutter Impedance

The impedance of the cutter is a function of frequency because of the inductance and iron losses in the magnetic circuit. The impedance increases from the nominal d.c. value of the cutter resistance in accordance with Fig. 5. Thus, a cutter having a d.c. resistance of 4 ohms will have an impedance of approximately 10 ohms at 400 cycles per second, 15 ohms at 1000 cycles per second, 43 ohms at 7000 cycles per second and 60 ohms at 10,000 cycles per second.

Total Impedance of Cutter and Auxiliary Circuits

In connecting the cutter to pentode output tubes, optimum loading conditions combined with good recorded response may be obtained by connecting the cutter in parallel with a resistance having a value of 1/2 to 2 times the 400 cycle impedance of the cutter. The effect of the parallel resistance on recorded frequency response is illustrated in Fig. 6. After a suitable response curve has been determined, the 400 cycle impedance of the parallel combination of cutter and resistor may be found from Fig. 7, for a 9611-B4 (10 ohms at 400 c.p.s.) cutter; however, it may be used for cutters of different impedance by multiplying all values given on the curve by $Z/10$ where Z is the 400 cycle impedance of the given cutter.

For the purpose of approximate cal-

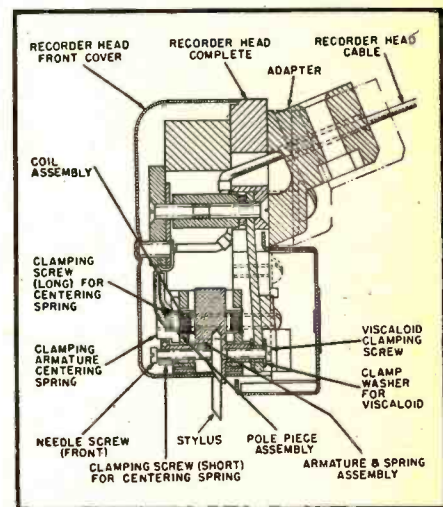
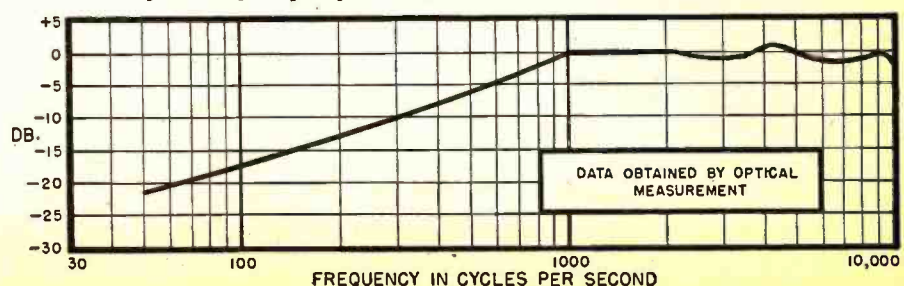


Fig. 8. Precision assembly of high quality magnetic cutter (RCA MI-4887).

culations in computing the series and parallel impedance of the load, it is permissible to treat the 400 cycle cutter impedance as if it were a d.c. resistance, inasmuch as the "Q" of the cutter is 0.8 at that frequency. For example, a 9611-B4 (4 ohms d.c., 10 ohms at 400 cycles) cutter is connected in parallel with a 15 ohm resistor. The total parallel impedance may be found from Fig. 7 to be equal to 6.3 ohms or it may be calculated approxi-

(Continued on page 122)

Fig. 9. Frequency response characteristics of cutter shown in Fig. 8.



4-Band Automatic Radio Direction Finder for Transport Planes



Hermetically sealed, iron core loop. This loop is sealed in an atmosphere of nitrogen at $\frac{1}{2}$ atmosphere pressure which protects the extra-sensitive iron core loop, autosyn transmitter, and the squirrel cage motor. The glass bell provides easy reading of two dial scales.

cluding those of European and Asiatic stations; it is so light in weight (60 lbs.) that it can be carried in small planes as well as in large airliners; and it reduces maintenance problems so that it is not necessary to literally rip a plane apart to service or replace the instrument. This model is so compact that its biggest component, the receiver ($17" \times 11\frac{1}{2}" \times 9\frac{1}{2}"$), can be mounted under the pilot's seat or in the baggage compartment, whereas the indicator ($3\frac{1}{4}" \times 3\frac{1}{4}" \times 5\frac{5}{8}"$) is placed on the instrument panel, and the control box ($8\frac{1}{4}" \times 5" \times 2\frac{3}{4}"$) in any convenient location with respect to the pilot and navigator.

By **RICHARD H. BAILEY***
G. M. Basford Company

Newly developed, lightweight radio compass provides greater "homing" accuracy for all types of planes.

Radio compass models of *Fairchild* manufacture go back to 1935. In that year, Capt. Albert Hegenberger, U. S. Army Air Corps, used the then current model as the basic unit of a blind landing system, for which he was awarded the 1935 Collier's Trophy. Since then, *Fairchild* units have figured prominently in aviation "firsts," such as the 1937 Russian 6668-mile flight from Moscow to California via the North Pole, and the record-breaking, round-the-world flight of Howard Hughes and his companions in 1938.

AIR navigation in bad weather, at night, or over long stretches of water and terrain devoid of any particular landmarks, has always been a severe test for a pilot. There are no guideposts in the sky. In the 1930s, radio engineers, seeking to overcome these problems, discovered ordinary commercial broadcast signals could help a pilot spot his location in relation to the earth, and accordingly "home" his plane. Aviation's use of the radio compass began.

Ever since, the radio compass has helped guide our planes safely over the unknown and the strange, in peace and in war. Now that the "go ahead" has come for opening and extending domestic and foreign airlines, it will become a more valuable navigational instrument than ever.

In its 17-year history of service to aviation, this unit has gone through many evolutions, and even though perhaps one of the most complicated of all radio receivers, it has nevertheless remained the most easily used and trustworthy device for air navigation.

Over the years engineers on the

radio compass have had many design problems to solve. The first radio compass models were not too successful, because sleet and rain ruined circuits, and prohibited the use of the instrument in varied types of weather. Further, they weighed too much (100-120 lbs.) to install in all but the largest aircraft. As single, or two-band units, they were incapable of receiving all wavelengths—only commercial and short-wave airport wavelengths.

But of late real advances have taken place in radio compass design, so that now it is a thoroughgoing navigational instrument. One such unit, a new model AN/ARN-6, developed by *Fairchild Camera and Instrument Corporation* of Jamaica, N. Y., for the Army Air Forces at Wright Field, is a good example of recent trends. Now available commercially, it is automatically operated and has four bands to cover all normal broadcast transmissions, in-

* The author wishes to acknowledge with thanks the kind assistance of Joseph Della Corte, engineer-in-charge, *Fairchild Camera & Instrument Corporation* and designer of this radio compass, in the preparation of this article.

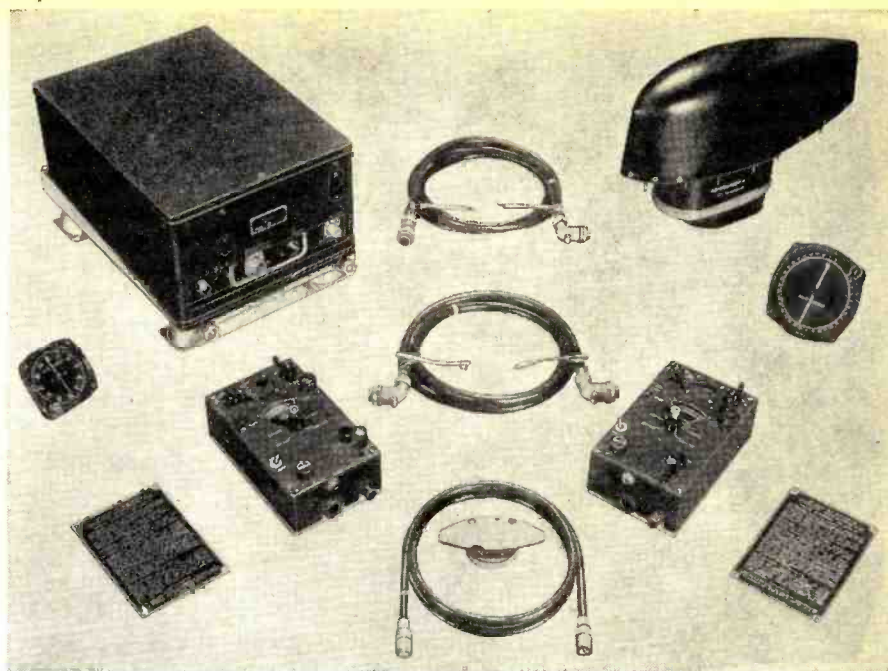
The new compass, called a dual remote control automatic direction finder, has met rigid military operational tests that simulated extremes of temperature in the tropics and in the Arctic.

It is the first model to be designed completely for four-band operation, with frequency range from 100 to 1750 kc. Other models have been modified to incorporate the fourth band, but this unit, which is even smaller than recent three-band designs, is an original four-band design. The new 100-200 kc. band makes it possible to take radio navigational aid from many European and Asiatic stations, and marine beacons. The other three bands are 200-410, 410-850, and 850-1750 kc.

Further, the new low frequency band reduces difficulty from night and mountain effects since low frequencies are less subject to these troubles. Mountain effect is a reflection of radio waves which can widen the aural null and cause erratic wavering of needle indications, whereas night effect is a reflection from the Heaviside layer which also causes a wider null and erratic needle indications on higher frequencies, particularly at sunrise and sunset.

The new unit's headphones permit an aural null as well as a visual signal indication of the direction-of-flight. By means of the aural signal's intensity as a station is being approached, the pilot can maintain a straight course regardless of crosswinds and overcast. With the visual signal, the pilot has unusual selectivity in picking up weak signals, and in excluding any extraneous signals of approximately the same wavelengths. This is important for the private flyer on relatively short hops where there is a minimum of landmarks. Through combined visual-aural signals, he can pick up emergency landing fields without difficulty, particularly if he is not familiar with terrain of established airline routes. If he encounters crosswinds, he can always maintain his course because he is correcting at all times, with his indicator set at his desired destination.

The automatic feature of the new radio compass is another important consideration. The compass loop, which may be mounted either normally or inverted, is turned automatically by the thyatron loop control to face the direction of the oncoming radio wave. Its position, and therefore the direction of the station, is shown on the indicators without any possible ambi-



Component parts of 4-band radio compass. Weighing only 60 pounds, unit is light enough to be used in both small personal planes and large commercial transports.

guity in determining the station's bearing.

Components of this new unit are improved in performance through hermetic sealing. Its iron core loop, transformers, and phasing vibrator are sealed in atmospheres of dry nitrogen. This is a necessary feature since requirements in global navigation are varied and severe, especially where high altitude effects, tropical deterioration, and high humidity which change electrical characteristics are present. Rigid tests at Wright Field, over long, sustained periods, substan-

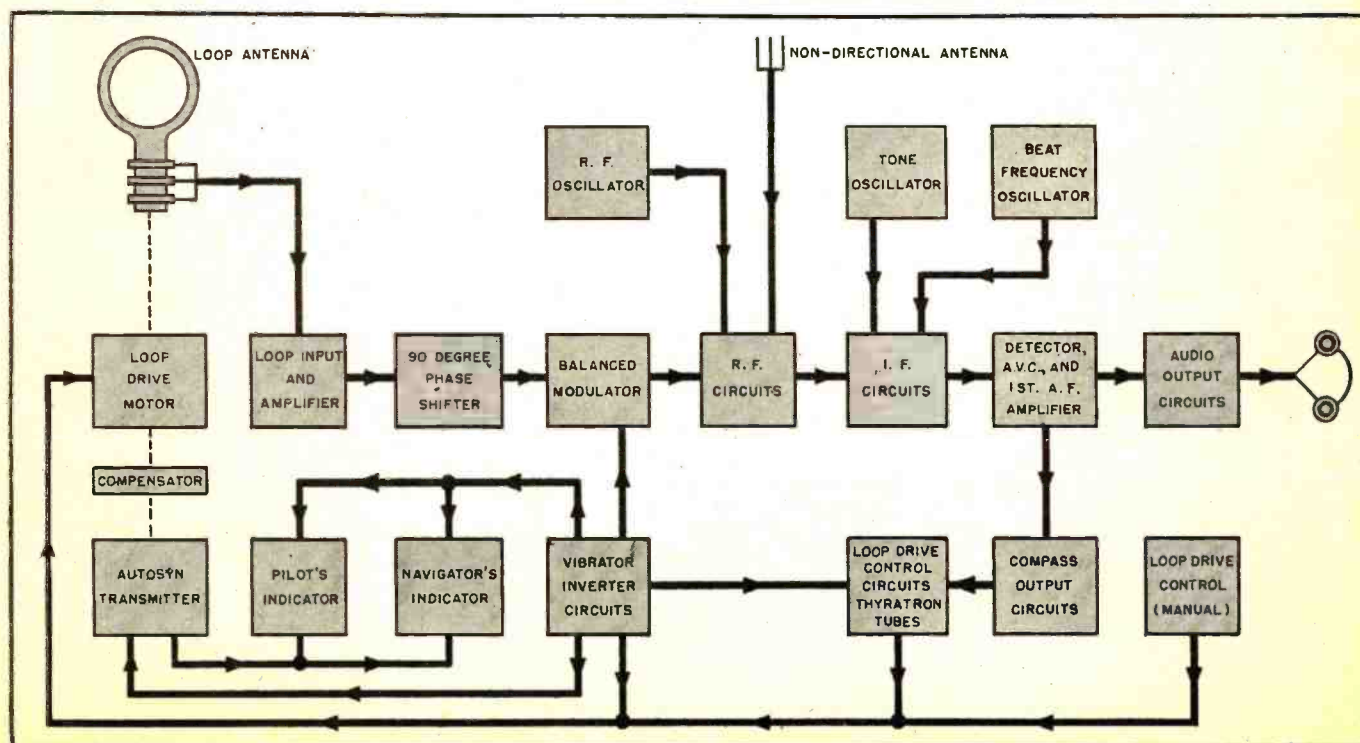
tiate the performance of this unit. Other high points of this new design, by components:

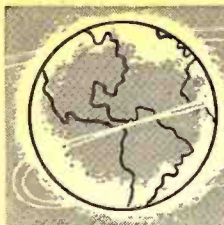
Radio Compass Receiver

An entirely new, highly sensitive 16-tube radio receiver and loop control circuit, designed to work directly from the standard 28-volt aircraft power supply, is enclosed in a compact rectangular aluminum housing, finished in black wrinkle lacquer.

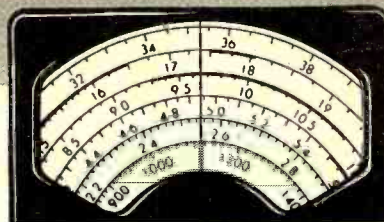
Necessity for a heavy, bulky 110-volt a.c. inverter and high voltage receiver (Continued on page 128)

Block diagram shows circuit functions. Radio compass was originally designed for Army Air Forces.





International SHORT-WAVE



Compiled by **KENNETH R. BOORD**

IT IS with pleasure that this month's ISW Department is dedicated to the Vatican Radio, *Vatican City State*.

High above the Vatican gardens towers the radio mast of Station HVJ, the "Voice of the Vatican." Nearby is the statue of Pope Urban II, who, in the 11th century, launched the First Crusade.

In that Pope's time, papal pronouncements were disseminated slowly. Today, broadcasts in many languages go out daily from the Vatican station to all parts of the world. Recently Pope Pius XII spoke through this medium to the boys and girls of the United States, urging them to work, save, and sacrifice during Lent in order to send food, clothing, and medicine to Europe's starving children.

Station HVJ was installed during the reign of the late Pope Pius XI by Guglielmo Marconi, inventor of the radio. The present Pontiff was the first to have his election as Pope (March 2, 1939) announced in this manner. The modern radio station is near the remains of the old wall built by Pope Leo IV in the ninth century. Together they form one of the many striking contrasts to be found in Vatican City.

Day and night the radio station of

The antenna masts of station HVJ. "The Voice of the Vatican" tower over the gardens of the Vatican. The station is housed in the old observatory.



(Editor's Note): Beginning with this issue, the ISW Department will use a 24-hour clock for transmission times, expressed in American Eastern Standard Time (EST); ADD 5 hours for Greenwich Civil Time (GCT).
For "p.m." hours, 12 is added to the "p.m." time; for example, 1 "p.m." plus 12 is 1300 hours, and so on. The following reference chart is provided for those not familiar with the 24-hour clock system:

0000—12 midnight	0600— 6 a.m.	1200—12 noon	1800— 6 p.m.
0100— 1 a.m.	0700— 7 a.m.	1300— 1 p.m.	1900— 7 p.m.
0200— 2 a.m.	0800— 8 a.m.	1400— 2 p.m.	2000— 8 p.m.
0300— 3 a.m.	0900— 9 a.m.	1500— 3 p.m.	2100— 9 p.m.
0400— 4 a.m.	1000—10 a.m.	1600— 4 p.m.	2200—10 p.m.
0500— 5 a.m.	1100—11 a.m.	1700— 5 p.m.	2300—11 p.m.

Vatican City is on the air. The station is run by a small party of priests of all nationalities and the broadcasts are timed to be best accepted in the particular country on its wavelength. The station itself occupies the one-time Vatican Observatory Building (now removed to the country), and has an annex in the former summer retreat of Pope Leo XIII.

In the radio telegraphy room, thousands of messages are handled each day.

Vatican transmitters are: 1. Marconi—built especially by Marconi for *Vatican Radio* in 1931; 12 kw.; wavelengths, 19.87 and 50.26 meters (15.095 and 5.971); antenna, non-directional; and 2. Telefunken—built in 1937; 50 kw.; wavelengths can be regulated for all short wavelengths; at present the following are used: 19.84, 17.19, 25.55, 16.82, 31.06, 48.47 meters; antennas include: non-directional, which may be regulated according to different wavelengths; dipole for 31- and 49-meter wavelengths; and four directional antennas for North and South America in one direction, and for Egypt, India, Australia, China, and Japan in the other.

Reports on transmissions will be gladly received by: Announcer in English, Vatican Radio, Vatican City State.

Schedules Listed

There is a *daily English* broadcast from 1315-1330 on wavelengths of 31.06 and 50.26 meters (9.660 and 5.971); subject to change, normal programs consist of: Sunday—Roma Sacra; Monday—talk of news interest; Tuesday—weekly news bulletin; Wednesday—talk on some doctrinal subject; Thursday—the words of the Pope; Friday—a Sacred Heart program; and Saturday—a talk on a liturgical subject.

A *daily English* news bulletin is presented on wavelengths of 19.87 and

31.06 meters (15.095 and 9.660), during the *winter* months at 1000, and during the *summer* months at 0900.

On Sundays, Mass is broadcast on wavelengths of 31.06 and 50.26 meters (9.660 and 5.971) at 0530 in the *winter* months, and at 0430 in the *summer* months. For a quarter of an hour *preceding* the Mass, there is a homily in these languages in turn: *English*, Polish, French, German, and Spanish.

Vatican Facts

The State of Vatican City (*Citta del Vaticano*) consists of 108.7 acres, or .16 square miles. As of December, 1932, the population was 1025.

For many centuries, with some slight interruptions, the Popes held temporal sovereignty over mid-Italy (the so-called Papal States), extending from sea-to-sea, comprising an area of some 16,000 square miles, with a population in the nineteenth century of more than 3,000,000. This territory, in the reign of Pius IX, was incorporated in the Kingdom of Italy, the sovereignty of the Pope being confined to the palaces of the Vatican and the Lateran in Rome and the villa of Castel Gandolfo, by the Italian law (May 13, 1871). This law also guaranteed to the Pope and his successors a yearly indemnity of 3,225,000 lira (\$622,425 at par of exchange), which allowance, however, remained unclaimed and unpaid.

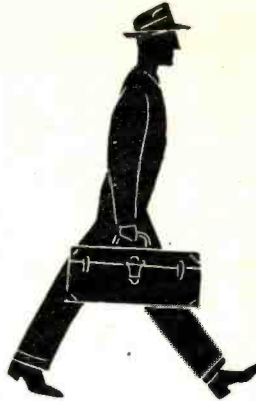
Final settlement of the Roman question came after negotiations (begun October 4, 1926), when the Treaty of Conciliation, the Concordat and the financial convention were signed in the Lateran Palace (February 11, 1929) by Cardinal Gasparri and Premier Mussolini. The treaty was duly ratified by the Pope and by the Italian Parliament (May 14 and 25) and signed by the King (May 27) and became effective (June 7).

Unless otherwise stated, "news" mentioned herein is broadcast in *English*.

RADIO NEWS

THIS MONTH IN RADIO MAINTENANCE

June Issue



Test Equipment Maintenance

The first of a series of three big articles on maintaining your own test equipment. Every Serviceman knows the importance of keeping his test instruments properly calibrated and in good condition—and this series of articles will help you do just that. Read about preventive maintenance on Tube Testers, VTVM, Oscillographs, Multimeters, Signal Generators, etc. . . . How often they should be calibrated . . . How to service them and the laboratory techniques of fine adjustments . . . Hints and kinks . . . meter peculiarities . . . Replacement parts, etc. Your test instruments can mean the difference between success and failure of your business . . . This series of articles will be a valuable reference for your service library!

Television Receivers

Part of a series by Morton Scheraga, Television Editor for RADIO MAINTENANCE. Mr. Scheraga describes completely each of the sections in a television receiver and its component parts . . . Alignment, Maintenance and Repair are thoroughly covered . . . In Metropolitan areas, television receivers are already in wide use and smaller communities will soon have them. The public will demand competent repair and maintenance of these new sets, and the Serviceman who knows his television is assured a successful career. Follow television in RADIO MAINTENANCE and be prepared!

When the customer isn't right!

What to do to keep good customer relations. Have you ever had a customer say that your price is too high compared to others? Or that this repair job should be free because you fixed the same radio only a month previously? Find out how some of the leading servicemen in the country handle these difficult situations brought on by some customers. The most frequently encountered problems of customer relations were boiled down into ten questions and each is answered by a different service organization. Read these answers in the June issue, and they will help you meet awkward problems with tact and assurance, and keep all of your customers happy!

And in addition you'll find

- THE RADIO SERVICE BENCH
- SERVICE MEN'S ACTIVITIES
- ELECTRONICALLY SPEAKING
- REVIEW OF TRADE LITERATURE
- THE LATEST THING IN RADIO

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Congratulations on the excellent job you are doing in RADIO MAINTENANCE. I, and all other servicemen I know, have for years been looking for a good magazine published especially for us and yours is one that fulfills our wishes. Keep up the good work!

R. A. J.
St. Louis, Mo.

I've saved every issue of RADIO MAINTENANCE since Vol. 1, No. 1, and a more valuable collection of service articles would be difficult to find. Thanks for giving us a magazine we can be proud of!

T. L. M.
Dayton, Ohio

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Address

City-State

*Occupation

Title (Service Mgr., etc.)

Employed by

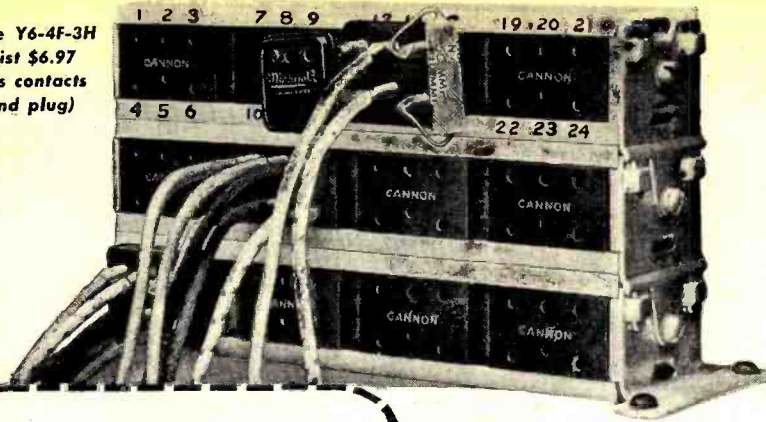
*Business or professional classifications are required to serve you better. Each subscriber will profit by writing one of the following classifications in space indicated.

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Same day
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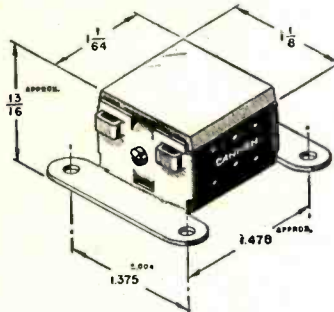
Type Y6-4F-3H
(List \$6.97
less contacts
and plug)



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DISCONNECT**



Six 5-amp. contact Plug (List 86c)



Basic Unit Y6-1F-1H (List 89d)



Single contacts—5-amp. (List 64 ea.)

**FOR RADIO and
LOW AMPERAGE
CIRCUITS**

TYPE Y6

This compact and flexible terminal block for radio equipment and other low amperage circuits handles single-to-single and multiple-to-single or multiple-to-multiple circuits easily and quickly. Circuits may be bussed, or used with resistors or capacitors in many combinations.

VERTICAL OR HORIZONTAL UNITS MAY BE ADDED. A desirable feature is the ease of adding units, starting with the basic single unit, Y6-1F-1H, shown at left. The Tenite strip, which also serves as an interlocking part, may be lettered or numbered by the user as required. (See above.)

SPECIFICATIONS. Foot and side brackets are steel; unit terminal blocks and six contact plugs are molded phenolic. Contacts are brass, silver plated, and will accommodate No. 16 B&S stranded wire for 5 amperes. Solder pots are tinned.

Available through jobbers located in all principal cities, or through Cannon Electric Engineering Representatives. Bulletin Y6-2 available upon request. Address Dept. F-228. Cannon Electric manufactures a complete line of multi-contact disconnect plugs and receptacles for radio, power, batteries, radar, television, instruments, sound, microphones, general electrical equipment. Also hospital signal equipment.

Vatican City includes St. Peter's, the Vatican Palace, and Museum covering more than 13 acres, the Vatican gardens, and neighboring buildings between Viale Vaticano and the Church. Thirteen buildings in Rome, although outside the boundaries, enjoy extra-territorial rights; these include buildings housing the congregations or officers necessary for the administration of the Holy See.

The legal system is based on the code of canon law, the apostolic constitutions and the laws especially promulgated for the Vatican City by the Sovereign Pontiff or those to whom he may delegate legislative power. In all cases not covered, the Italian law of Rome applies. The flag of the State is white and yellow, charged with the crossed keys and triple tiara. Postage stamps have been issued, and a complete coinage was struck (1931).

Police duties are carried out by the Pontifical Armed Corps which comprise the Noble Guards, the Swiss Guards, the Palatine Guards of Honor and the Pontifical Gendarmerie.

The present Sovereign of the State of Vatican City is Pius XII, Eugenio Pacelli, born in Rome and elected as the 262nd Pope in succession to Pius XI (March 2, 1939). The late Pius XI in 1933, began to go outside Vatican City, and summered, with more or less regularity, at Castel Gandolfo in the Alban Hills. He modernized life and habits in the State of Vatican City by full use of wireless, telegraph, telephone, radios, automobiles, and other up-to-date conveniences.

And so we take our leave of Station HVJ, "The Voice of the Vatican," overlooking the present Pope's garden in a peaceful setting of fountains, cyprus and fir trees, with St. Peter's for its background.

* * *

China to North America

Following is a special dispatch to RADIO NEWS from the Central Broadcasting Administration, Nanking, China:

Opening salvos of an elaborate plan for the broadcasting of feature programs about China for short-wave listeners around the world were heard in Nanking today with the announcement by Roy Dunlop, Director of Foreign Programs for the Central Broadcasting Administration, that a daily two-hour service for North American listeners is being inaugurated from Nanking this week (April).

The broadcasts will be heard on 15.350 megacycles (19-meter band) and 9.730 megacycles (31-meter band). They will reach North American listeners at 2100-2300 EST, according to the announcement.

Under the guidance of Dr. T. Y. Woo, Director-General of CBA, and Dr. Fung Chien, Director of China's International Broadcasting System, the plans for further expansion of Chinese programs for foreign consumption are going ahead as fast as the necessary equipment can be installed. Already, F. C. Chien, Chief



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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 2AP1 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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1 mfd. 600v. \$0.35	.5 mfd. 2000v. \$2.10
2 mfd. 600v.60	1 mfd. 2000v.95
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8 mfd. 600v. 1.10	3 mfd. 2000v. 2.95
10 mfd. 600v. 1.40	4 mfd. 2000v. 3.95
1 mfd. 1000v.90	15 mfd. 2000v. 4.95
2 mfd. 1000v. 1.05	12 mfd. 3000v. 6.95
4 mfd. 1000v. 1.10	.05 mfd. 3000v. 1.95
8 mfd. 1000v. 2.00	.25 mfd. 3000v. 2.95
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Hi-Voltage Insulation

1600v @ 4ma; 700VCT @ 150ma; 6.3v @ 8a. \$ 8.50
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6300v @ 4ma. 9.95
500-0-500v @ 100ma; 5vct @ 3a. 4.95
442-0-442v @ 1000ma. 9.95
425-0-425v @ 150ma; 6.3v @ 7.5a; 6.3v @ 3a; 5v @ 3a. 5.95
400-0-400v @ 200ma; 5v @ 3a. 4.95
350-0-350v @ 150ma; 6.3v @ 6a; 5v @ 3a; 78v @ 1a. 4.95
350-0-350v @ 35ma—XLNT for Volt Doubler. 1.49
300-0-300v @ 65ma; 2X-5v @ 2a; 6.3v @ 2½a; 6.3v @ 1a. 3.49
120-0-120v @ 50ma. 2.49
2.5v @ 3a, 15KV test. 3.95
2.5v @ 10a, 10KV test. 3.25
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4 Hy @ 250ma. \$1.98	12 Hy @ 300ma. \$3.95
10 Hy @ 250ma. 2.49	15 Hy @ 100ma. 2.95
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No. 4RJ 2000 ohms SPDT. Can adjust to less than 1 ma. **\$1.98**

BLOWER

Hi-air blast, designed for transmitting tube service. Motor operates on 100-125v 60 cycle at 7000 RPM. Noise free with self contained chokes and filters. Enclosed in satin finish, aluminum cabinet. Measures 4" high x 2½" x 3¼". Many uses.

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

Use as plating unit, battery charger, etc. 12 Amp-12v D.C. from 110v A.C. Unnecessary to tear set apart. Leave set portable.

COMPLETE READY TO PLUG IN.....**\$32.50**

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6AG5 1.10	8005 4.95
6AG7 1.25	8016 1.95
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805 5.50	2051 1.50
806 15.95	257B 14.95
807 1.05	3089
808 5.95	35T 3.50
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810 3.55	726A/C 7.50
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813 7.95	1N2135
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0-5 Ma. D.C. 0-8 Amps. R.F.
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0-100 Ma. D.C. 0-15 K.V. w/shunt
0-300 Ma. D.C. 0-3.5 K.V. w/shunt
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0-8 V. A.C. 0-15 V. A.C.

Your choice any 3½" METER. . . \$3.95

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Your choice any 2½" METER. . . \$2.95

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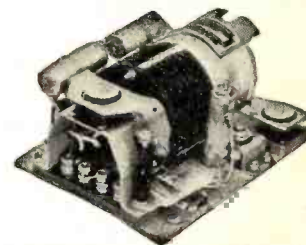
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4000 mfd.—18WVDC	\$1.95
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Electronic STETHOSCOPE for 105-125 V. 50-60 cycles A.C. Complete with 4 tubes, probe and Service Guide. Wt. 10½ lbs.

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Available for Export. Choice territories still open. Write for details.

Engineer of Nanking's XGOA, and his staff are completing the installation of two 20,000 watt short-wave transmitters which will be in operation this summer. In addition, one 100 kw. long-wave transmitter is being erected in Nanking, and a 50 kw. long-wave transmitter is at present being installed for the Shanghai area. Engineer K. S. Yeh is in charge of the latter project, and excellent headway is being made.

When the "Voice of China" speaks out from the Chinese capital this month (April), it will speak from Nanking for the first time. The world-famous "Voice of China" during the war years was that of Station XGOY at Chungking, which was, until now, the only Chinese station broadcasting regular programs for international listeners. Mr. Dunlop has been brought to China by the CBA to reorganize and build up this country's foreign programs so that China may take her rightful place among the company of international broadcasters. He will leave shortly for Chungking to reorganize the foreign programs of Station XGOY there.

Mr. Dunlop is a Canadian, well-known in the United States, Canada, and England as author, playwright, and director-producer in radio. During the three months he has been in China, he has revised foreign programs at Station XORA, Shanghai, and at Station XGOA, Nanking.

Best wishes go from the ISW Department of RADIO NEWS to the CBA in its reorganization and development of international short-wave radio services in China.

Saigon Broadcast Report

Thanks go to ISW readers who sent in reports on the special DX broadcast dedicated to RADIO NEWS by *Radio Saigon* on March 16. While reception was erratic throughout the world, largely due to ionospheric disturbances, the broadcast was highly successful, both to *Radio Saigon* and many listeners over a widespread area. Officials of the station were so well pleased with the broadcast, that further "Goodwill" programs, sponsored by radio clubs, are now being considered.

Reports received by your ISW Editor indicate excellent reception on the West Coast of the United States; fair in Mid-West, East and South; fair in Canada; good in Brazil, parts of New Zealand and Australia; excellent in India; inaudible in Finland, Sweden, England, and South Africa.

Sincere thanks go to Margaret Morgan, formerly of Pennsylvania, and to M. Jean Pipon, head of *Radio Saigon's* English Department, for the splendid manner in which the broadcast was presented.

Special DX Programs

Following the lead set by the ISW Department for special DX broadcasts (Stockholm in November; Saigon in (Continued on page 96)

TERMINAL has VALUES \$\$\$ \$\$\$ YOU Save Plenty!

Terminal IS YOUR **Best Bet** FOR **Better Buys**

Terminal has tremendous stocks of Everything in Radio at Lowest Prices! Prompt attention given all orders! Immediate delivery of all items on this page!

NEW YORK'S
LEADING RADIO
SUPPLY HOUSE

Test Equipment

Hickok 191X Signal Generator	143.00
Simpson 305 Tube Tester	48.51
RCA WV75A V. Ohmyst	125.00
Silver 904 C/R Bridge	48.90
Jackson 636 CP Tube Tester	61.25
Precision E-200 Signal Generator	62.87
Supreme 592 Speed Tester	57.75

Communications Receivers

NATIONAL	
NC-46	107.40
NC-240D	241.44
HRO-5TAI	306.71
I-10	67.50
HAMMARLUND	
HQ-129X	173.25
SP-400-X	342.00
HALLICRAFTERS	
S-38	47.50
S-40	89.50
SX-42	275.00

SPECIALS for HAMS

TUBES! Brand New! Transmitting & Special Types! JAN Approved! Guaranteed!

6AK5	.90
802	1.58
803	9.00
805	3.75
807	1.05
810	2.65
811	1.95
813	6.75
814	4.50
832A	4.05
866A	.75
872A	2.95
3E29/829B	3.00
24G	1.95

Oil-filled Filter Condensers

10 Mfd.—600 W.V.D.C.	.98
4 Mfd.—1000 W.V.D.C.	.95
2 Mfd.—2000 W.V.D.C.	1.75
4 Mfd.—3000 W.V.D.C.	5.95
3 Mfd.—4000 W.V.D.C.	6.95
4 Mfd.—4000 W.V.D.C.	9.95

Many others—write for complete list

GARRARD Dual-Speed Phonograph Motor & Turntable Model 201 V/D



An Exclusive Terminal Scoop! You profit by this fortunate purchase from the U. S. Gov't!

Brand New! Well packed for shipment anywhere!

The new Garrard 201-V dual-speed motor is now offered in its latest, trouble-free form, exactly as produced for the U. S. Navy and the British Admiralty during the war.

The governor-controlled motor operates at either 33 1/3 or 78 r.p.m. with absolute constancy and without waver or rumble. It is ideally suited for use where truly superior reproduction is required.

Because of its extra-heavy rotor, which is slow-running, the resulting torque makes this motor amazingly smooth and silent. In sheer performance, it is the finest Garrard has to offer. It is a self-starting induction type unit, and is fitted with the patented Garrard Governor to insure perfect regularity.

The 201-V is equipped with a Speed Regulator, by means of which a wide range of speeds is possible — as well as perfect adjustment at 33 1/3 and 78 r.p.m. It is set on an extension arm so that 16" transcription records can be properly speed controlled.

Model 201-V/D — Two speeds, 78 and 33 1/3 r.p.m. Dual range AC Model, 110/130 and 200/250 volts, 40/60 cycles.

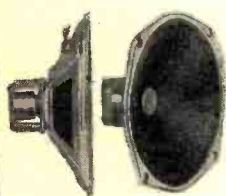
Complete with 12" turntable. Your cost only

39⁹⁵

A TERRIFIC VALUE!
TERMINAL Does It Again!

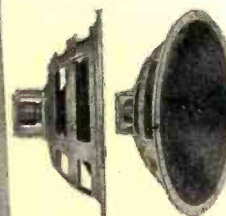
General Electric Alnico V PM Speakers

Excellent for monitoring purposes, high quality receivers, p.a. systems, etc., etc.



Model 800C — 8" permanent magnet speaker, rated 8 watts. Frequency response 90 to 8000 cycles. Your cost, each..... **4⁹⁵**

10 for..... **44⁰⁰**

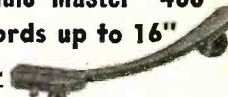


Model 1200C — 12" permanent magnet speaker, rated 12 watts. Frequency response 70 to 7000 cycles. Your cost, each..... **8⁷⁵**

10 for..... **74⁵⁰**

ASTATIC Studio Master "400" For records up to 16"

This new modern, streamlined transcription pickup employs revolutionary type NYLON I-J cartridge with replaceable Sapphire-tipped NYLON Needle. Smoothest reproduction, free from distortion, frequency response 50 to 8000 c.p.s. Light brown Hammerlin finish for lasting beauty. Your cost, only..... **14⁷⁰**



ASTATIC Nylon "508" For 10" and 12" records

Employs new NYLON I-J crystal cartridge with Sapphire-tipped Needle. Designed to faithfully reproduce the newest extended range recordings now available. Frequency response 50 to 8000 c.p.s. Balance arm for smooth tracking and longer record life. Light brown Hammerlin finish. Your cost, net, only..... **10⁷⁹**



MICROPHONE STANDS Fit all standard mikes 5/8" — 27 thread

TABLE STAND — Handsome, all-chrome, 7 1/2" high. Special..... **1⁸⁹**
FLOOR STAND — Positive clutch action, polished chrome stand adjustable from 34" to 63". 10" diameter, weighted base. Special..... **4⁴⁵**

CRYSTAL Instrument PICKUP

Crystal contact mike, easily attached to guitars, pianos, etc. With mtg. clamp and 25 ft. cable. Special..... **8⁷⁵**

ASTATIC'S New NYLON 1-J Crystal Cartridge

Improve your record reproduction — eliminate annoying scratch and record noise! Replaces L-70 and LP series cartridges. Frequency response 50 to 8000 c.p.s. Your cost, each only..... **5²³**



BRENTWOOD 14-WATT AMPLIFIER



Features 2 separate high impedance inputs for microphone and phono, separate gain controls for mixing and fading, tone control, push-pull beam power output. Output impedances: 2, 4, 8, 16 and 500 ohms. Outstanding for its true, rich and natural tonal qualities. Operates on 110/120 volts AC 50/60 cycles. Your cost, including tubes..... **26⁹⁵**

ASTATIC N-30 High Fidelity Crystal Microphone

Wide-range, smooth response. Freq. range is 30-10,000 c.p.s.! Complete with 15 ft. cable. Your cost..... **11²⁵**



Net

WARRANTY — No change in our policy. Every item we sell is fully guaranteed, regardless of its low price.

If unable to visit our store, send us your mail orders with 25% deposit. Remit in full all orders under \$5.00. Prices are F.O.B., New York.

TERMINAL RADIO CORP.

85 CORTLANDT STREET, NEW YORK 7, N. Y.

PHONE: WORTH 2-4415

3-WAY PORTABLE KIT \$17.95! UTILITY P. A. KIT \$17.95!

Every Kit we offer is complete with tubes; nothing else to buy. Order yours today.

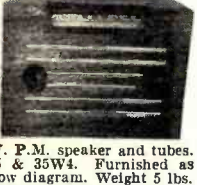
3-WAY PORTABLE RADIO KIT, \$17.95

Build this powerful, 5 tube, 3-way portable kit. Operates on 110 volts AC or DC or self contained batteries. Receives broadcast 550 to 1650 K.C. Incorporates a standard superhet circuit with AVC and loop Ant. Has Alnico 5 PM Speaker, 2 gang condenser. All parts and batteries are furnished including tubes 117Z6, 1R5, 1T4, 1S5 and 3S4. Has attractive leatherette portable cabinet size 7x9x9. Weight 14 lbs. Kit Model 3-2A. Net \$17.95



NEW SUPER MIDGET KIT, \$12.95 MODEL KP-T

Build this new super Midget Broadcast Radio. Has beautifully made, highly polished walnut cabinet. Size 7 1/4 x 4 1/2 x 5 1/2. Attractive slide rule dial. Incorporates a standard superhet circuit with 456 KC IFS & AVC. Has 2 gang condenser and loop ant. Every part including Alnico V. P.M. speaker and tubes. 12BE6, 12BA6, 12AT6, 50B5 & 35W4. Furnished as well as photo and easy to follow diagram. Weight 5 lbs.



RADIO-PHONO COMB. KIT, \$29.95

Build this beautiful portable combination radio phonograph. We furnish everything. Beautiful two tone portable case, latest rim drive phono motor, Astatic crystal pick-up. All parts to build high quality 5 tube AC-DC radio. Tunes 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. Wt. 20 lbs. Your Cost \$29.95

DELUXE RECORD PLAYER, \$19.95

Offered in same case as RP-12 shown above. Complete kit furnished including latest rim drive phono motor high output crystal pick up and wired and tested ready to play 3 tube ac dc amp with tone and volume controls. Push pull 35L6 tubes assures high output and good base response. Has latest 6 1/2" alnico V PM speaker. Model R-12, weight 20 lbs. Net... \$19.95

PORTABLE AUTOMATIC, \$33.95

Kit J-24 Portable Automatic Record Player. Easily assembled in a few minutes. Has beautiful Alligator covered portable case. Latest single post record changer and ready wired and tested powerful push pull AC DC amplifier. Furnished with the latest type crystal pick up which drives the pushpull 35L6 tubes to full output with exceptional base and treble response. Furnished with tubes Two 35L6 and 35Z5. Has full 6 1/2" Alnico V PM speaker, tone and volume controls. Kit J-24 priced complete nothing else to buy. Net... \$33.95



RECORD PLAYER KIT, \$11.95

Only 900 of these top quality single record player kits to sell at this exceptionally low price. Has latest 78 RPM rim drive phono motor and light weight crystal pick up. Ready wired and tested 3 tube AC DC amplifier and Alnico 5 PM speaker. Has separate tone and volume controls. Easily assembled in a few minutes. Priced complete with tubes 12SR7, 50L6 and 35Z5. Kit Model J25. Net \$11.95



KIT J-19 SINGLE RECORD ATTACHMENT, \$3.95

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 Dealer's Net \$3.95



Model B-4 phono oscillator (fits under base). Dealers Net \$3.69

HOME RECORDER KIT J-K6. Net \$59.95

Consists of latest General Industries dual speed 33 or 78 RPM record-play-back mechanism. Beautifully made to fit walnut cabinet and a complete kit of parts to build a high quality recording amplifier with push-pull 6V6 outputs. All parts, tubes, 5" PM speaker, Astatic crystal mike and diagram furnished. This amplifier can also be used as a 15 watt P.A. system. Provision made to connect 12" PM Speaker. (12" G. E. PM Speaker and wall baffle \$16.95 extra). Net Kit J-K6 \$59.95. JK-6 in Portable Leatherette Case and 6" PM Speaker \$5.00 extra. Wt. 33 lbs.



8-TUBE RADIO-AMP. KIT, \$29.95

Build this High-Fi Radio Amplifier

- Standard Superhet Circuit covering Broadcast 550 to 1700 K.C.
- New Positive Drive Permeability Tuning.
- Offered with 12 or 15 in. PM Speakers. Push-pull 6V6 Output stage giving 15 watts of full range audio.
- Dual Tone Controls (Bass and Treble).
- Inputs for both Mike and Phono pick-up.



Here is something new in radio. A real 15 watt power amplifier with bass and treble controls. Has extra gain stage for crystal or dynamic mikes. And on the same chassis, a standard superhet radio receiver. We furnish all parts, knobs, escutcheon plate and tubes: 6SA7, 6SK7, 6SR7, 6SN7, 6S7, two 6V6 and 5Y3. No cabinet. Extra care in designing the power supply section assures low hum level, making this unit ideal for recording as well as P.A. use. We furnish everything as well as schematic diagram and photos of the completed chassis. Weight 35 lbs. PK-10 Radio Amp. Kit with 12 P.M. Speaker... Net \$29.95 PK-10X Radio Amp. Kit with 15 in. \$30.00 value Cinnacograph P.M. speaker... Net \$42.95 If you desire a more powerful Audio section in the above kit we offer either the PRK-10 or PRK-10X with a full 200 mill power transformer and push pull 6L6 tubes in the final giving 25 watts of full range audio for \$10.00 extra on either kit.

NEW PLASTIC CABINET AC-DC SUPERHET KIT. Cabinet size 7x6 1/2 x 10 1/2". Attractive slide rule dial. 2-gang tuning condenser. 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. Wt. 9 lbs. Net \$12.95 4 TUBE 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, 1S5, 3S4 and diagram. Less battery pack. Kit model PB-48. Your Cost \$10.95



DELUXE AC-DC KIT J-D5

Beautiful walnut cabinet and all the parts to build a broadcast 5 tube AC-DC radio. Superhet with slide rule dial, 2 gang; tuning condenser and loop aerial. Everything furnished; includes speaker and tubes 12SA7, 12SK7, 12SQ7, 35Z5 and 50L6 and diagram. Kit J-D5. Wt. 10 lbs. Net \$14.95 KIT K-6D. Similar cabinet to above J-D5 except 15 is AC Trans. type and has 6 volt tubes. Net \$16.95



KIT K-7A. Easily assembled into a fine working attractive, transformer type AC, broadcast receiver; 550 to 1700 KC. Has push-pull audio, tone control and 6 1/2" Alnico 5 PM speaker. Beautifully made 14" walnut cabinet. Incorporates a standard superhet circuit, with AVC and loop antenna. All parts, schematic and tubes 6SA7, 6SK7, 6H6, 6SN7, 2-6G6's and 5Y3 furnished. Nothing else to buy. Wt. 17 lbs. Dealers 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. Wt. 8 lbs. Very Special at only \$9.95



RECORD PLAYER SCOOP, \$16.95

Assemble this single record player. Only a few minutes required to mount pick up, motor and ready wired and tested amplifier. Everything furnished including tubes 12SR7, 50L6 and 35Z5. Has heavy duty Alnico V PM speaker, tone and volume controls. Has latest crystal pick up and 78 RPM phono motor. The attractive Alligator covered case is small and ruggedly constructed. (15x8 1/2 x 11). This is our leader in a portable record player. Weight 18 lbs. Kit J-20. Net \$16.95



G.I. RECORDER MECHANISMS

Latest 1947 General Industries recording assemblies with 4 ohm magnetic cutters and crystal play back Model 12445-78 RPM. Net \$24.50 Model 12700-33 and 78 RPM. Net \$28.95 Model 13810-Automatic changer with cutter, 78 RPM. Net \$40.10

SMALL SLIDE RULE DIAL All assembled. Ready to mount on top of 5" speaker. Special \$0.39 Small Universal Output Trans. \$1.99 Medium Universal Output Trans. \$2.29 Large Universal Output Trans. \$4.49

20-WATT UTILITY AMP KIT, \$17.95

Build this 20 watt utility 110 volt AC, 20 Watt power amplifier. Ready punched aluminum chassis, size 12 x 6 x 2 1/2 inches. Has two input circuits, one mike and one phono. Mike stage has 135 DB gain, for crystal or dynamic mike. Has bass and treble controls. Designed for use with PM speakers; has 8-16 ohm output transformer. All parts, controls, transformers and easy-to-follow diagram furnished, including tubes: 2-6SN7, 6J5, 2-6L6GA, 5Z3. Kit Model 20-LX. Net \$17.95 12" G. E. 12 watt Alnico 5 PM speaker, \$9.50 extra. Astatic crystal mike and desk stand, \$7.95 extra.



6-110 VOLT UTILITY AMP. KIT

Model 20-LX6 20 watts output. Similar in appearance to the model 20-LX except on slightly larger chassis. Has same tube line up and input circuits. Has power supply that will work on 6 Volt DC, or 110 Volts AC. Equipped with super heavy duty vibrator. Has output voltage to run a reg. AC phono motor when used as a 6 volt unit. All parts tubes and easy to follow diagram furnished. Model 20-LX6 amp. kit. Net \$29.95. Ship. weight 30 lbs. Latest 12 in. PM Alnico 5 speaker, 12 watt. Net \$6.95 Crystal mike and desk stand \$7.95

MUSICAL AMP-KIT, \$22.95

Build this 10 watt AC-DC musical amplifier. Designed with the new selenium rectifier in a unique voltage doubler circuit. Has gain stage for crystal or dynamic mike and inputs for instrument or phono pick-ups. Variable tone control. Priced complete with 12" speaker and case as shown and tubes 2-50L6, 12SL7, 12SJ7. All parts, rectifiers and punched chassis and wiring diagram furnished. Kit Model MM-10. Net \$22.95 Crystal Mike and desk stand \$7.95 extra



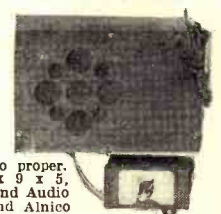
20-WATT PORTABLE AMP KIT, \$34.95

Build this 20 watt portable public address system. We furnish all parts and an easy to follow diagram. Attractive leatherette 3 piece case (snaps together to form one package). Has 12 Alnico 5 PM speaker. Inputs for mike and phono pick-up. Tone control. Full 150 mill power transformer. All parts, resistors, controls and condensers and tubes furnished. 5U4, 2-6L6GA 6SC7, 6SH7. 25 ft. of speaker cable included. Amplifier Kit model XX-20 with one 12" PM speaker \$34.95 With two 12" PM speakers. Net \$43.95 Crystal Mike and 20 ft. of cable. Extra \$7.95



BUILD THIS AUTO-RADIO, \$19.95

550 to 1650 K.C. We furnish you a complete kit of parts to build a 4-tube superhet car radio. The UNDERDASH remote control case (Size 2 1/2 x 2 x 5) Houses the permeability tuning unit and converter tube. The output from this remote control (I.F.-Freq.) is fed through 30" length of small coax to the radio proper. The metal case, size 6 x 9 x 5 Houses the I.F. Detector and Audio Stages; Vibrator supply and Alnico 5 P.M. speaker. All parts, metal case, vibrator, power supply and tubes 6BE6, 6SD7, 6SQ7, 6K6 & Sync. Vibrator, furnished. Diagram and photo furnished for easy assembly. (Kit Model CB-4). Net \$19.95



WALNUT CABINET RECORD PLAYER \$16.95

Beautifully made, highly polished walnut cabinet with hinged lid. Plays 10" records with lid closed. Latest rim drive phono motor and high output Astatic crystal pick-up. High power 3 tube AC-DC phono amplifier (wired and tested). Heavy duty 4" Alnico 5 PM Speaker. Single record player kit. Model WL-3. Wt. 15 lbs. Your Cost \$16.95



SMALL RADIO-PHONO KIT, \$24.95

After carefully designing the record player and cabinet shown above (Model WL-3), we decided that it should also be offered as a radio-phonograph combination. The cabinet is both attractive and small (12x12x3). The radio kit part of this unit is similar, except for the dial to our Kit Model K-PT shown in column 1 of this page. We furnish all parts, tubes, phono motor, pick-up, etc. Easy to follow diagram. Kit Model WL-3R. Wt. 16 lbs. Net \$24.95

NO FULL C.O.D. ORDERS

on small orders, include ample postage.

McGEE RADIO COMPANY WRITE FOR CATALOG SEND 20% DEPOSIT—BALANCE C.O.D. 1225 McGEE ST., KANSAS CITY, MISSOURI

BC-654 TRANSMITTER RECEIVER \$12.95

GUARANTEED TO BE IN GOOD CONDITION

7-Tube Superhet Receiver and 6-Tube Trans. with 25 Watts Power.



Order Now at this Scoop Price. Covers 3800 Kc. to 5800 Kc.

Portable voice and CW transmitter and receiver for portable, mobile, and fixed station operation. 7-tube superheterodyne receiver with 3.5 microvolt sensitivity on voice and 0.5 microvolt sensitivity on CW, and 100 milliwatts undistorted power output. 455 KC IF. Uses 3-1N5GT, 1-1A7GT, 2-3Q5GT, 1-1H5GT tubes. 6-tube transmitter with antenna tuning network, Colpitts thermal compensated oscillator, class C final with 2-307A tubes in parallel, and crystal oscillator for checking frequency every 200 KC. 25 watts output on CW and 11.2 watts output on voice. Frequency range, transmitter and receiver, 3800 to 5800 KC. Ideal for Hams! Comes complete with cover; set of tubes installed, 5 spare tubes and 3 spare pilot lights. Less power supplies. These units are used but in good condition. Shipping weight 50 lbs. Net price with all tubes and spares \$12.95; 2 for \$25.00. Send your order to our Kansas City store. This unit will be shipped from our Chicago warehouse. Immediate delivery. You can hardly tell they are used.



BC-645, \$14.95 Each Two for \$29.00

Made by General Electric. Factory printed Conversion Diagram. New, factory cartoned. 15 tubes. Covers 450 mc.

ARMY BC-645 I.F.F. UNIT. 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 hand 420-450 mc., citizens radio 460-470 mc., fixed and mobile 450-460 mc., television experimental 470-500 mc. Equipment capable of doing the jobs of the modified set sells for hundreds and hundreds of dollars. The 15 tubes alone are worth more than the sale price. 4-7F7, 4-7H7, 2-7E6, 2-6F6, 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. Shipping weight 25 lbs. Extra WE316A Tubes \$1.29 each. 12 Volt Dynamotor \$4.95

TINY HEAD-PHONES SCOOP, \$1.29

Tiny ear phone so small that they are almost completely hidden when worn. Ideal to use as speaker when building very small radios. 500 ohms imp. each, but with small output to match them to 8000 ohms built in the patch cord.



CHEST MIKE \$1.29

Army chest mike model T-26A carbon type with 6 ft. cord and talk listed switch. Scoop price \$1.29



CARBON HAND MIKE, \$1.29

Model T-17 carbon hand mike with push to talk switch. New in factory cartons with 6 ft. cord and PL-68 plug.

DYNAMOTOR SCOOP
28 Volts DC. Input \$2.49
540 Volts Output A 250MA. 10 lbs.

100,000 RADIO TUBES

Jan or regular brand. Cartoned or uncartoned. Every tube guaranteed.

SCOOP PRICE 49c

12A6	39	12SN7	6B4	1R5
12H6	76	6SD7	80	
12SH7	37	12SL7	6J5	12AT6
1631	5Y3	6F8	9003	12BA6
1632	5Y4	26	1S5	12BE6
9001	1633	27	1T4	35W4
	1644	6H6	3S4	50B5
		6SH7	1L4	
		56	3A4	

SCOOP PRICE 59c

6C5	6V6gt	12SK7	OY4
6F6gt	6K7	35L6	12SJ7
6SA7	41	50L6	12SR7
6SK7	42	35Z5	6C6
6SQ7	6K8	6K6	6D6
12SA7	6A8gt		77
12SQ7	12J5		78

SCOOP PRICE 79c

6SC7	7Q7	7B7	14B6
6SL7	7A8	7C5	35Y4
7A7	7B8	7C6	50A5
7A4	7Y4	7E5	35A5
7B4	7Z4	7F7	117Z6
7A6	14A7	7N7	
7B6	14Q7		

1 1/2 Volt Octal Tubes.....99c each
1Ld5, 1Ld5, 1Lh4, 1LA4, 1LB4, 1LA6 and 1LC6.....Net \$1.29 each

BUILDERS AND REPAIRMEN SPECIALS

Heavy duty 4 in. A5 PM speaker. 500 to sell.
Stock No. 4-PX.....88c
Two gang cond. matched loop and osc. coil latest prod. Net.....\$1.49
50L6 Output trans. spec......39
500,000 ohm volume Cont. SPST switch......49
500,000 ohm control with DPST SW......59

SYNC-VIB. UNIT, 99c

Small sync. replacement with unit 6 volt long leads. 5000 to sell at this scoop price.

DETROLACHANGER \$14.95

Very Special. Detrola automatic changer (plays 12 10-in. or 10 1/2-in. records). New and factory cartoned. Dealers' net \$14.95. Attractive walnut made to fit base.



AERO AUTOMATIC CHANGER SCOOP PRICE \$13.95

This is a real changer scoop. Plays 12 10-in. or 10 1/2-in. records. Has plastic arm with latest crystal cartridge. Brand new and factory cartoned. We have plenty at the scoop price of only \$13.95. Attractive walnut made to fit base \$2.49 extra.

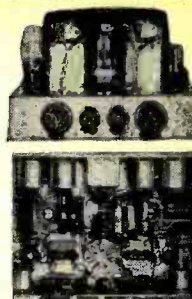


PHONO-MOTOR. Latest rim drive 78 RPM 110 volt type with turntable scoop price 100 to sell. Net \$3.19 G.I. Heavy Duty dual (adjustable) speed gear driven motor 110 volt AC governor type.....Net \$15.49
Astatic or shure light weight crystal pickups.....Net \$2.29 Each
Double 40 Watt Fluorescent Ballast made by General Transformer.....\$3.98

ARMY PARTS SALVAGE SCOOP!—\$2.49 EACH

TWO FOR \$4.49

Another red hot value in salvage. All kinds of good useable parts in this unit. Con. Res. Relays, Modulation trans. and tubes VR150, 12J5 and 1625. Brand new and in factory carton. Originally designed to modulate the BC 457 W.E. Transmitter. You can find many uses for this. BC-456 Modulator scoop, price.....\$2.49



BOTTOM VIEW



ANT. CURRENT METER SCOOP!—\$1.95

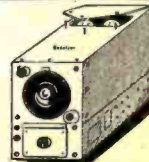
There is always a need for one of these in every ham shack. Has 2 in. 0 to 10 antenna current meter with external thermo-couple. Has built-in trans. rec. relay. Anly 500 of these to sell at the scoop price of.....\$1.95

SCOOP—NEW 3 TO 6 MC.

Aircraft Rec. has 1415 kc. I.F. channel. Easy to convert to a hot 10 meter receiver.

\$2.95 Less Tubes

\$5.95 With Tubes

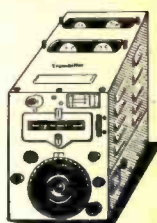


The Army Aircraft Receiver BC-454 covers 3 to 6 MC. Has 3 gang tuning condenser and two stages of 1415 KC. intermediate frequency. By removing plates from the gang and re-winding the Ant., R.F. and osc. coils you can have a red hot 10 meter receiver. We have plenty of these in the original factory carton. Priced less the 28 volt dynamotor.
New BC-454 3 to 6 MC. Rec. less tubes.....Net \$2.95
With 12K8 three 12SK7, 12SR7, 12A6.....Net 5.95
New BC-455 6 to 9 MC. Rec. less tubes.....Net 2.95
With six tubes.....Net 5.95
28 volt snap on dynamotor for either rec. 1.95
Rec. shipping weight 8 lbs.

AIRCRAFT TRANSMITTERS

BC-457-A—4 to 5.5 MC BC-458-A—5.3 to 7 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 2-1625 (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 this ridiculous price; with tubes.
BC-457-A Transmitter 4 to 5.5 MC. Complete with 4800 KC crystal and tubes.....Your Cost \$9.95
BC-458-A Transmitter 5.3 to 7 MC. Complete with 6900 KC crystal and tubes.....Your Cost \$9.95
Special. Both of above on shock mounting rack. \$18.95



DALBAR AUTOMATIC PHONO RADIO SCOOP PRICE, \$39.95



Dalbar 5 tube superhet receiver 550 to 1600 KC. (not a kit) complete chassis with tubes 12SA7, 12SK7, 12SQ7, 50L6 and 35Z5. Has heavy duty PM speaker and attractive airplane dial. We furnish everything. This Dalbar chassis, latest single post automatic record changer and attractive ready cut walnut cabinet. You can slip the chassis into the cabinet and have a good quality radio phono comb in only a few minutes time. Model DB-5, weight 30 lbs.

2-TUBE PHONO-OSCILLATOR

Complete, wired and tested. 800 to 1500 KC. Model B-4. Has audio gain stage for proper power output. Complete with tubes ready to operate.....\$3.69



MIKE-OSCILLATOR

800 to 1500 KC Mike Oscillator model C-4. Not only does the unit work as a phono-osc., but has added gain stage for a crystal mike. Priced complete, wired and tested with 3 tubes and fader control. Net \$4.95. Crystal Mike.....\$4.90 extra



DELUXE MIKE OSCILLATOR

800 to 1500 KC Phono-Mike Oscillator. Makes any receiver a PA system, Record player or Recording amplifier. 3 stage high output unit with power transformer for AC operation only. High gain input stage for crystal or dynamic mike. Control on panel for fading recording to voice, simulating an actual broadcast station. Model DL-5 Complete with 3 tubes, wired and tested. Net \$7.95. Crystal Mike.....\$4.90 extra

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What's New in Radio

COMMUNICATIONS RECEIVER

A new postwar communications receiver for amateur use has been announced by *National Company, Inc.*

A 13-tube superheterodyne with calibrated bandspread covering the 6, 10-11, 20, 40 and 80 meter bands, its frequency range extends from 540 to 31,000 and from 48,000 to 56,000 kc.



for both AM phone and code reception. The a.v.c. is operative for both phone and c.w. reception and need not be turned off when listening to c.w. at normal keying speeds.

Voltage regulated circuits give this set a minimum of drift and the pitch of code characters does not change noticeably over wide periods of listening time. The new threshold noise limiter approaches the noise limiting achieved in FM reception.

The set operates from a.c., battery or other separate source. Power requirements are 110 to 120 volts or 220 to 240 volts, 50 to 60 cycles. Phonograph, microphone pickup or headphones can be plugged into a special jack and any kind of antenna can be used.

The manufacturer, *National Company, Inc.* of Malden, Massachusetts, will furnish additional details on this new model NC-173 receiver.

P.A. AMPLIFIER

A new line of audio amplifiers for p.a. systems, including 8, 25, and 50 watt amplifiers, a preamplifier and a booster have been announced by *The Thordarson Electric Manufacturing Division of Maguire Industries, Incorporated.*

The 8 watt amplifier provides two input circuits, one a high impedance



microphone channel giving 115 db. gain and the other a high impedance phono channel with 72 db. gain (both values based on 100,000 ohm input impedance). The tone control, of the high frequency attenuator type, will

eliminate needle scratch or objectionable highs, according to the manufacturer. Normal operation features a flat frequency response within 1 db. from 50 to 10,000 cycles.

The 25 watt amplifier provides three input circuits all of which may be electronically mixed to feed the output circuit. Individual treble and bass tone controls are included and in normal position the frequency response is flat within 1 db. from 30 to 15,000 cycles. The hum level is 65 db. below the rated output.

The 50 watt unit is intended for large commercial installations and is capable of 65 watt peak output. Five input channels are available, each equipped with individual controls.

Additional information on this amplifier line may be secured by writing to *The Thordarson Electric Manufacturing Division of Maguire Industries, Incorporated*, 936 North Michigan Avenue, Chicago 11, Illinois.

AUTOMATIC RECORD PLAYER

Distribution is now under way on a new table model phonograph, complete with automatic record changer, manu-



factured by *Webster-Chicago Corporation.*

Designed to blend with any surroundings, the new model is housed in an all metal cabinet of hammered gold finish. It weighs only 16½ pounds and can be easily transported from room to room.

A feature of the Model 60 is the full range tone control and master switch which makes it possible to "warm-up" the amplifier before starting the record changer. This model comes equipped with the new *Webster* nylon sapphire-tip needle.

Full details will be furnished by *Webster-Chicago Corporation*, 5610 Bloomingdale Ave., Chicago, Illinois.

TRANSCRIPTION PLAYER

Production of a new portable transcription player, the "Panacoustic," has been announced by the *United States Research Corporation*, division of the *United States Recording Company.*

The lightweight pickup, equipped

RADIO NEWS

**224
OPPORTUNITIES
TO WIN!**

\$4,325⁰⁰
WORTH
OF

PRIZES

**IN CASH
and
Servicing Equipment**

JUST TELL WHY
(in 100 words or less)
**"RIDER MANUALS
MEAN
SUCCESSFUL SERVICING"**



Yes, that's all you need do. Nothing to buy, nothing on which to beat your brains out.

Anyone of the tens-of-thousands of servicemen who have enjoyed the many benefits of RIDER MANUALS during any of the past seventeen years has the answers at the end of his pencil, ready for placing on the official entry blank available at all jobbers. And, a newly established serviceman has an equally good chance of winning by merely going over RIDER MANUALS at his jobbers' and reading the RIDER MANUAL ads appearing in national radio publications every month. You don't need to be a fancy writer, even spelling and grammar are unimportant. Just, in plain, everyday conversational English, write us 100 words or less on why you believe "RIDER MANUALS mean SUC-

CESSFUL SERVICING." The first thing you write may win you one of the many substantial cash or servicing equipment prizes.

Note the rules which have been kept easy in order to promote the purpose of the contest, i.e., to quickly acquaint as many servicemen as possible with the many time-saving, profit-making features of RIDER MANUALS.

Entries should be submitted on the official RIDER MANUAL CONTEST entry blanks which are available at your local parts jobbers. It is designed to make it still easier for you to win one of the 224 valuable prizes. Do it today. Send in your entry early!

**DON'T PUT IT OFF—WRITE IT DOWN!
SEND IN YOUR ENTRY TODAY**

SUCH EASY CONTEST RULES!

1. Nothing to buy. Just send in 100 words or less giving your reasons why "Rider Manuals mean Successful Servicing," and indicate on the official form, the name of your preferred parts jobber.
2. Mail entry on the official contest entry blank obtainable from parts jobbers, or write direct to John F. Rider Publisher, Inc. for blank.
3. Entries must be postmarked no later than Sept. 15, 1947.
4. Entries will be judged on completeness, compactness and originality of expression of reasons. Judges will be John L. Stoutenburgh, Executive Editor of "Radio Retailing"; Herman L. Finn, C.P.A.; Lansford F. King, Advertising Agent. The decision of the judges will be final. Duplicate prizes will be awarded in case of a tie. All entries become property of John F. Rider Publisher, Inc.
5. Contest open to anyone interested in radio servicing, living in continental U.S., its possessions and Canada, except employees (and their families) of John F. Rider Publisher, Inc., its advertising agency, accounting company, the principals and executives of Rider jobbers, or Caldwell-Clements, Inc., publishers of "Radio Retailing."

LOOK AT THESE PRIZES!

For Contestants

1st Prize	Cash	\$500
2nd Prize	Cash	300
3rd Prize	Cash	200
4th Prize	Cash	100
5th Prize	Cash	75
6th to 10th Prizes (\$50 each).....	Cash	250
11th to 40th.....(30 equipment Prizes worth \$25 each)		750
41st to 80th.....(40 equipment Prizes worth \$15 each)		600
81st to 140th.....(60 equipment Prizes worth \$10 each)		600
141st to 224th.....(84 equipment Prizes worth \$7.50 each)		530

For Jobbers of Winning Contestants

1st Prize	Cash	\$100
2nd Prize	Cash	75
3rd Prize	Cash	50
4th Prize	Cash	25
5th Prize	Cash	20
6th to 10th Prizes (\$10 each).....	Cash	50
Total		\$4,325

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Export Division, Rocke International Corp., 13 East 40th Street, New York City. Cable ARLAB

"THE RADIO SHACK" Leads the Parade!
Prices Must Come Down! Compare These Values! Save!

Special! Guaranteed Electrolytic Tubular Condensers

Sprague 16 MFD 450 V.....	ea.	48c
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Acrovox 40x20 MFD 150 V.....	ea.	49c
Mallory 40x20 MFD 150 V.....	ea.	49c
40x30x30 MFD 150 V.....		
20-25 V.....		79c
Mallory F.P. 10 MFD 450 V.....	ea.	43c
Sprague .01 MFD 400 V.....	per 100	7.00
Cornell Dubilier "Bearer" 8 MFD 450 V.....	ea.	42c
Solar .01 MFD 400 V.....	per 100	7.00
Solar 16 MFD 450 V.....	ea.	49c
20x20 150 V.....	ea.	49c
8 MFD 450 V.....	10 or more, ea.	25c; ea. 27c
20 MFD 150 V.....	10 or more, ea.	26c; ea. 29c
20x20 MFD 150 V.....	10 or more, ea.	49c; ea. 59c

CLARKSTON 2 METER RING TUNER
 No coils—no condensers needed to put receiver or transmitter on two meters... **\$4.80**

OUTDOOR AERIAL KITS
 Complete with 25 ft. lead-in wire, 50 ft. antenna wire, ground straps, glass insulators and nail knobsea. **69c**

OUTPUT TRANSFORMERS
 HIGH QUALITY FOR:
 50 L6
 35 L6
 25 L6
 6 V6 etc. **49c**

WEBSTER CHANGERS
 Model 50\$21.17
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S. L. SHURE PHONO ARMS
 High voltage output.....\$1.95

PHONO MOTORS
78 R.P.M.
 Complete with heavy turn table **\$3.25**

SPECIAL! 66" 3 SECTION AUTO ANTENNA
 Complete with lead and insulators. Individually boxed.each \$1.07
 25 to a carton.....ea. 99c

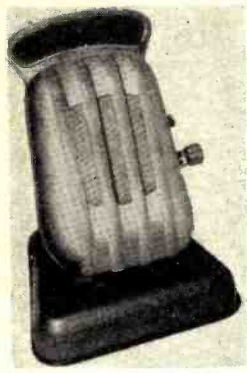
MALLORY VOLUME CONTROLS 500M OHM
 Complete with switch **55c**

IRON CORE ANTENNA COILS
39c ea.

MICROPHONE STANDS
 Heavy crackle base—chrome plated stem... **\$4.95**

TERMS: F.O.B. Chicago

SOMETHING NEW! POST-WAR MIRACLE



"ULTRA MIKE" WIRELESS MICROPHONE

This unit with your regular radio and NO extra interconnecting wires will provide superior results as a

- CALLING SYSTEM
- PUBLIC ADDRESS
- DETECTOPHONE
- BABY OR INVALID WATCHER

The "Mitey Mike" is light—economical to operate—completely self contained—no connections to power lines—portable.
 Complete with batteries. **\$10.58**
 Retail \$18.00

"BUILD YOUR OWN KIT!"



Complete 5 Tube AC-DC Superhet Radio Kit with Cabinet

Anyone can build this radio. Uses universally accepted superheterodyne circuit containing the following tubes: 12SA7, 12SK7, 12SQ7, 50L6, 35Z5, and tunes from 550 Kc to 1600 Kc. Bakelite cabinet and brand new illustrated instruction sheet, showing simple, detailed, step-by-step diagrams. **\$14.95**
 Less tubes

AMAZING NEW HI-POWER 1/4" PORTABLE ELECTRIC DRILL

AC/DC Motor—air cooled—powerful 1/4" capacity in steel—light weight. Guaranteed against any defect in materials and workmanship for six months. Not a toy—but a fine tool made for maximum service. **\$17.95**
 Actual Value \$39.95



SAVE! P.M. and DYNAMIC SPEAKERS

4" Alnico #5.....	\$1.19
5" Alnico #5.....	1.25
6" Alnico #5.....	1.98
4x6 oval 450 ohm field.....	2.25
4" 450 ohm field.....	1.98
5" 450 ohm field.....	2.25

PHONO AMPLIFIERS



3 tube AC/DC phono amplifier complete with tubes..... **\$6.95**
 4 tube AC/DC, 1 microphone, 1 phono input. With tubes..... **\$12.95**
 Ask for our new complete catalog

with permanent sapphire stylus, assures quality reproduction with almost no distortion over a wide frequency range. The pickup is mounted on a sturdily constructed extension bracket and maintains proper alignment at all times.
 Features of the "Panacoustic" are



the three position fixed control, the slide-out amplifier for immediate servicing, the four-watt undistorted output, and the RCA accordion speaker mounted in the lid with built-in labyrinth and 15-foot extension cable. A microphone input for p.a. use is available upon request.

Further information on the "Panacoustic" will be furnished by the United States Research Corporation Division of the United States Recording Company, 1121 Vermont Ave., N. W., Washington 5, D.C.

INTERCOM SYSTEM

Immediate delivery of their first postwar intercommunication system has been announced by the RCA Sound Equipment Section, Radio Corporation of America.

The newly styled speaker stations, small as an ordinary desk clock, are housed in black plastic with satin-chrome speaker grilles. The system is constructed with amplifier and speaker



station in separate units, permitting out-of-the-way location of the amplifier and reducing the speaker size to a minimum.

A flick of the two-position switch makes conversation possible at normal voice level while its release returns the switch to a listening position. To eliminate hiss and hum, a three-inch speaker featuring design and circuit refinements is used in the speaker station.

The system, which includes two speaker stations, separate amplifier, (Continued on page 94)

The Radio Shack Inc. OF CHICAGO
 630 W. RANDOLPH STREET CHICAGO 6, ILL.



This can be your complete ham shack

YOU will have an outstanding station with a Collins 75A receiver and a Collins 32V transmitter. You'll have good quality on phone, clean keying on cw.

The transmitter is rated at 150 watts input on cw, 120 watts on phone. Bandswitching is employed in all stages, and all circuits are ganged except the final. The final stage utilizes a universal output network, with only two controls—one for loading into the antenna and one for tuning the final.

The 75A receiver utilizes a double conversion (triple detection) circuit to give you a minimum of 50 db image rejection on all bands. Sensitivity is 1 microvolt for a 6 db signal to noise ratio. A clean, easy-to-use crystal filter and calibrated BFO are additional advantages. *The pitch of a cw signal is unchanged by any control except the tuning dial and BFO control.*

The Collins band-lighted dial is used in both the receiver and the transmitter. It gives you a direct reading of frequency.

Receiver accuracy is within 1 kc or better at all frequencies below 22 mc, and within 2 kc on the 11 and 10 meter bands. The transmitter accuracy is within $\frac{1}{2}$ kc on 80 meters and directly proportionate on other bands. Stability of both units is included in the accuracy specification. Furthermore, *the band-lighted dial shows only the band in use*—no other band is lighted. This new dial eliminates the usual "getting used to it" time, and shows you the correct frequency at a glance.

The 75A and 32V make a complete station right on your desk. Everything is there. You have no power supplies or spare coils to store or hide. Your shack will be neat, attractive, efficient, and dependable. When you want to operate, your rig will be ready. Components used are sturdy, substantial, and are operated conservatively.

Let us send you detailed illustrated bulletins describing these units. Place your order soon for prompt delivery.

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



COLLINS RADIO COMPANY, Cedar Rapids, Iowa

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a personal service you will find nowhere else. Sooner or later you will be a regular WRL fan. A complete line of radio parts... a prompt, personal answer to all inquiries... and fast, efficient delivery are all part of LEO'S Service.

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**WRL MT-100
MULTITESTER
\$15.95**

Reduced in price while the supply lasts. DC volts 0 to 500. AC volts 0 to 1000. DC mills 0 to 100. Ohms 0 to 1 Meg.

RECEIVERS

Lowest time payment plan. We carry our own paper. Trade-ins accepted.

SX38	\$ 47.50	NC173	\$189.50
SX42	275.00	(complete)	
S40	89.50	NC240-D	241.44
Super Pro	347.25	(complete)	
(complete)		NC46	107.40
HQ129X	173.25	(complete)	
KP81	342.00	National 1-10A	67.50
RME84	98.70	National HRO.	307.50
RME45	198.70	(complete)	

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WRL is headquarters for the finest in transmitters including the popular WRL kits.

Gordon Beam	\$225.00
Meissner Signal Shifter	120.00
WRL Exciter Kit (unwired)	17.95
WRL Exciter Kit (wired)	23.95



**Breaking
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All Over
the World**

WRL Globe Trotter TRANSMITTER KITS

A 40 watt input kit that is in a class by itself. Nothing in the market to compare in quality and price. Complete including all parts, chassis panel, streamlined cabinets, less tubes, coils and meter.

Stock No. 70-300 **\$69.95**
Stock No. 70-312—Same as above, wired, \$79.50
1 Set Coils, meter, tubes... \$15.15 extra

Send for our New Flyer



Address Dept. RN-6, Council Bluffs, Iowa

For the EXPERIMENTER



A CRYSTAL RECEIVER

In recent years there has been little published on the subject of the one-time highly popular crystal receiver. The superiority of tube receivers, along with the ease of construction, has more or less put crystal receivers in the background.

Although lacking in sensitivity and selectivity, crystal receivers are ideal for use as a spare receiver for the children, or as a standby. The old bugaboo of locating the most sensitive spot on the crystal can be eliminated by the use of one of the new crystal diodes developed during the war.

The receiver shown in Fig. 2 can be constructed in less than an hour and will give satisfactory reception from local broadcast stations, the performance depending almost entirely on the antenna used.

Parts are mounted on a plywood base-board measuring five by seven inches. Only one section of the two gang variable is used, and if available, a single section type should be used for this purpose. The dial may be any type available as the tuning is not critical.

The coil used is wound on a piece of two inch diameter cardboard mailing tube, measuring four inches long. The winding consists of 90 turns of number 22 double cotton covered wire, with a tap twisted every ten turns. This wire is close wound and occupies approximately two and three quarters inches of the form. The taps are staggered slightly to allow free access for the antenna clip. The coil form is mounted to the base by means of a block of wood cut to fit snugly inside the form, and fastened to the base by means of a wood screw.

A 1N21 surplus radar crystal was used in the receiver illustrated. Any of the radar types may be used, or one of the new 1N34 type. The crystal is held in place by using a prong from an octal socket to hold the small end and a fuse clip to hold the large end. Care should be taken in handling the crystals as they are very sensitive to stray

voltages or heat and are easily damaged.

After the parts are mounted, the insulation on the coil taps should be scraped off so that the antenna clip may make contact. A small battery clip is soldered to a short length of

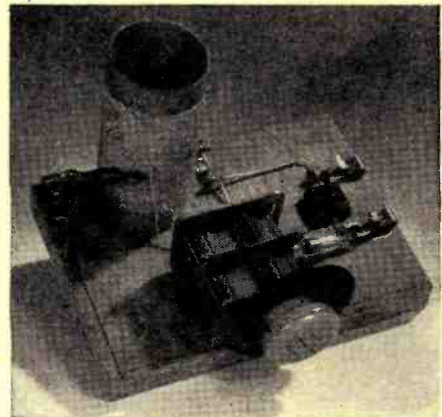


Fig. 2

flexible wire and used to connect to the optimum point on the coil.

Fahnestock clips are used for antenna and ground connections as well as the headphone terminals. The .002 μ fd. condenser to bypass the headphones is connected directly across the headphone terminals.

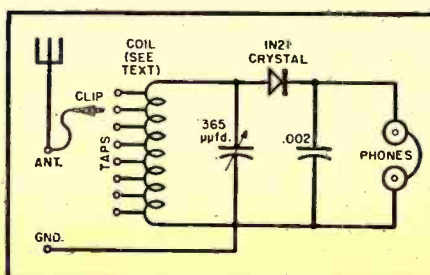
When connections have been completed, a pair of headphones of at least 2000 ohms resistance should be connected to the headphone terminals, and an antenna and ground connected. The antenna used should consist of a single wire as long and high as possible. It is essential that a good ground be used. A water pipe will usually be satisfactory. The antenna clip should be connected to one of the taps near the top of the coil and the tuning condenser slowly turned. If you are in the vicinity of broadcast stations, several should be heard as the dial is turned. Moving the antenna lead to a lower tap will aid in eliminating interference between stations. The volume will also be reduced somewhat as the tap is placed lower on the coil, so as much coil as possible should be used.

A CONTINUITY AND CONDENSER TESTER

The beginner is often confronted with the problem of checking circuit continuity, as well as the quality of doubtful condensers. Many excellent instruments are available for these purposes, but their cost is often beyond the means of the beginner.

(Continued on page 86)

Fig. 1



Announcing
**THE NEW ADDITION TO OUR
 RADIO SCHOOL**

**OWN YOUR OWN
 RADIO SHOP
 BE YOUR OWN BOSS**



**WITH A THOROUGH EDUCATION
 FROM OUR COMPLETE RADIO SCHOOL**

Radio (and its allied fields—electronics, television, radar) now looms as a major industry in the United States offering a constant and ever-expanding field of wealth and opportunities. Each new development points the way toward further improvements and an increasing demand for men and women, specialized in this field.

The Radio courses offered by the Tyler Commercial College are highly specialized to enable you to enter many branches of radio, both as your vocation or your profession. The present courses listed represent a partial list of the extensive and complete training offered by the Tyler Commercial College who have had over 30 years experience in the Radio Training Field.

They invite you to examine the content of their catalogue and determine for yourself how radio training at Tyler Commercial College will enable you to find your own place in one of the many interesting and profitable jobs in the vast radio industry.

TYLER COMMERCIAL COLLEGE
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GENERAL RADIO COURSE

The course in General Radio is designed to provide a broad foundation for careers in the technical radio field. Among the various job objectives are Radiotelephone Operator (broadcast, police, or airline), Radiotelegraph Operator (marine, zone police, or airline), and Radio-Electronics Technician (industry). Success in qualifying for F.C.C. Radiotelephone or Radiotelegraph License is a requirement for graduation; therefore, an extensive study of radio theory, essential radio mathematics, and laws and regulations governing radio communications is included in preparation for operator license examinations.

Average Time to Complete Course . . .
12 Months

**RADIO MAINTENANCE
 AND REPAIR COURSE**

The Radio Maintenance and Repair Course offers preparation for a career as radio receiver repairman, sound-system technician, and radio service shop operator. Accurate, up-to-the-minute knowledge of radio principles and practice is essential for future success in this important field of radio. After a thorough introduction to radio and electrical principles, emphasis is directed to modern trouble-shooting methods, notable "signal-tracing." A section on facsimile receivers, frequency-modulation (FM) receivers and television sets is provided to bring the repairman up-to-date on recent developments. A wide range of topics is covered in this course, all of which are important to the modern repairman.

Average Time to Complete Course . . .
10 Months

Send for Free Catalogue

For full details and catalogue regarding this unique school, write to The Tyler Commercial College, Radio Department, RN, 115 South College, Tyler, Texas.

Attach this to your letter head or card.

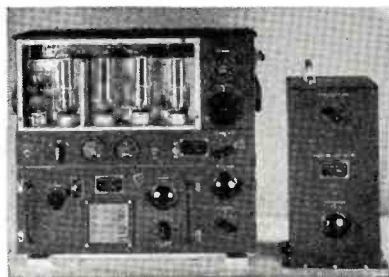
MAIL TODAY

**A STATE APPROVED
 INSTITUTION**

6-BAND COMMUNICATIONS RECEIVER BC-348

Featuring coverage from 200 to 500 Kc. and 1500 to 18000 Kc. on a direct reading dial with the finest vernier drive to be found on any radio at any price—extreme sensitivity with a high degree of stability—crystal filter—BFO with pitch control—standard 6 volt tubes. Contains a plate supply dynamotor in compartment within the handsome black crackle finish cabinet, the removal of which leaves plenty of room for installation of a 110V, 25 or 60 cycle power supply. These receivers, which make any civilian communications receiver priced under \$200.00 look cheap and shabby by comparison, are only \$44.50. Power supply kit for conversion to 110V, 25 or 60 cycle, is only \$8.50 additional.

BENDIX SCR 522—Very High Frequency Voice Transmitter-Receiver—100 to 156 MC. This job was good enough for the Joint Command to make it standard equipment in everything that flew, even though each set cost the Gov't. \$2500.00. Crystal Controlled and Amplitude Modulated—HIGH TRANSMITTER OUTPUT and 3 Microvolt Receiver Sensitivity gave good communication up to 180 miles at high altitudes. Receiver has ten tubes and transmitter has seven tubes, including two 832's. Furnished complete with 17 tubes, remote control unit, dynamotor and Ant.—\$37.95. We include free parts for the conversion to "continuously variable frequency coverage" in this receiver, as well as circuit diagrams for operation of the unit on 110V AC.



**GENERAL ELECTRIC
150-WATT TRANSMITTER**

**Cost the Government \$1800.00
Now only \$44.50!!!**

This is the famous transmitter used in U. S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: FREQUENCY RANGE: 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with slight modification.) OSCILLATOR: Self-excited, thermo compensated, and hand calibrated. POWER AMPLIFIER: Neutralized class "C" stage, using 211 tube, and equipped with antenna coupling circuit which matches practically any length antenna. MODULATOR: Class "B"—uses two 211 tubes. POWER SUPPLY: Supplied complete with dynamotor which furnishes 1000V at 350 MA. Complete instructions are furnished to operate set from 110V AC. SIZE: 21½ x 23 x 9¼ inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, five tuning units, antenna tuning unit and the essential plugs. These transmitters are priced to move fast: Order today and be the proud owner of one of the finest rigs obtainable.

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BC-947A ONE KILOWATT HIGH FREQUENCY TRANSMITTER

This relay-controlled transmitter includes a 115V, 60 cycle power supply, protected by 3 magnetic circuit breakers. That alone is worth more than the price we are asking for the whole rig, even on today's surplus market. On the front panel are six 3½" GE or Weston meters, including 250 MA, 50 MA, 1000 MA, 150V AC, and 1500V DC at 1000 ohms per volt for screens and plate. The rack-type 21"x15"x36" unit contains six amplifier and rectifier tubes aggregating over \$60.00 at WAA current wholesale prices. Western Electric's price to the government was \$1500.00. Shipping weight 500 lbs. Your cost, as is, only \$69.95.

**GENERAL ELECTRIC RT-1248 15-TUBE
TRANSMITTER-RECEIVER**

TERRIFIC POWER—(20 watts) on any two instantly selected, easily pre-adjusted frequencies from 435 to 500 Mc. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's, as first detector and oscillator, and 3 7H7's as IF's, with 4 slug-tuned 40 Mc. IF transformers, plus a 7H7, 7E6's and 7F7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for use in mobile or stationary service in the Citizen's Radio Telephone Band where no license is necessary. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice, in AM or FM transmission or reception, for use as a mobile public address system, as an 80 to 110 Mc. FM broadcast receiver, as a Facsimile transmitter or receiver, as an amateur television transmitter or receiver, for remote control relay hook-ups, for Geiger-Mueller counter applications, and it sells for only \$29.95 or two for \$53.90. If desired for marine or mobile use, the dynamotor which will work on either 12 or 24V DC and supply all power for the set, is only \$15.00 additional.

RADAR INTERCONNECTOR UNIT, contains 15 tubes—\$29.95. **C-144 TRANSMITTER,** 2 type 826 tubes as oscillator in lecher line tuning circuit that resonates between 150 and 200 Mc. Contains 3 DC power supplies that operate from 110v 60 cycles, 10 tubes, meter, circuit breaker, and carrying case—\$49.95.

AIR CRAFT MARKER BEACON RECEIVER—Complete with 3 tubes and sensitive relay to control external circuits from received signals. Just the receiver you have been waiting for to control models, open doors from a distance, etc. Priced at only \$4.95.

AIRCRAFT AMPLIFIER, C1, contains 3—7N7, 3—7F7 and one 7Y4, in an aluminum case that is 9x8x7 inches—\$9.95.

BC-654 TRANSMITTER-RECEIVER—Complete with 17 tubes and 200 Kc. calibrating crystal—\$39.95.

SERVICEMEN

Check This Column for Lowest Prices on Quality Parts

TUBES: A warehouse full, including the new miniatures. Order all the types you need and we will try to supply you completely. The following prices are for fifty or more assorted tubes. 5% less on lots of 100 or more. 27, 6Y3—38c; 26, 35Z5, 58, 75—44c; 76, 78, 6J5—50c; 6SK7, 6SQ7, 12SA7, 12SQ7, 50A, 8C6, 6D6, 6SA7—54c; 6SK7, 12SH7, 5Y4, 5Z3, 6X5, 6X7, 6V6, 6SD7, 6c; 6J7, 6K8, 6SF7, 72c; 5V4, 6F7, 12BA6, 12AT6—86c; 6L4—99c; 32L7—\$1.08; 50B5—\$1.28. These special prices on tubes are for one month only.

POWER TRANSFORMERS—Half-shell type, 110V 60 cy. Centertapped HV winding. Specify either 2.5 or 6.3 filament when ordering.

For 4-5 tube sets—650V, 40MA, 5V & 2.5 or 6.3V.....\$1.49
For 6-6 tube sets—650V, 45MA, 5V & 2.5 or 6.3V..... 1.75
For 7-7 tube sets—675V, 50MA, 5V & 2.5 or 6.3V..... 1.90
For 7-8 tube sets—700V, 70MA, 5V & 6.3 or two 2.5..... 2.35
For 9-11 tube sets—700V, 100MA, 5V & 6.3 or two 2.5V 2.85
For 9-15 tube sets: 600V, 150MA; 5V & 6.3V..... 2.95

TRANSFORMERS—All types in stock. AUTO-TRANSFORMERS: Steps up 110v to 220v, or steps down 220v to 110v—\$1.95. **FIL. TRANS.:** 6.3v, 8 Amps.—\$1.98; 5v, 10 Amps.—\$1.98; Universal Output Trans. 8 Watt—89c; 18 Watt—\$1.29; 30 Watt—\$1.69. **AUDIO TRANSFORMERS:** S. Plate to S. Grids: 3:1—79c; S. Plate to P.P. Grids—79c; Heavy Duty Class AB or B, P.P. Input—\$1.49; Midret Output for AC-DC sets—69c; **MIKE TRANSFORMER** for T-17 Shure microphone, similar to UTC oncer type—\$2.00.

CONDENSERS—PAPER TUBULAR 600 WV—001: .002; .005—8c; .01: .05—9c; .1—10c; .25—23c; .5—36c; ELECTROLYTICS: 8mfd 200v—20c; 10mfd 35v—20c; 30mfd 150v—23c; 20/20mfd 150—35c; 30/20 150v—46c; 50mfd 150v—43c; 8mfd 475v—34c; 16mfd 350v—65c; **OIL CONDENSERS:** 4mfd 600v—49c. **BATH TUB TYPE CONDENSERS:** 3X.1mfd—20c. **RESISTORS:** All types in stock at the lowest prices; Resistor Kits—100 2 watt resistors—\$1.95.

FILTER CHOKES: 200, 300, 400, 500 ohm light duty—59c; 200 or 300 ohm heavy duty—99c; 250 ma 35 ohm, made for U.S. Navy, fully shielded—\$1.95; 75 ohm 125 ma—25c or 25 for \$4.25; "Meissner type" tapped filter chokes—25c; 8 amp. iron core A filter—25c; Choke-condenser combination, ideal to replace any size speaker field when installing FM speakers—79c.

110 V. CIRCUIT BREAKERS of Magnetic type: Following Current Ratings in Stock: 1, 2.5, 3, 4, 8 Amps. Please Specify. \$1.95 each. Seven Assorted I.F. Transformers—\$1.98; Five Assd. Oscillator Coils—69c.

WILLARD rechargeable 2 volt storage batteries for G.E. portable radios—\$2.95.

SPEAKERS—PM dynamic type 4"—\$1.55; 5"—\$1.55; 6"—\$1.95; 8"—\$3.95; 10"—\$5.95; 12"—\$7.50.

HEADPHONES—Highest quality Signal Corps headsets with sponge rubber ear cushions, 12" cord and plug \$1.00. 5" rubber covered patchords with phone plug & socket—25c.

RELAYS—Guardian SPST 12-24v, has heavy duty 15 Amp. Contacts—\$1.25; Guardian 12 to 24v D.C. triple make, single break relay, 5 for \$3.75; Sigma supersensitive 2000 ohm D.C. SPDT Relay. (May be adjusted to operate on less than 1 Milliampere)—\$2.50; 6 Pole, Double Throw, Telephone Type 2000 ohm Relays, Super Sensitive, \$2.50 ea., or two for \$4.50.

SELENIUM RECTIFIERS—Dry disc type 1½" by 1", 1.2 Amp. maximum, suitable for converting DC relays to AC, for supplying filament source in portable radios, converting DC meters to AC applications, and also may be used in low current chargers—90c.

METER RECTIFIERS—Full wave, may be used for replacement, or in construction of all types of test equipment—\$1.25. Half Wave—90c.

LINE FILTERS—110V—each unit contains two 2 mfd. oil filled condensers and a 15 amp. iron core choke. This filter has innumerable uses such as oil burner line filter, etc. A ten dollar value for 98c.

CRYSTAL PICK-UP, phono motor and turntable—\$5.25.

PUBLIC ADDRESS AMPLIFIERS—25 Watts peak output, 5 tubes, separate controls for Microphone and Phono Inputs. \$65.00 value for only \$32.00.

Wire—No. 18 POSJ 2 conductor parallel zipcord, brown. 250 ft. spools—\$4.25; 500 ft. spools—\$7.95; No. 18 PO brown rayon covered parallel lampcord. 500 ft. spools—\$7.95; No. 18 SV round rubber covered double wire for wash machines, vacuum cleaners, etc. 250 ft. spools—\$6.99. Rubber covered mike cable—6c per foot; RGSU 50 ohm coax cut to any length—8c per foot. Single stranded conductor shielded lead with brown rubber over shield, super special, \$1.20 per 100 ft.; \$10.00 per 1000 ft. All kinds of hook-up wire—1c per foot.

30 MC IF TRANSFORMERS, double slug tuned—25c. **VIDEO AMPLIFIER PLATE COILS—Slug Tuned—25c.** **REMOTE CONTROL UNIT:** Aluminum case 4x3x2", containing 2 potentiometers, triple pole switch, 4 knobs, gear mechanism, counter and phone jacks—59c. **MODULATION TRANSFORMERS:** 10 watt, metal case—98c; 30 watt, open type—\$1.95; 40 watt, cast aluminum case—\$2.95; Class "B" input transformers, cast aluminum case—\$1.95; Transceiver audio transformers—65c; Transceiver modulation transformers—65c.



MICROPHONES—All nationally known brands. Bullet crystal—\$5.45; Bullet Dynamic—\$7.45; Mike Jr.—60c; Handy Mike—90c; Label Mike—93c; SHURE T-17 MIKES, with push to talk switch—99c. **20 ASSTD COIL FORMS,** including 11 ceramic, 3 polystyrene, and 6 fiber, all useful sizes—50c. **VARIABLE CONDENSERS:** 350 MMFD, 5 gang—\$1.95; 4 gang—\$1.49; 3 gang—83c; 2 gang—79c; 7.5 to 20 MMFD, 1750v spacing, extra long shaft Hammarlund—69c; miniature variable—25 MMFD—39c; 50 MMFD—49c; 75 MMFD—59c; 100 MMFD—69c; 140 MMFD—79c. **TRANSFORMING CHOKES:** 4 PIE, 350 Ma.—25c or 5 for \$1.00. **INTERRUPTION FREQUENCY COILS** for super-regenerative receivers or the tremendously popular FM adapters for standard broadcast sets. Iron core with a resonant frequency of 50 KC—39c; Air Core, 100 KC—29c. **30 MC IF TRANSFORMERS,** double slug tuned—25c. **VIDEO AMPLIFIER PLATE COILS—Slug Tuned—25c.** **REMOTE CONTROL UNIT:** Aluminum case 4x3x2", containing 2 potentiometers, triple pole switch, 4 knobs, gear mechanism, counter and phone jacks—59c. **MODULATION TRANSFORMERS:** 10 watt, metal case—98c; 30 watt, open type—\$1.95; 40 watt, cast aluminum case—\$2.95; Class "B" input transformers, cast aluminum case—\$1.95; Transceiver audio transformers—65c; Transceiver modulation transformers—65c.

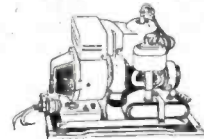
ELECTRONIC ALTIMETER ONLY \$75.00

BRAND NEW APN 1 14-tube electronic altimeter in original packing cases. This famous 18x9x7 unit, which weighs only 25 pounds, without plugs or cables, cost the government \$2000, and includes a transmitter, a receiver, all tubes, an altitude limit switch, and two easily installed 11" antennas. A 28 volt dynamotor is included which can be easily changed to other aircraft supply voltages. Working on the radar principle the receiver measures the absolute altitude from 3 to 4000 feet with precision enough for blind landings. In addition the altitude limit switch gives an alarm if the plane's height varies more than 10 feet from a preadjusted value. Another outstanding feature is that connections are provided to control an electronic automatic pilot. This unit might also be used to warn boats of any obstruction that is on their course.



PE-109 32-VOLT DIRECT CURRENT POWER PLANT

This power plant consists of a gasoline engine that is direct coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run many of the surplus items that require 28-32 V. D.C. for operation. The price of this power plant is only \$100. We can also supply a converter that will supply 110v AC from the above unit or from any 28-32v DC source for \$29.95.



AT LAST YOU CAN AFFORD A LABORATORY STANDARD SIGNAL GENERATOR

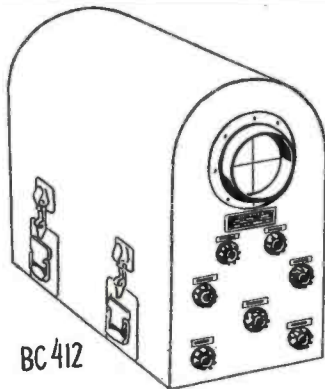
The famous Measurements Corp. Model 78B, 5 Tube Laboratory Standard Signal Generator (currently selling new, FOB Boonton, N. J., for \$310.00 net), is available in perfect condition for 25 to 60 cycle, 115 V AC operation. Until now this is the sort of top-flight lab equipment that discriminating buyers have only vainly hoped would be released at a bargain price. Worth every cent the manufacturer asks, but available FOB Buffalo while our limited supply lasts, for only \$99.95.



Model 78-B Standard Signal Generator. Two Frequency Bands between 15 and 250 megacycles.

"REMEMBER THAT A STANDARD IS ONLY AS RELIABLE AS ITS MAKER."

5" RECEIVER INDICATOR OSCILLOSCOPE WITH 31 TUBES



This unit, sold by Western Electric for \$2500.00, includes a 13 tube receiver with 7 IF stages; 2 tube multivibrator sweep generator; 2 tube sweep amplifier; video amplifier; pedestal impulse and sweep generator; and 115 V, 60 cycle supply with 2X2 for high voltage. Makes a wonderful laboratory instrument, or can be more easily converted to a complete home television receiver than any other war surplus item. Only \$69.95.

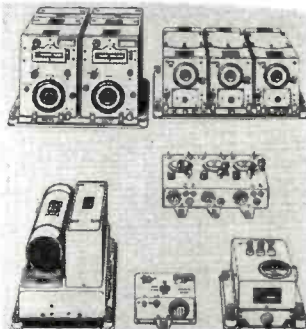
RADAR OSCILLOSCOPES APN-4, complete with 27 tubes including 5-inch cathode ray tubes—\$39.95.

5" RADAR OSCILLOSCOPE BC-412, these units are easily converted to first class laboratory instruments by a few hours work. 110v 60 cps.—\$59.95.

5" SURFACE SEARCH RADAR OSCILLOSCOPE complete with 9 tubes. This unit contains magnetic deflection yokes and selsyn motor—\$39.95.

Radar RANGE UNIT consists of a Helmholtz coil for manually introducing phase shift of 0° to 360°. This unit is ideal for use with oscilloscopes. Contains 4 tubes and a 110 V. 60 cps. power supply—\$19.95.

MC 363A Range Converter containing 20 tubes, servo motor, oscillator, motor field amplifier, isolating amplifier with 3 stages, 3 stage summing amplifier, 2 stage preamplifier, control amplifier including band shaping motor supply networks to improve servo motor operation, and high current, regulated power supply, similar in construction to the well-known RA57A power unit. Government cost \$2000.00—only \$39.95.



SCR-274N COMMAND SET

The greatest radio equipment value in history.

A mountain of valuable equipment that includes 3 receivers covering 190 to 550 KC; 3 to 6 MC; and 6 to 9.1 MC. These receivers use plug-in coils, and consequently can be changed to any frequencies desired without conversion. Also included are two Tuning Control Boxes; 1 Antenna Coupling Box; four 28 V. Dynamotors (easily converted to 110 V. operation); two 40-Watt Transmitters including crystals covering 3 to 4 MC and 4 to 5.3 MC; and Preamplifier and Modulator. 29 tubes supplied in all. Only a limited quantity available, so get your order in fast. Removed from unused aircraft, and in guaranteed electrical condition. A super value at \$29.95.

RED HOT SPECIALS!

U. S. GOVERNMENT SURPLUS ELECTRON TUBES

Type	Your Cost	Type	Your Cost
3AP1.....	\$2.95	50L6.....	69c
3BP1.....	2.95	6SJ7.....	49c
5BP1.....	3.95	12SH7.....	49c
5CP1.....	3.95	6SS7.....	49c
5FP7.....	3.95	6SF5.....	59c
7BP7.....	4.95	6V6GT.....	69c
9LP7.....	5.95	12SQ7.....	59c
12DP7.....	6.95	89.....	49c
304TH.....	7.95	77.....	49c
829B.....	3.50	39-44.....	49c
837.....	1.85	12SK7.....	49c
6AK5.....	.95	0Z4.....	69c
5U4.....	.59	GAT6.....	49c
78.....	.49	12AT6.....	49c
12A6.....	.69	1N5GT.....	69c
6K7.....	.49	1R5GT.....	89c
5Y3.....	.43	1S5GT.....	89c

ASTATIC PICKUPS

With L26 crystal.....ea. \$ 1.79
10 for.....\$15.00

ARB AIRCRAFT RADIO RECEIVER

The ARB is a six tube, four band, superheterodyne Aircraft Radio Receiver with built-in dynamotor, designed for the reception of MCW (tone or voice) or CW within the frequency range 195Kc to 9.05 megacycles.
Used.....\$19.95

FILTER CHOKES

All Fully Enclosed

15H. ±10% @ 165 MA. DC., .5 H., 60 cycles shielded, 2 stand-off terminals: size 4½" x 4" x 3½", each.....95¢

Dual, 15H. @ 100 MA., 400 ohms DC. Each section, 500 VDC insulation test. 3½" x 3" x 6" High; 4 MTG. Studs and 4 terminals, each.....79¢

59H. Min. @ 100 MA.; 10V RMS 60 cycles; 850 ohms DC. Res.: 4 MTG. Studs, size 4½" x 3½" x 3½", each.....79¢

3.7 H. @ 145 MA. DC., 125 ohms DC. Res. 4 MTG. Studs, each.....95¢

OUTPUT TRANSFORMERS

50L6.....39¢
6V6.....39¢

IMPEDANCE 4000 ohms, SEC. 4000 ohms TAPPED AT 250 ohms, FREQ. RESPONSE 250 to 2500 CYCLES, HERMETICALLY SEALED METAL CASE 1½" x 1" O.D.... 29¢

IMPEDANCE 1184 ohms, SEC. 165 ohms, FREQ. RESPONSE 475 to 3000 CYCLES, ENCLOSED IN SHIELD 1.4" LG. 1" O.D. 29¢

IMPEDANCE 25,000 ohms, SEC. 4000 ohms, FREQ. RESPONSE 2000 to 10,000 CYCLES, SHIELDED CASE 1½" H. x 1" DIA.... 29¢

Wholesalers, Dealers, Institutions and Other Quantity Purchasers
... Write, Wire, Phone for Quantity Prices, All Shipments F.O.B. Chicago—20% Deposit Required on All Orders.

DEPT. C

ARROW SALES, INC.

59 WEST HUBBARD STREET
CHICAGO 10, ILLINOIS
Telephone: SUPERIOR 5575

The unit shown in Fig. 2 will check continuity of circuits up to 10 megohms. It will also indicate leaky, open, or shorted condensers, of the mica or paper type as well as electrolytics.

Essentially the unit consists of a 100 ma. selenium rectifier together with a neon bulb. The rectifier together with its associated filter circuit furnishes a source of d.c. voltage which is applied across the condenser under test, in series with the neon bulb. For continuity measurements the part to be checked is connected across the a. c. line in series with the neon bulb.

A plywood baseboard measuring five by seven inches is used to mount the parts. Four Fahnestock clips are fastened across the front of the baseboard. The pair of clips on the left are used for continuity measurements, while those on the right are for condenser checking.

The neon bulb used should be the type with the resistor in the base. These may be obtained in any radio store and may be easily identified by the candelabra base. Those types with the bayonet base do not contain the protective resistor and should not be used.

No details as to the placement of the parts will be given as the layout is not critical and may readily be seen from the photograph. It is essential, however, that the proper polarity be observed on the rectifier and filter condensers.

To check continuity, the part to be tested should be placed across the left hand terminals, after the unit has been plugged into the line. A pair of test leads will enable parts to be checked without removal from the equipment. It is essential, however, that they be disconnected from associated parts. The equipment under test should not be plugged into the line during test as misleading results may be obtained.

If the part under test has continuity the neon lamp will glow. The brilliance of the glow will depend on the resistance of the part being tested. A slight glow can be obtained with resistances as high as ten megohms. Parts which are shorted or of low resistance will cause the lamp to glow at full brilliancy.

To test condensers of the mica or paper type, the right hand pair of terminals should be used. The condenser under test should be placed across the terminals.

When the condenser is first connected, there will be a slight flash in the neon tube caused by the charging

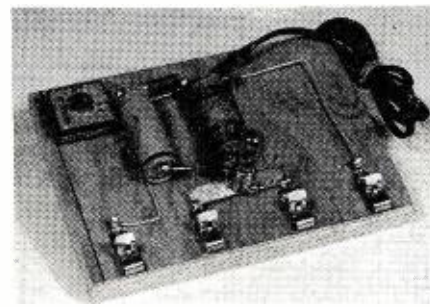


Fig. 2.

of the condenser. This flash will be brief, its duration depending on the capacity of the condenser. If the neon tube stays lighted, it is an indication of a leaky or shorted condenser. It will probably not be possible to see this charging flash if the condenser under test is less than .002 µfd. capacity.

To check condensers of small values, up to .002 µfd. capacity, the continuity test should be used. If the condenser is good, a slight glow will be observed in the neon tube. Shorted or leaky condensers will also give this glow, so the condenser should also be checked on the right hand terminals.

If the condenser to be checked is of the electrolytic type, the correct polarity must be observed. The plus side of the condenser must be connected to the plus terminal of the condenser test clips.

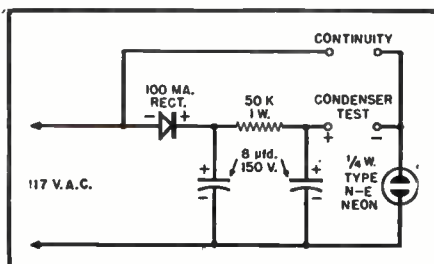
When the condenser is first connected, the neon tube will glow. This glow is caused by the charging and leakage current of the condenser. If the condenser is good, the glow will gradually become less or disappear entirely. The better the condenser, the less glow that will be observed. Large condensers will take longer for the glow to extinguish. If the glow does not diminish in three minutes or less, the condenser is either leaky or shorted, and should be replaced.

DEVELOPMENT OF THE PENTODE

The student or beginner in electronics is often confused by the many grids appearing in various types of vacuum tubes. A careful analysis of the functions of the grids in a pentode tube reveals that each serves a very useful purpose.

The control grid in a vacuum tube (the grid nearest the cathode) is utilized primarily to control the flow of electrons to the plate. Its potential is usually slightly negative with respect to the cathode so that many of the electrons emitted from the cathode are forced back by this grid and never reach the plate. Making the grid more negative forces more of the electrons back, decreasing the number that can reach the plate. In the same way, making the grid less negative permits more electrons to pass through to the plate, increasing the plate current. Thus the grid acts as a valve, controlling the flow of plate current in much the same

Fig. 1.

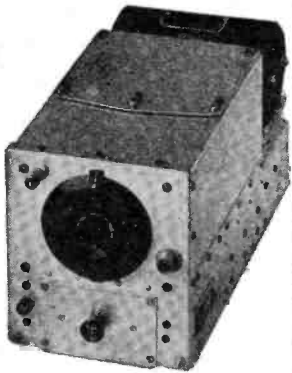


Better Buys from "ARROW"

ARMY AIRCRAFT RECEIVER

Model BC-946-B

Broadcast band from 520 to 1500 kc. Tube complement; 3-12SK7, 1-12SR7, 1-12A6, 1-12K8. Designed for dynamotor operation, but is easily converted to 110 or 32 volt operation. Has two I. F. stages and three gang condenser. Comes packed in sealed carton complete with tubes and instruction manual, but less dynamotor. **\$12.95**
DYNAMOTOR DM 32A. Each. **\$1.95**



RADIO RECEIVERS

- BC-454-A; 3-6 mc. **\$3.95**
- BC-453-A; 190-550 kc. **6.95**
- BC-455-A; 6-9.1 mc. **3.95**
Used, in A-1 Condition. Complete with tubes

RADIO TRANSMITTERS

- BC-457-A; 4-5.3 mc. **\$2.95**
Complete with Tubes and Crystals
- BC-458-A; 5.3-7 mc. **2.95**
Complete with Tubes and Crystals

MODULATOR UNIT

- BC-456-A. **\$6.95**

REMOTE CONTROL BOX

- BC-450-A. **\$1.95**

ARMY SURPLUS, principal components of radio set SCR-274-N; includes 2 transmitters, 3 receivers, 1 modulator, 4 dynamotors, control box, etc.—original cost over \$600.00—NOW \$24.95 complete.



HICKOK 2 1/2" 0-150 Volt AC VOLTMETER
Each **\$2.49**

COAXIAL CABLE

26 ft. of Coaxial Cable RG8, 52 ohm, with 2 amphenol plugs, one at each end. **89c**

HEADPHONES

Signal Corps, 8000 ohms and 200 ohms, each. **\$2.49**
2000 ohms, Trimm, each. **1.79**
EARPHONES, less headband, HS18 high impedance. **.79c**

POWER TRANSFORMER—NAVY TYPE

159 ma; 6.3 V at 6.5 amps; 5 V at 3 amps. 110 volt. **each \$2.89**
200 ma; 6.3 V at 6 amps; 5 V at 3 amps. 110 V. A. C. **each 3.50**

SURPRISE PACKAGE

For the experimenter, radio serviceman, handy man, repairman, "ham," hundreds of valuable miscellaneous parts. 10 pounds. **\$1.59**

SPEAKERS

5" PM speaker. **\$1.19**
4x6 dynamic, 450 ohms. **1.65**
5x7 PM—hvy. slug. **2.15**
6" PM Alnico. **1.95**

RADIO TRANSMITTER and RECEIVER APS-13

Light weight air-borne radar system, radio transmitter and receiver APS-13; tube complement: 5-6J6; 9-6AG5; 1-VR105; 2-D21; unit is brand new, complete with tubes, the tubes alone are worth more than this LOW PRICE OF ONLY....

\$15⁰⁰

GLIDE PATH RECEIVER R-89/ARN-5

Glide Path Receiver used in the Instrument Landing System covering the frequency range 332 to 335 mc; complete with the following tubes: 7-6AJ5; 1-12SR7; 2-12SN7; 1-28D7; and including three crystals 6497KC; 6522KC; 6547KC... units are in A-1 condition for ONLY.....

\$6⁹⁵

SCR-522 TRANSMITTER and RECEIVER

The standard very-high frequency airborne receiver-transmitter. 100 to 156 megacycles. 4 crystal-controlled channels selected from remote control box. Used in good condition—ONLY.....

\$19⁹⁵

RADAR OSCILLOSCOPE

Complete with 27 tubes including 5" Cathode Ray tube—used. Each. **\$24.95**

RADAR OSCILLOSCOPE

Complete with 29 tubes including 3" Cathode Ray tube—used. Each. **\$24.95**

MARKER BEACON RECEIVER — AIRCRAFT

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way that a water valve controls the flow of water. In fact, in England vacuum tubes are called valves.

If two conductors are separated by an insulator, a condenser is formed. Thus the control grid and plate of a triode vacuum tube form two plates of a condenser. This condenser can be very detrimental to vacuum tube operation, particularly at higher frequencies, because it permits energy to be fed back from the plate circuit to the grid circuit in the correct phase to produce reinforcement of the original grid signal. This might lead to oscillation, a condition which could be very undesirable. It is advantageous to eliminate or minimize this capacity as far as possible in applications where feedback from the plate circuit to the grid circuit may be detrimental.

If a third plate is placed between the two plates of a condenser and this third plate grounded, the capacity between the two plates is greatly reduced. We use this same method to decrease the grid-to-plate capacity in a triode vacuum tube.

A second grid is inserted between the control grid and plate, and operated effectively at ground potential. This greatly decreases the grid-to-plate capacity, and practically eliminates the feedback trouble mentioned previously. Since this grid in effect shields or screens the control grid from the plate, it is called a *screen grid*.

However, operating this grid at ground or cathode potential with respect to the d.c. circuits greatly increases the resistance of the tube, since such a grid makes it very difficult for electrons to reach the plate. Therefore, such a tube, called a *tetrode*, is operated with the screen grid at a d.c. potential equal or nearly equal to that of the plate. In order to keep the screen grid at ground potential with respect to the a.c. signal being amplified, it is effectively bypassed to ground or cathode by a suitable condenser whose reactance is small compared with the resistance in the screen grid circuit.

When electrons strike a metal, they have a tendency to knock out other electrons, called secondary electrons. Naturally, these electrons must go somewhere. When a tetrode vacuum tube is being used as an amplifier, the potential on the plate is varying at the signal frequency and may at some instant be less than the d.c. potential on the screen. Then any secondary electrons knocked out of the plate will logically go to the screen grid, since it is at a higher potential. This is very undesirable, since it in effect produces a current between the screen grid and plate.

To eliminate this difficulty, a third grid is inserted in the tube, between the screen grid and plate, and placed physically quite close to the plate. This grid is operated at ground or cathode potential both with respect to d.c. and a.c., and so is quite negative with respect to the plate. Therefore, any

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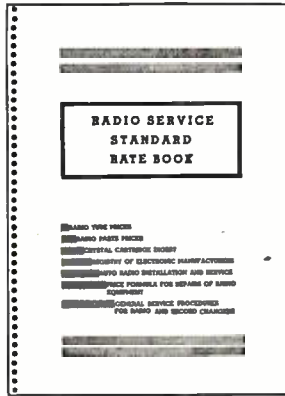
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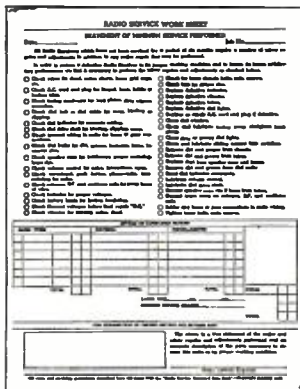
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secondary electrons knocked out of the plate are strongly repelled back to the plate, and do not reach the screen grid. In effect, secondary emission is suppressed, and so this grid is called the *suppressor* grid. The tube now becomes a *pentode*.

Although this grid is spaced quite close to the plate, it does have an appreciable effect on the stream of electrons. Being highly negative with respect to the plate, it tends to limit this flow of electrons, and thus greatly increases the resistance of the tube. One of the characteristics of a pentode is a very high plate resistance.

We now have a tube which will amplify high frequencies without appreciable feedback because of the screening action of the screen grid, which reduces grid-to-plate capacity. We have also minimized the undesirable effects of secondary emission by inserting a suppressor grid next to the plate, which repels secondary electrons and does not let them reach the screen grid. Some typical pentodes are: 1N5, 2A5, 6AC7, 6K6, etc.

Other grids may be added to a vacuum tube for various purposes producing such tubes as the pentagrid, hexode, heptode, etc. Some of these special tube types will be discussed in a future article.

—50—

Mono-Sequence Tuning

(Continued from page 45)

formulas or charts for series resonant circuits.

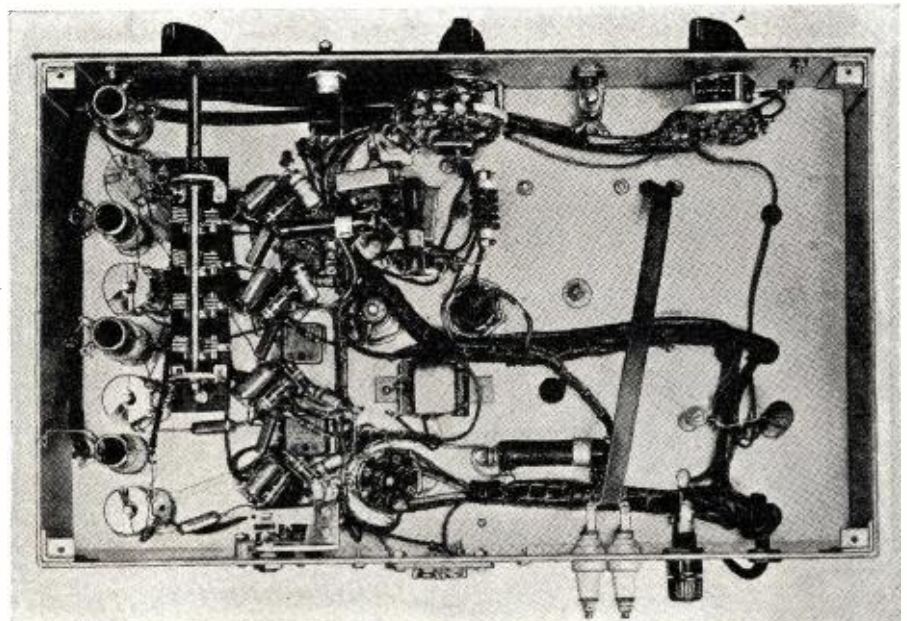
The first step in calculating the proper value of inductance for each stage is to carefully determine the total minimum capacity across each tuned circuit. In determining this total value of capacitance, the tube capacities, wiring capacities, and the minimum capacity of the variable tun-

ing capacitor must be included, as well as coupling capacity to the following stage, etc. Since some means must be provided for equalizing the total minimum capacity of each stage, a small "trimmer" capacitor is required in each resonant circuit.

Having determined the minimum fixed capacity across each tuned circuit, the value of inductance for each stage should be calculated for the highest frequency to be used in each circuit. Working back from this point, determine the total capacity required to resonate each circuit to the lowest frequency at which it will operate, using the value of inductance previously determined. The difference between the fixed capacity and the capacity required to resonate the circuits to their lowest frequency will be the value of the variable capacitor required to cover the range.

For instance, suppose we wish to design an oscillator and a series of multipliers, to operate in the amateur 3.5, 7, 14, and 28 mc. ranges. The highest frequencies will be 4 mc. for the oscillator, 8 mc. for the first doubler, 16 mc. for the second doubler, and 32 mc. for the third doubler. The lowest frequency will be 3.5 for the oscillator, 7 mc. for the first doubler, 14 mc. for the second doubler, etc. We have determined that the total minimum fixed capacity across each circuit is 20 μmfd . Using the conventional formulas or charts for obtaining inductance where f and C are known, we find that with a capacitance of 20 μmfd , 79.5 μh . will resonate at 4 mc., 19.5 μh . will resonate at 8 mc., 4.8 μh . will resonate at 16 mc., etc. Again using standard formulas or charts, we find that with an inductance of 79.5 μh , we must have 26 μmfd . of capacity to tune the first circuit to 3.5 mc., which is our lowest frequency. Therefore, our variable capacitor must have a total variable range of 6 μmfd . in each

Fig. 4. Under chassis view of transmitter which features mono-sequence tuning. The four-gang variable condenser may be seen at the left hand side of the chassis.



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Tube complement 2—832; 3—12A6; 1—6G6; 2—6557; 1—12J5GT; 1—12C8; 1—9002; 3—9003; 1—12AH7GT and 3—12SG7. Shipped as shown above in 1 1/2 x 12x25 wood crate; weight 107 pounds. Complete with tubes. **\$39.95**

SCR-274-N COMMAND SET

This unit consists of 3 receivers, 2 transmitters, 4 dynamotors, 1 modulator, 2 tuning control boxes, 1 antenna coupling box with RF ammeter, antenna relay and 5000 v., 50 mmdF. W.E. vacuum condenser. Also complete set of 29 tubes with each unit. The receivers cover frequencies of 190-550 kc.; 3-6 mc.; 6-9.1 mc. Tubes included are: 12SK7—RF amp.; 12K8—mixer; 12SK7—1st IF; 12SK7—2nd IF; 12SR7—diode det. and CW osc.; 12A6 output or AF; Xmters cover freq. of 5.3-7 mc. and 4-5.3 mc. Tubes included are 1626 master oscillator driving 2 parallel 1625's; a 1629 and a calibrating crystal also included. Each receiver has its own dynamotor and another dynamotor powers the transmitter and modulator. Terrific Value. Complete ready to operate. **\$39.00**

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6C8	\$.12	956	\$.75	837	\$.25
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CF-42-2MFD 20000 V. DC.	16.15
CF-43-2MFD 20500 V. DC.	16.55
CF-44-2MFD 21000 V. DC.	16.95
CF-45-2MFD 21500 V. DC.	17.35
CF-46-2MFD 22000 V. DC.	17.75
CF-47-2MFD 22500 V. DC.	18.15
CF-48-2MFD 23000 V. DC.	18.55
CF-49-2MFD 23500 V. DC.	18.95
CF-50-2MFD 24000 V. DC.	19.35
CF-51-2MFD 24500 V. DC.	19.75
CF-52-2MFD 25000 V. DC.	20.15
CF-53-2MFD 25500 V. DC.	20.55
CF-54-2MFD 26000 V. DC.	20.95
CF-55-2MFD 26500 V. DC.	21.35
CF-56-2MFD 27000 V. DC.	21.75
CF-57-2MFD 27500 V. DC.	22.15
CF-58-2MFD 28000 V. DC.	22.55
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CF-60-2MFD 29000 V. DC.	23.35
CF-61-2MFD 29500 V. DC.	23.75
CF-62-2MFD 30000 V. DC.	24.15
CF-63-2MFD 30500 V. DC.	24.55
CF-64-2MFD 31000 V. DC.	24.95
CF-65-2MFD 31500 V. DC.	25.35
CF-66-2MFD 32000 V. DC.	25.75
CF-67-2MFD 32500 V. DC.	26.15
CF-68-2MFD 33000 V. DC.	26.55
CF-69-2MFD 33500 V. DC.	26.95
CF-70-2MFD 34000 V. DC.	27.35
CF-71-2MFD 34500 V. DC.	27.75
CF-72-2MFD 35000 V. DC.	28.15
CF-73-2MFD 35500 V. DC.	28.55
CF-74-2MFD 36000 V. DC.	28.95
CF-75-2MFD 36500 V. DC.	29.35
CF-76-2MFD 37000 V. DC.	29.75
CF-77-2MFD 37500 V. DC.	30.15
CF-78-2MFD 38000 V. DC.	30.55
CF-79-2MFD 38500 V. DC.	30.95
CF-80-2MFD 39000 V. DC.	31.35
CF-81-2MFD 39500 V. DC.	31.75
CF-82-2MFD 40000 V. DC.	32.15
CF-83-2MFD 40500 V. DC.	32.55
CF-84-2MFD 41000 V. DC.	32.95
CF-85-2MFD 41500 V. DC.	33.35
CF-86-2MFD 42000 V. DC.	33.75
CF-87-2MFD 42500 V. DC.	34.15
CF-88-2MFD 43000 V. DC.	34.55
CF-89-2MFD 43500 V. DC.	34.95
CF-90-2MFD 44000 V. DC.	35.35
CF-91-2MFD 44500 V. DC.	35.75
CF-92-2MFD 45000 V. DC.	36.15
CF-93-2MFD 45500 V. DC.	36.55
CF-94-2MFD 46000 V. DC.	36.95
CF-95-2MFD 46500 V. DC.	37.35
CF-96-2MFD 47000 V. DC.	37.75
CF-97-2MFD 47500 V. DC.	38.15
CF-98-2MFD 48000 V. DC.	38.55
CF-99-2MFD 48500 V. DC.	38.95
CF-100-2MFD 49000 V. DC.	39.35

METERS

MM-4-0-100MA-Model 301-WESTON-3 1/2"	\$.35
MM-10-0-100MA-Model 302-WESTON-2 1/2"	3.95
MM-12-0-SOMA-NX35-WESTINGHOUSE-3 1/2"	3.95
MM-14-0-150MA-NX35-WESTINGHOUSE-3 1/2"	3.95
MM-15-0-100MA-Model 303-WESTON-2 1/2"	3.95
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MM-27-0-1MA 27 ohm DC. Res. DEJUR-2 1/2"	3.95
MM-28-0-200MA-DK33-WESTINGHOUSE-2 1/2"	2.95
MM-33-0-1MA-DK30-1K-McCLINTOCK-3 1/2"	3.95
MM-34-0-SOMA #2DW51-Gen. Elec. 2 1/2"	2.95
MM-36-50-0-5M Meter Face Calif. Basic Movement 1 MA-WESTON-1 1/2"	1.95
MR-5-0-2.5 R.F. amp-MD3001-McCLINTOCK-3 1/2" Panel Mount	3.95
MR-6-0-100 R.F. MA-DW 42-G-2 1/2"	3.95
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MR-13-0-8 R.F. amp #425AM-WESTON-3 1/2"	4.95
MZ-1-0-130 V. AC-25 to 125 cy-#476VM	3.95
WESTON-3 1/2" WESTON-3 1/2"	3.95
MZ-11-0-8 V. AC. #476 WESTON-3 1/2"	3.95
MV-4-0-3.5 K.V. OC. WESTINGHOUSE-3 1/2"	3.95
MV-5-0-1000-5-IMPSON-2 1/2"	2.95
MV-10-0-50V. DC. MODEL PW-LEATHERETTE CASE-WESTINGHOUSE 4"x3 1/2"	1.95
MV-100-0-100-5-IMPSON-2 1/2"	3.95
MQ-1-EXT. RES. FOR K.V. METERS-4 Megohms V.T.V.M.-MODEL #450-REINER ELECT. complete with MODEL 101 amplifier, AC Probe & Leads-a beautiful Lab. instrument	69.50

TRANSFORMERS—CHOKES

HF-11-Jefferson-Dual Choke-9.5 HY ea.	\$ 1.49
HF-16-Thordarson-10 HY @ 100A-2 1/2"x3 1/2"x1 1/2"-7 cy	.89
HF-17-G.E.-10 HY @ 5A-5 1/2"x4 1/2"x4 1/2"-12 lbs.	4.95
HF-18-G.E.-10 HY @ 3A-4 1/2"x4 1/2"x4 1/2"-9 lbs.	4.95
HF-19-11.5 HY @ 400A-5 1/2"x3 1/2"x3 1/2"-10 lbs.	4.95
HF-20-G.E. 10 HY @ 150A-4 1/2"x3 1/2"x3 1/2"-4 1/2 lbs.	1.49
HF-21-G.E. 7 HY @ 200A-5 1/2"x3 1/2"x3 1/2"-5 1/2 lbs.	2.25
TC-9-Chicago Trans.-Pri. 110 V. @ 60 CY SEC. 16S @ 125A, 18 V. @ 1.5A, 1 V. @ 1.25A-4 1/2"x4 1/2"x3 1/2"-8 lbs.	1.49
TC-10-Pri. 115 V. 50-1200 CY SEC. 6.3 V. @ .6A, 350 V. @ .70A, 65 V. @ .70A, 400 V. @ 10A, 6.3 V. @ 6.3V-4 1/2"x3 1/2"x3 1/2"-13 lbs.	5.95
TC-11-Raytheon-Pri. Tapped 105 V., 110 V., 115 V. @ 1.2 A, 5 V. @ 5A, 6 V. @ 12A-10"x11"x10"-70 lbs.	35.00
TC-12-Pri. 115 V. 60 CY. SEC. 700 V. @ .040A, 6.3 V. @ 1.2A, 5 V. @ 3A-6"x3 1/2"x3 1/2"-3 lbs.	2.49
TC-14-G.E. Pri. 115 V. 60 CY. SEC. 600 V. CT 600 V. @ 175A, 5 V. @ 3A, 6.3 V. @ 3A-5"x3 1/2"x3 1/2"-8 lbs.	3.95
TF-1-N.Y. Trans.-Pri. 220 V. @ 13A, 5 SEC. 10 W. @ 125A, 6.3 V. @ 2.7A, 5 3/4"x5 1/2"x4 1/2"-18 lbs.	5.49
TF-3-N.Y. Trans.-Pri. 220 V.-SEC. 10 V. @ 10A, 6.5 V. @ 2.7A-4 1/2"x3 1/2"x4 1/2"-12 lbs.	5.25
TF-10-N.Y. Trans.-Pri. 220 V.-SEC. 6.4 V. @ 10A, 6.3 V. @ 2.7A-4 1/2"x3 1/2"x4 1/2"-12 lbs.	3.95
TF-11-N.Y. Trans.-Pri. 220 V.-SEC. 5.07 V. @ 13.5A-5 1/2"x4 1/2"x5 1/2"-13 lbs.	4.25
TF-17-G.E. Pri. 115 V. 60 CY. SEC. .065, 5V. @ .065 KVA-INSUL. 12.5 KVA-5"x7"x8"-9 1/2 lbs.	9.95
TF-18-G.E. Pri. 115 V.-SEC. 6.3 V. @ 2.5A INSUL. 7.5 KVA-5"x8"x4"-5 lbs.	7.50
TF-19-G.E.	

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Your Price **\$33.95**
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AC—DC—BATTERY PORTABLE DELUXE!

4 tubes plus selenium rectifier. Beautiful simulated alligator case.



Your Price **\$29.45**
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ALL-PURPOSE PHONO COMBINATION

Walnut veneer cabinet—Superheterodyne radio—Silent motor—crystal pickup. Beautiful tone!

For quantity prices—write. Shipped FOB warehouse—20% deposit, bal. COD.

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section, giving us a total of 26 μ fd. for the lowest frequency.

Checking further, we find that the first doubler circuit having 19.5 μ h. of inductance will resonate at 7 mc. with 26 μ fd. of capacity, the second doubler having 4.8 μ h. of inductance will resonate at 14 mc., etc.

Thus we have perfect tracking and a single dial tuning of the oscillator and all multiplier stages, using a multiple unit or "ganged" variable capacitor having identical sections.

A Practical Application

A practical application of the mono-sequence tuning system is shown schematically in Fig. 1. Here we have a complete c.w. telegraph transmitter capable of delivering power in excess of 20 watts to the output terminals at any frequency in the amateur 3.5, 7, 14, and 28 mc. bands. The oscillator and multiplier tubes are 7C5LT beam tubes, and the output tube is an 807 type beam tube. The keying relay opens the cathode-to-ground circuits of all tubes, with the back contacts of the relay arranged to provide a normal load on the power supply when the key is in the "up" position. A selector switch and a single milliammeter permits the metering of each stage.

A small adjustable powdered iron core is inserted in each inductance to correct for slight discrepancies in inductance due to commercial manufacturing tolerances. Miniature trimmer capacitors are associated with each tuned circuit for equalizing the fixed capacities in each circuit. A special four section variable capacitor tunes the oscillator and all multiplier stages simultaneously. The amplifier output circuit is tuned separately so that some correction can be made for reactions from the loading, if the load does not represent a pure resistance. Plug-in output coils are used for each band.

The grid drive circuit of the output amplifier is switched between the oscillator and multiplier stages for the selection of the desired driving frequency. Small coils are coupled to each of the oscillator and multiplier circuits for supplying drive power to the amplifier. The use of coupling coils prevents a change of capacity across the tuned circuits when the amplifier is switched from one stage to the other. This assures perfect alignment of all gang tuned circuits at all times.

The transmitter may be used for telephony by connecting the output of a modulator in series with the amplifier. Shorted terminals marked "Mod." are shown in Fig. 1 for this purpose.

By the application of mono-sequence tuning, we now can proceed with the construction of a truly efficient single dial tuning system for the oscillator and frequency multiplier stages of a modern multi-band transmitter, without sacrificing any of the stability and other highly desirable characteristics of individually tuned circuits.

Electronics Made Easy!



Magi-Klips Kit

Build 18 Experiments at Home—No Tools!

RADIO RECEIVER, HOME BROADCASTER, PHOTOELECTRIC RELAY, CODE PRACTICE OSCILLATOR, SIGNAL TRACER, REMOTE CONTROL RELAY, Phonograph Transmitter, Intercommunication Amplifier, Code Transmitter, Radio Frequency Oscillator, Telephone Line Amplifier, Electronic Switch, Phonograph Amplifier, Temperature Control Relay, Contact Detector, Electronic Metronome, Interval Timer (one-shot), Interval Timer (repeating).

With a Magi-Klips kit you cover the entire field of electronic engineering theory quickly in your spare time. It's simple to arrange the components for each circuit. No soldering. No tedious wiring. Kit operates on 110 v. AC or DC and includes 35Z5 rectifier, 50L6 power amplifier, 12SL7 double triode, powerful 4" speaker-mike, plate relay, broadcast and SW coils, tuning condenser and generous supply of resistors, condensers, chokes, extra wire. Parts worth double the price of kit.

Kit's 48-page manual has complete instructions and diagrams easily followed by the beginner. Remember, you need no tools, except possibly a screwdriver, with a Magi-Klips **\$29.75** COMPLETE electronic experimenter's kit.

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RESISTORS KIT
\$2.05 each

(Assorted and Not Mixed 100 pcs.)
 (60 pcs. 1/2 watt and 40 pcs. 1 watt)

ELECTRONIC PARTS AND COMPONENTS

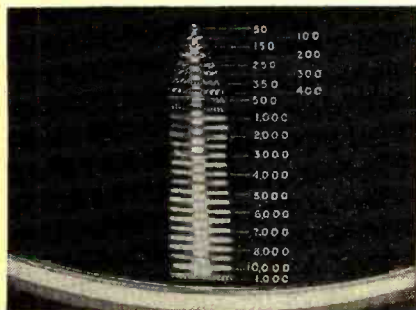
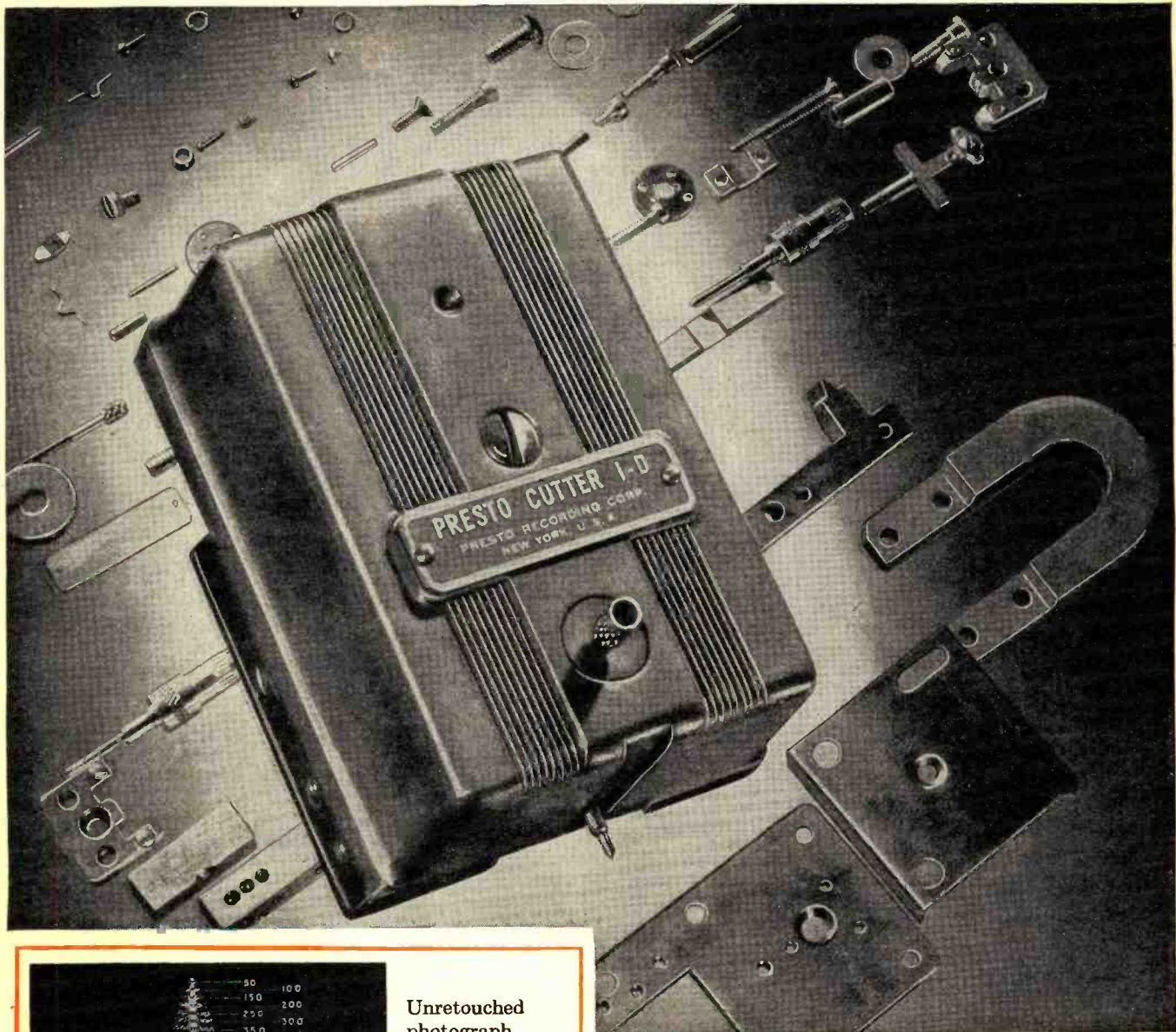
LEGRI S COMPANY, Inc.

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NOW! a new standard of performance in cutting heads
THE PRESTO 1-D

► The new Presto 1-D Cutting Head offers: *wide range, low distortion, high sensitivity and stability through a temperature range of 60°-95° F.* The Presto 1-D Cutting Head is a precision instrument made entirely of precisely machined parts, expertly assembled and carefully calibrated. These factors, plus its sound basic engineering design, produce a cutter unequalled in performance by any other mechanically damped magnetic device.

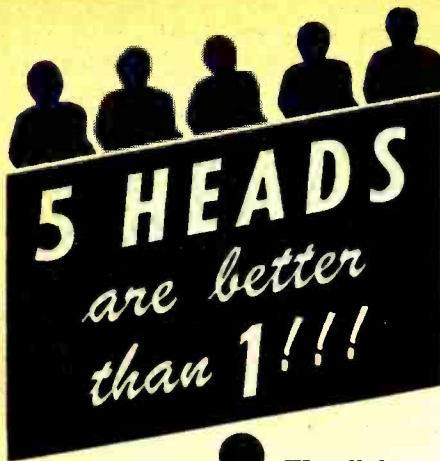
► Note from the light pattern below: The correct location of the cross-over point at 500 cycles, the 6 db per octave slope below this point, and flat response above 500 cycles, which is free from resonant peaks. The range of the cutter is 50-10,000 cycles. The Presto 1-D is damped with "Prestoflex" which is impervious to temperature changes between 60 and 95 degrees Fahrenheit.



Unretouched photograph showing the light pattern. Notice correct location of the cross-over point at 500 cycles.

PRESTO

RECORDING CORPORATION
 242 WEST 55TH STREET, NEW YORK 19, N. Y.
 Walter P. Downs, Ltd., in Canada



We all know that five heads are better than one, and also that an item with five uses is better for you than an instrument with only one use. The NEW BUD GX-79 GIMIX is a multi-purpose unit that has five definite uses on Amateur Radio Bands of 10, 15, 20, 40 and 80 meters.

1. Use as a **WAVE-METER.**
2. Use as a **MONITOR.**
3. Use as a **FIELD STRENGTH METER.**
4. Use as a **CARRIER SHIFT INDICATOR.**
5. Use as a highly sensitive **NEUTRALIZING INSTRUMENT.**



This is the instrument that you have been waiting for, and we believe that you will agree that it has been worth waiting for.

The BUD GX-79 has been designed and built with true BUD quality and dependability. It is available at your local distributor, and we suggest that you contact him immediately so you will lose no time in getting the BUD GIMIX in your shack which is where it belongs.

Amateur Net—\$8.30

BUD Can Supply All Your Needs...

... with the latest types of equipment including: condensers—chokes—coils—insulators—plugs—jacks—switches—dials—test leads—jewel lights and a complete line of ultra-modern cabinets and chassis.



What's New in Radio

(Continued from page 80)

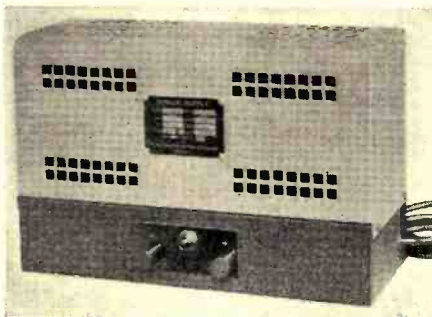
and 100 feet of connecting wire, is easily installed. It may be plugged into any 110-volt a.c. or d.c. outlet. If desired three additional stations can be connected to the amplifier.

The manufacturer is *RCA Sound Equipment Section, Radio Corporation of America*, Camden, New Jersey.

HEAVY DUTY POWER SUPPLY

Federal Telephone and Radio Corporation has recently placed on the market a new heavy duty selenium rectifier power supply which is especially designed for servicing all types of auto radios.

Designated the FRT 3246-BS, this unit combines the advantages of selenium rectification with low ripple, good regulation and heavy surge current handling. The power supply re-



quires no adjustments and needs only to be plugged into an a.c. source and the connection of the load to the output binding posts. A pilot light indicates when the equipment is energized.

The FRT 3246-BS features an insulating type transformer; a *Federal* single phase, full wave selenium metallic plate type rectifier with center tap connection; an input choke and condenser filter; and a bleeder resistor. The output contains a ripple factor of only .3 volts under normal operation with regulation of approximately 6 volts at 10 amperes and 8 volts at 2.5 amperes.

Details on the unit will be furnished upon request to *Federal Telephone and Radio Corporation*, 67 Broad Street, New York 4, New York.

CURRENT-SENSITIVE RELAYS

A complete line of single-pole, double-throw, current-sensitive d.c. relays has been announced by the Control Division of the *General Electric Co.*

This series of relays has been designed for electronic applications which require switching operation with available powers as low as 10 milliwatts.

Input ratings for the eight types of relays in the line range from 10 to 180 milliwatts; .47 to 1470 milliamps; and .07 to 67,000 ohms. Contact voltage ratings range from 12 to 110 volts, a.c. or d.c. At 24 volts d.c. the contacts will handle 2 amperes non-inductive or .5 ampere inductive.

Complete data on the line of relays is included in a special publication, GEA-3819D, which is available from the *General Electric Company*, Schenectady, New York.

ELECTROPLATING UNIT

Warner Electric Company, Incorporated of Chicago is currently offering a new electroplating outfit which may be used to plate any conductive surface with gold, silver, nickel, copper, cadmium or chromium.

Especially designed for the home workshop, this battery operated electroplater can be used to finish amateur radio equipment and other home-built servicing or test equipment.

Full details and prices on this unit will be supplied upon request to *Warner Electric Company, Incorporated*, 1512 West Jarvis Avenue, Chicago 26, Illinois.

TUBE TESTERS

Two new tube testers, Models 305 RC and 330 RC, have been announced by the *Simpson Electric Company* of Chicago.

Both of these models incorporate the new *Simpson* "No-Backlash" roll chart for identifying tubes and setting controls. The units themselves are 1947 adaptations of the Models 305 and 330. The Model 305 is a standard type tester with a 3-way switching arrangement which makes possible the testing of any tube regardless of base connections or the internal connections of its elements. The Model 330 is the Mutual Conductance Tube Tester announced by the company last year.

Details of the Models 305 RC and 330 RC will be supplied by *Simpson Electric Company*, 5200 West Kinzie Street, Chicago 44, Illinois.

SCRATCH FILTER

Of interest to radio servicemen is the new LP-1 filter and equalizer which has just been announced by *Newcomb Audio Products Company*.

Designed to reduce needle scratch to a minimum, the LP-1 may be installed in either commercial or professional systems or in the home phonograph. Easy to install, the unit is intended to be used between the crystal pickup and the amplifier where it improves



the response of the pickup and provides effective control of needle noise, according to the manufacturer.

• COMMERCIAL AIR LINES • AIR CHARTER PLANES • YACHTS
 • HOME RADIOS • FISHING VESSELS • AIR FREIGHT • HAM OPERATORS

Brand New Automatic Direction Finder RADIO COMPASS SCR-269-F



\$75⁰⁰

COMPLETE WITH COMPONENT PARTS



The radio compass SCR-269-F was designed to be the primary radio navigation compass for the United States Army and Navy Air Forces. Constant reception is possible day or night so that fixes can always be made to establish the plane's or ship's location.

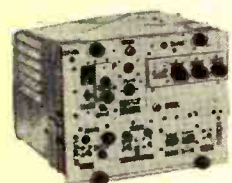
The azimuth Indicator is divided into 360 degrees and is connected to the loop antenna, therefore making it possible to navigate the ship in any direction as preset on the dial.

Plotting fixes is accomplished by selecting two or more stations and plotting these on the navigation map. The point of intersection of these lines indicates the location of the craft.

This equipment comes complete with 17 tubes superheterodyne receiver which is tunable from 200-1750 KC in three bands. A complete instruction book for operation and maintenance accompanies this equipment.

COMPONENT PARTS

Quantity	S. C. Stock No.	Quantity	S. C. Stock No.	Quantity	S. C. Stock No.	
1	Radio Compass Receiver BC-433-F...	2C3016 F. 1	1	Plug PL-112.....	2Z7212	
1	Radio Control Box BC-434-F.....	2C3324 F. 1	1	Plug PL-118.....	2Z7218	
1	Mounting FT-213-A.....	2Z6721-213A	1	Plug PL-122.....	2Z7222	
1	Mounting FT-224-F.....	2Z6721-224F	1	Dehydrator Hose, Fitting & Clamps		
1	Loop LP-21-F (Includes Dehydrator).	2Z1921 F. 1	1	10 foot lengths.....	2Z8727	
1	Cord CD-365-A.....	3E1365	1	Operating & Maintenance Handbook		
1	Indicator I-81-F.....	2Z5381F	1	Coupling MC-136.....	2Z3266	
1	Relay SW-172.....	2Z7672F	1	Tuning Shaft MC-124 (300').....	2ZA124-300	
				1	Insulator IN-79.....	3G579
				1	Insulator IN-81.....	3G581
				1	Shaft Casing and Spline Drive.....	2ZA124/1A/4
				1	Shafting F/MC-124 (300').....	2ZA124/1
				5	Nut F/MC-124.....	2ZA124/2
				5	Spline F/MC-124.....	2ZA124/4
				5	Sleeve F/MC-124.....	2ZA124/5
				1	Transformer C289A5-R16-T	



TRANSMITTER & RECEIVER
\$14⁹⁵

The famous boat anchor, widely used on 144 MC band. Shipping weight 100 lbs. Your price, less tubes and power transformer.....\$14.95

MODULATION TRANSFORMER 1KW
\$14⁹⁵

RCA modulation transformer is conservatively rated at 550 Watt audio to modulate that new KW rig. Really rugged construction with protective flashover gaps, which are adjustable. Terminals and gaps are mounted on a "Mycalex" terminal board. The laminations that make up this transformer are of high audio quality and are extremely thin, making it impossible for the core to "chatter or talk".
 Audio Watts—550 Sec. #1-450 Mils Sec. #2-80 Mils Turns
 Ratio—Pri: Sec. #1-1:1 Pri: Sec. #2-5:1 Pri: Sec. #2 Tap-25:1
 Impedance Ratio—Pri: #1-1:1 Sec. Pri: Sec. #2-25:1 Pri: Sec. #2 Tap-625:1
 DC Resistance—Pri: 135 ohms Sec. #1, 112 ohms; Sec. #2, 99 ohms.
 Transformers insulation tested: Pri. 8000V.; Sec. #2-2000V. to the rest of the coils and core. Primary center tapped for Class "B" modulators. Secondary #2 will carry 80 Mils to modulate screens of beam power or screen grid tubes. Primary will match any Class "B" tubes up to 10,000 ohms plate to plate, such as 810's, 75T's, 8005's, ZB120's, 203's, HY512's, 211's, 813's, 828's, 805's, 2037's.
 Size 9 1/2" wide, 7 1/2" deep, 7 1/4" high. Heavy channel iron mounting brackets. Weight approx. 40 lbs.



BUTTERFLY CONDENSERS
 Type B—frequency range 300 to 1000 megacycles
95^c ea.
 Cat. No. BC-2

Power Transformer
 Pri. 115 v 60 Cy.
 Sec. 1-255/255 80 MA.
 Sec. 2-6.3V3.8A
 Sec. 3-5V 4A
\$12⁹⁹

BC 191 TRANSMITTER

Less tubes and tuning units. **\$14⁹⁵**

BC 654 TRANS. & REC.

Used, with tubes. **\$14⁹⁵**

SCR 625 MINE DETECTOR \$49⁵⁰

MICA CAPACITOR
 .002 MFD 3000V VDC. Cat. No. **49^c**
 RT-101

IF TRANSFORMER
 Mounted in aluminum shield can 1500 KC, with air trimmer, impedance coupled type. Cat. No. T-19..... **95^c**

30MC IF TRANSFORMER
 In square aluminum can, silver slug tuned. Cat. No. T-20..... **29^c**



NEW BC 223 AX TRANSMITTER

801 Oscillator and 801 Power Amplifiers, 2-46 Modulators and 1-46 Speech Amplifier 4 Xtal Frequencies and Master Oscillator on selector switch. 10 to 30 watts output. Tone Voice or C.W. Mod. Ideal for 80 meter band. Comes with 3 coils TU 17A 2000-3000 Kc. TU 18 3000-4500 Kc. TU 25 3500-5250 Kc. Black wrinkle case. Includes 2 separate cases to store extra coils. Frequencies chart and tubes included, packed in original cases, less crystals at this low price. Cat. No. MT-100..... **\$29⁹⁵**

BC 375E Gen. Elec. MOPA TRANS. Complete with tubes, 7 tuning units, Dynamotor and antenna tuning unit Brand new in original crates..... **\$49.95**

FILAMENT TRANSFORMERS

Thordarson 6.3 V-4 amps, 6.3 V-4.5 amps, 9.7 V-5 amp., pri. 110 V AC 25 or 60 cy.—Cat. No. FT-11.....	1.95
Thordarson pri. 110 V 60 cy.—sec. 6.3 V 6 A, CT—Cat. No. FT-12.....	1.49
Thordarson 8 HY 150M choke, Cat. No. FC-201.....	.95
Thordarson 12 HY 25M choke, Cat. No. FC-203.....	.39

CONDENSERS

Cat. No.	Cap. MFD.	Working Volts	Your Cost
C110.....	1	5000 Oil	\$3.95
C111.....	3	4000 Oil	4.95
C112.....	1	1000 Oil	.44
C114.....	8	600 Oil	.95
C115.....	2	600 Oil	.49
Westinghouse 1 MFD 6000 volts WVDC			\$7.95
Westinghouse 2 MFD 6000 volts WVDC			10.95
Westinghouse 1 MFD 10,000 volts WVDC			12.95

TUBES

813.....	\$ 5.45	829.....	\$ 2.45
814.....	4.95	872A.....	1.95
RK60.....	1.25	211.....	1.45
VT127.....	2.95	VR150.....	.69

TUNING UNIT
 Tuning Unit BC 375. Approx. 65 M.M.F.D. cond., coils, RF chokes, dials, asst'd mica condensers. 2500 WVDC, over Cat. No. TU-101..... **\$37⁵**
 \$50.00 in parts.

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RADIO COMPANY
 5249 GRAND RIVER • DETROIT 8, MICH.

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 C. O. D. Orders
 F. O. B. DETROIT
 \$20 Minimum

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LAFAYETTE'S BIG NEW CATALOG

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SEND NOW for your free copy of this giant-size, 144-page catalog which offers you America's latest, largest line of top-quality ham gear, parts, communication equipment, tubes, tools, test equipment, amateur kits and accessories. Page after page of post war radio developments—plus a special bargain section that lists surplus and standard-make radio and television parts at famous Lafayette economy.

Supreme Panel Meter Bargains

3" SQUARE CASE
PS 305 .0 to 10 MA DC, Supreme #3111
PS 308 .0 to 50 MA DC, Supreme #3115
PS 323 .0 to 300 MA DC, Supreme #3120
PS 315 .0 to 10 V.D.C., Supreme #3135
\$4.58 Each

PS 305 .0 to 1 MA DC, Supreme #3107
\$4.85

4" SQUARE CASE
PS 328 .0 to 25 MA DC, Supreme #4114
PS 329 .0 to 50 MA DC, Supreme #4115
\$5.15 Each

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LAFAYETTE RADIO, Dept. RF-7
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PASTE COUPON
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Newcomb Audio Products Company,
6824 Lexington Avenue, Hollywood 38,
California will furnish additional de-
tails to those requesting them.

MIDGET IRON

Production has begun a new needle-point midget iron, the Model 250, at the Chicago plant of *Drake Electric Works, Inc.*

Designed specifically for the meter and hearing aid industries this mica-wound, continuous-duty 35 watt iron will work from 110 volts a.c. or d.c. The unit is provided with two tips, one standard 1/8" straight tip and one special 45 degree angle tip. The iron measures 7" long and is constructed so that no stand is required.

Additional details on this unit will be furnished by *Drake Electric Works, Inc.*, 3656 Lincoln Avenue, Chicago 14, Illinois.

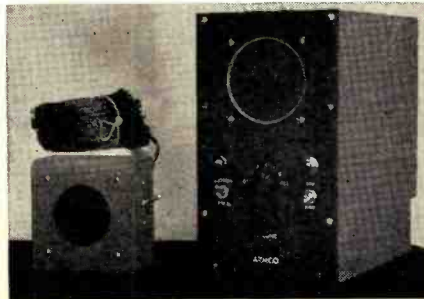
NEW INTERCOM

Edward E. Gurian Co., Inc. is currently marketing a new intercom which may be adapted for 2-way private communication or used for system-wide intercommunication. The main unit consists of a master station, one slave unit and 100 feet of coded wire. Additional slave stations up to 6 may also be connected into the system.

The intercom operates on 110-120 volts a.c. or d.c. and distances of over 5 miles may be covered without loss of intelligibility. The main unit may also be used as a p.a. system as sufficient power is provided to drive up to a 14" PM speaker.

Each station is encased in an all-steel cabinet which may be used either indoors or outdoors.

Full details and prices will be fur-

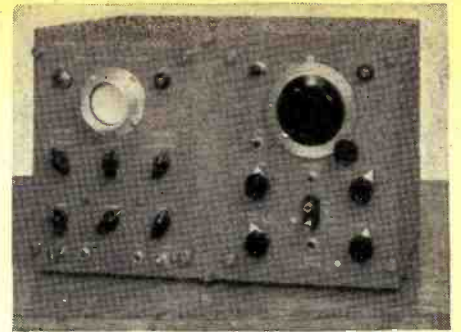


nished by *Edward E. Gurian Co., Inc.*, 2011 S. Michigan Avenue, Chicago 16, Illinois, upon request.

HARVEY OSCILLOSCOPE

Harvey Radio Laboratories, Inc. has recently announced a new addition to its line of test equipment, the Model 188 TS oscilloscope which has been designed for use with either the 204 TS and 205 TS Visual Alignment Signal Generator.

The equipment incorporates the usual focus, intensity, and centering controls in addition to the vertical and horizontal amplifiers. No internal sweep circuits are used since the sweep voltage for the oscilloscope is obtained from either of the Visual Alignment Signal Generators with which it is used.



The 205 TS Visual Alignment Signal Generator, which is pictured in conjunction with the oscilloscope, has a frequency range of 500 kc. to 20 mc. with an adjustable frequency deviation of 900 kc. peak-to-peak.

The 204 TS model which may be substituted in the combination unit has a frequency range of 20 kc. to 500 kc. with an adjustable deviation of 70 kc. peak-to-peak.

Complete details on these units may be obtained from *Harvey Radio Laboratories, Inc.*, 447 Concord Avenue, Cambridge 38, Massachusetts.

-50-

International Short-Wave

(Continued from page 74)

March), several of the radio clubs throughout the world have or are arranging special DX programs for the summer and fall months. *It is suggested that readers watch club publications closely for complete details.*

* * *

TAP Wants Reports

Cevad Memduh Altar, director of the Radio Branch, Turkish Press Department, Ankara, Turkey, has requested that readers monitor the special broadcasts for the United States on Tuesdays, fortnightly, at 1800, over TAP, 9.465. "We shall be very glad to learn their comments and would appreciate having reception reports airmailed to our address," Mr. Altar states. Correct reports are always verified by *Radio Ankara*, and recently some monitors have received veries via airmail from Ankara.

Tuesdays for which these special programs are scheduled include June 3, 17; July 1, 15, 29; and August 12, 26.

* * *

Verification Data

We are indebted to Paul Kary, Pennsylvania, for the following paragraphs of verification data, compiled by him from reports of URDXC members:

Warsaw III now verifies from Chief Foreign Liaison, Dyrekcja Ogolno-Organizacyjna, Polskie Radio, Noakowskiego 20, Warsaw, Poland; registered letter verie now takes 11 weeks. (Young, Pa.)

ZAA verified in two months by registered letter in French; prefers reports in that language but will verify those submitted in *English*; address, Direction Centrale de la Radiodiffusion d'Albanie, Rue Conference de Peza 3, Tirana, Albania. (Legge, N. Y.)

RADIO NEWS

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Get your hat . . . follow the crowds to Hallicrafters booth at the parts show. Get the details on Hallicrafters advanced developments in high frequency, short wave communications equipment. Hear all about the Gatti-Hallicrafters spectacular radio-equipped expedition to the Mountains of the Moon. This scientific safari, based on Hallicrafters-built mobile radio equipment, will spread the name and fame of "the radio man's radio" around the world. All the dope on this exciting adventure at Hallicrafters show headquarters.

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EXHIBIT
BOOTH 86**

hallicrafters

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

Aktiebolaget Radiotjanst, Kungsgatan 8, Stockholm 7, Sweden, is address applying to *all* Swedish short-wave outlets. (Walker, Va.)

British Far Eastern Broadcasting Service, P.O. Box 434, Singapore, Malaya, sent a card in 5 months; is apparently no longer operated by Department of Publicity and Printing. (Legge, N. Y.)

Lebanese Broadcasting Station FXE, Beirut, Lebanon, is now using a card instead of the former letter-verie; answered in 3 months. (Legge, N. Y.)

XEBT verified with colorful card showing antenna mast rising from Mexico and radiating calls; arrived in 1 month; *English* reports satisfactory. (Seese, Md.)

HP5K sends blue or yellow card with overprint of call; received in 45 days; *English* reports acceptable. (Seese, Md.)

Teheran stations may be addressed at Wireless Dept., Ministere des Postes, Telegraphs et Telephones, Teheran, Iran; verified within 4 months by registered letter in *English*. (Legge, N. Y.)

* * *

This Month's Schedules

(Note: Between compilation of these schedules and the time you receive the magazine, many countries will have gone on Summer Time, making broadcasts normally 1 hour earlier than Standard Time; many stations will also move to higher frequencies for the summer months. Therefore, if you cannot tune in a station at the time indicated herein, it is suggested you try for it another day one hour earlier. For notices of frequency changes, it is well to check stations often.)

Alaska—From Pfc. James Moriarty, Alaska Communications System, Transmitter Station WXFG, Adak, comes word that this station uses about 1400 watts; frequencies used include 12.255, 5.820, 8.860, 16.070; employed is a Radio Laboratories Model H-300 with a H-2000 rectifier and a P-2000 power amplifier; it is rated as a 2-kw. set, but full power is not utilized, being unnecessary for the radiotelephone circuit to Seattle.

Albania—ZAA, 7.852, Tiraña, has news at 1515. (Watkinson, Pearce, Swalin)

Algeria—The Algiers transmitters of the "Voice of America in North Africa" are now on summer frequencies of 11.765 and 9.61. (Beck)

Algiers I, 9.610, is scheduled 1300-1745, to Western Europe, while Algiers III, 11.765, is scheduled same time, to Balkans.

The French transmitter on 11.835 (listed location is Constantine, but may be at Algiers) is scheduled 0130-0315 (French); 0745-0930 (French); 1315-1400 (Arabic); and 1430-1900 (French); medium-wave outlet is 941 kcs. The short-wave outlet is heard in Pennsylvania, signing off at 1900 with "La Marseillaise." (Kary)

Anglo-Egyptian Sudan—The 9.650 and 13.320 frequencies are now heard

2310-2345 with program in Arabic; fair signal some nights on 9.650, but 13.320 is badly QRM'd by c.w. (Legge)

Also scheduled 1130-1430; on Thursdays has *English* period 1230-1300. (Logan)

Angola—CR6RB, "Radio Clube de Benguela," has been finally identified as the station heard in Australia on 9.165; opens at 1230, heard to sign-off at 1400 with the Portuguese National Anthem; station identifies frequently in Portuguese; while listed at only 50 watts, signal indicates greater power may be in use; CWQRM sometimes prevents copying. (Gillett)

Arabia—ZNR, 6.765, Aden, is heard in Sweden at 1000. (Frick)

Argentina—Paul Kary, Pennsylvania, has learned from a Swedish correspondent that two Swedes have started a 50 watt short-wave station in Buenos Aires with calls BAES and BARE, on frequencies of 6.950 and 8.232, respectively; schedule is 0830-0900 and 1700-1800; address, "Gustaf Gullander," c/o Thellander, Balcare 353, Buenos Aires, Argentina.

Radio Belgrano, Buenos Aires, is using LRY, 9.455, and LRY1, 11.88, in parallel, to around 2100; the 9.455 frequency is the best signal from the Argentine this early summer. (Beck)

Australia—Complete summer schedules of *Radio Australia* are announced:

To Europe, 0115-0230, VLA6, 15.20, VLB8, 21.60; VLC9, 17.84, added at 0145; VLB8 off Saturdays. In French to New Caledonia and Pacific islands, 0245-0345, VLC4, 15.32, VLG3, 11.71. To Forces in Northern Pacific, Japan, Asia, VLA6, 15.20, 0330-0800; VLB8, 21.60, 0330-0745; VLG10, 11.76, 0530-0800; VLC4, 15.32, 0700-0745. Between 0355-0700, *English*, Chinese, Dutch, Indonesian languages are used on VLC4, 15.32; VLG10, 11.76, will carry this program, 0355-0530, when it joins the Forces' program. To Southeast Asia, using French, VLA6, 15.20, 0800-0845; Chinese, 0845-0900.

To Eastern North America, VLB, 9.54, VLC7, 11.84, 0800-0915; also to *English* listeners in Southeast Asia on VLG10, 11.76, between 0800-0900. To India and the Forces in Asia, 0900-1000, VLA6, 15.20, VLG10, 11.76, while VLB4, 11.81 and VLC9, 17.84, join the program at 0930.

To Europe and Britain at 1000-1045, VLA6, 15.20, VLC9, 17.84, VLG10, 11.76; VLB4 continues to 1100.

To West Coast of North America, VLA8, 11.76, VLC6, 9.615, 1100-1200; and to South Africa, VLG4, 11.84.

To British Isles (new time to conform to British Summer Time) at 1245-1415, VLA4, 11.77, VLC11, 15.21; DX session will now be at 1300, Saturdays. To Forces in Northern Pacific, China, Japan will use VLA6, 15.20, VLC9, 17.84, 1615-1800.

To Eastern North America will have two frequencies, VLC9, 17.84, VLA9, 21.60, 1800-1945; DX session on Saturday will probably continue at about 1920. To Forces, 2100-2300, VLB5, 21.54, VLC9, 17.84, VLG6, 15.24;

TRANSFORMERS

Pulse—High Voltage—Power
Supply—Audio

Raytheon Pulse Transformer.
UX 4298 E. Pri: 4 KV, @ 1
microsecond; secondary: 16 KV
@ 16 amps. Filament pri:
115V/400 cycles \$15.00

W.E. Hi Volt input pulse trans-
former No. D169271. 9.95

G.E. Radar pulse transformer
K2731, Diameter app. 11". Ver-
tical cooling fins. 19.50

Prim: 117V/60 cycle. Secondary:
500-400-0-400-500 @ 250 ma.
and 6.3V @ 1.5 amps. Dinen-
sions 5"x4"x6" app. 6.95

Prim: 117V/60 cycle. 3.8 amp.
Secondary: 980V @ 450 ma.
..... \$4.95 ea.; \$9.00 Pr.

Prim: 117V/60 cycle. Sec: 6.3V
@ 9 amps, center tapped; 6.3V
@ 2.2 amp and 6.3V @ 2.2
amps. Three secondaries, app.
4"x4"x5" 3.75

Filament
Transformer
Raytheon
UX 6899.
Primary
115V/60
cycle. 1 a.
Secondary
No. 1—5V
@ 5.5 amps;
Secondary
No. 2—5V
@ 5.5 amps.
Tested for
29,000 volts
insulation. \$12.95



2KVA Transformer and choke pri-
mary 110V/60 cycles. Single
phase. Output 17,000 volts @
144 ma. Choke 4,000 Hy @
current. DCR 4500 ohms. Dimen-
sions 26"x29"x13". Amertran
74.50

Here's an unusual transformer
special! AC in, DC out. A
rectifier unit is incorporated in-
side the transformer. You will
find many money saving uses for
this rectifying transformer. Made
by Federal Tel. No. RA7087-1.
Primary 117V/60 to 62 cycles.
Secondary: 62 V DC @ 3.5
amps. Use it with a rheostat to
run DC units directly from your
house line. A buy at 8.95

115V/60 cycle p.r.l. Secondaries:
470V CT @ 60 ma and 6.3V
and 5V 1.50

6 Henry choke—60 ma—to match
above65

Utah—small Blocking oscillator
type transformer—either 9218
or 9308, ea.75

A special buy for you if you can use
400 cycle transformers. We have most
of our small 400 cycle transformers on
sale at 50c each. Larger sizes propor-
tionately low. Send us your approximate
voltage requirements. We'll fill your
order. Audio transformers, modulators,
etc.

Modulation Transformer. 807 to
pair of 807s. \$1.00

Line to voice coil transformer. Pri:
600 ohms; sec: 6 ohms. Sub Siz
Type No. CRP 30448. 1.45

UTC Type No. 83718—Primary 600
ohms CT, Secondaries: 4000 ohms
and 150 ohms, ea., only.50

BC-375E—Air Corps version of the fa-
mous BC-191. Used condition. Supplied
with one tuning unit, Meters, coils, con-
densers, etc. Special for quick sale
..... \$9.95

TUBE SPECIALS

2AP1 \$3.75	837 \$1.35
3BP1 3.95	872A 2.45
3PP7 3.50	3E2A 3.95
5BP1 5.95	8045 5.95
5BP4 7.95	705A 6.75
5CP1 4.95	241-B-WE 30.00
5FP7 4.25	861 39.00
	304-TL 8.00

Sockets for 5CP1, 5BP1, 3BP1, 705A,
829 \$.95 ea.

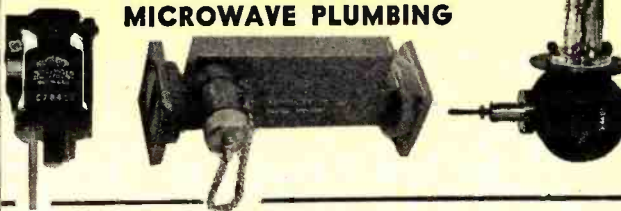
CONDENSERS

G.E.—C.D.—AEROVOX

1 mf 800 vdc. \$.20	1 mf 1000 vdc. \$.75
2 mf 800 vdc. .25	4 mf 600 vdc. .60
4 mf 800 vdc. .30	10 mf 600 vdc. .85
4 mf 400 vdc. .50	1 mf 1000 vdc. .25
5-5 mf 400 vdc. 1.05	2 mf 1000 vdc. .89
3 mf 650 vdc. .25	1 mf 1500 vdc. .95
.25 mf 600 vdc. .20	4 mf 1500 vdc. .15
.85 mf 600 vdc. .25	2 mf 660 ac/
1 mf 600 vdc. .30	1000 ..... .85
.1-1 mf 7000	4 mf 1500 vdc 1.20
vdc G.E. Pyr 2.00	1 mf 2000 vdc 1.00
2 mf 600 vdc. .35	

"Communications"

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THREE CENTIMETERS

Wavenometer (Maguire Industries #1539TFX-21GA) 3 centimeter cavity. \$20.00

Vernier Driven Dial. 3.00

Wave guide 15" bend, 16" long, choke to cover. 3.00

Wave guide 30" bend, 10" long, choke to cover. 5.50

"T" Section 5.50

Wave guide 90° bend, E Plane, 18" long. 5.50

Wave guide 180° bend with pressurizing nipple 12 1/2". 4.00

Wave guide "S" curve, 8" long, cover to choke. 2.50

Wave guide 2 1/2 ft. long, 180° bend, choke to cover. 5.95

Section Rigid coax, 18", 58 ohm, has 1/4 wave section. 4.00

Pick up loop with adjustable tuning section used in duplexer. 1.50

Brass choke, opening 1 1/2".60

5 feet, 3 cm waveguide, per foot. 1.95

TEN CENTIMETERS

Coax rotary joint with deck mounting. \$ 8.00

Coax coupler connects 1/4" coax to 3/4" coax magnetron coupler. 2.50

Standing wave detector, coax 58 ohm. 5.00

Sand load (dummy antenna) wave guide section with cooling fins. 35.00

Wave guide to coax coupler at right angle. App. 10" high. Gold plated, has mounting flange. 25.00

10 cm wave guide, 16 foot lengths, per foot. 2.00

Signal generator I-138 made by Western Electric. 2700 to 3000 MC. Operates on 115V 60 cycles. Regulated power supply and has out-put meter. 75.00

1.25 CENTIMETER

"T" section, choke to cover. \$ 4.50

Mitred elbow, cover to cover. 3.50

Flexible section 1", choke to choke. 3.00

MAGNETRONS—KLYSTRONS, ETC.

8J31 Magnetron (1 Cm) listed at \$95.00. Our price. \$20.00

2I32 Magnetron (10 Cm) 250 KW Peak Pulse Power. Technical data supplied. Brand new in original packing. Listed at \$200. Our price 25.00

720 Magnetron, 2760 MC. Value \$200. Our price. 25.00

2J26 Magnetron (10 Cm). 12.00

Magnets for the above magnetrons. 37.50

2I38 Magnetron (3245-3263 Mc) complete with magnet. 7.75

Klystron—2K25/723AB (3 Cm) technical data supplied. Listed at \$3835

Sockets for Klystron 723AB, each. 9.95

McNally—707B (10 Cm). 3.50

External cavity for 707B.95

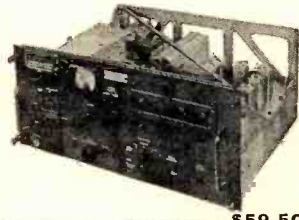
Thermistor beads used in microwave measurements, either D167332 or D170396 (W.E.).95

Thermistors—button type, either D168393 or 168391 or D168392 (W.E.).95

Magnetron stabilizer (3 Cm). Assembly is made up of 3 Cm magnet and magnetron stabilizer cavity. Clnaudagraph Type UC 210. 22.50

ALL TUBES ARE BRAND NEW!

IFF Equipment. Includes pulse
Transmitter-Receiver BC 1267 and
Power Supply RA 105A. Operates
on 117V/60 cycles. Frequency 157
to 187 MC. Can be used as a low
power radar unit as if coupled to
a cathode ray tube. Or very easily
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band. Has 5 stagger tuned IF
stages which makes it easily adapt-
able for FM or Television work.
The power supply furnishes all oper-
ating voltages. These two units
in excellent condition fit into a
metal rack which is also provided.
G.C. \$2,500. Our price RC 148. \$59.50



SCR-518 Altimeter. Complete and new! In original crate. Con-
tains transmitter, receiver, antennas and 3" calibrated indicator.
20,000 ft. range. Ready for complete installation. \$279

SO Radar 10 centimeter. Extensively used by the U. S. Navy for
search and blind navigation. Plan Position Indicator continuously
draws a map of surrounding area. Range from 4 to 80 miles. New
in original crates, including all spare parts as supplied to the
U. S. Navy by Raytheon Mfg. Co. for installation. Spare parts,
alone in many cases provide 4 replacements for each part.
Write for Our Special Low Price

SO Radar, used. Includes transmitter-receiver, indicator, motor gen-
erator set, echo box, section of 10 Cm wave guide and BRAND
NEW antenna assembly. \$500

Separate units which make up the SO Radar. These are used but
in excellent condition:

Motor generator set. 85

Transmitter-receiver unit. Contains the magnetron, the RF assem-
bly, and the receiver IF strip. All tubes included. 150

Indicator unit. Contains the Plan Position Indicator tube, video
amplifier, and all video display controls. 100

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F.O.B. New York City. Send Money Order or Check. Shipping
charges sent C.O.D. Send for our latest Flyer.

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RELAYS!

Here are values you'll never beat.

TIME DELAY CRAMER—clock-
work relay. 115v/60 cycle. 10 amp
rating \$2.95

Edison tube type, sealed thermal
relay, 45 to 60 second delay. \$10
value \$2.95

Struthers Dunn 125V DC. 3 amp
Type ADBT 3. A rugged relay
mounted on bakelite base. DPST \$1.50

G.E. time delay relay, 115V/60
cycle, 10 amp rating. Type
CR 2790, 1 contact SPST open;
1 contact DPDT closed. 2.10

G.E. Underload relay, Type
CR 2810-1285. High ampereage,
Sturdy construction on 1/2 inch
bakelite base. 1.50



Telephone type
DPST; 1
closed, 1 open.
Contact rating
5 amp @ 115V
50V @ 10 amp
1 amp @ 250V
Leach 3.5 ma. 1.05

115/60 c. 1.39

6 Volt AC DPDT DUN 1.50

6 Volt AC DPST DUN 1.20

DC RELAYS

Leach, Kurman, Advance and other
well known makes:

SPST, 12 or 28 volts, ea.39

DPDT, 12 or 28 volts, ea.49

TPTT, 12 or 28 volts, ea.59

Discounts on lots—100, 10%; 1000, 15%;
5000, 20%.



DP U. S. NAVY DIRECTION FINDER

The DP is a Navy direction finder, made
by RCA with a frequency range of 100-
1500 Kc. The input voltage is house
current (115V/60C). The tube line-up
is 3-6C6; 4-6D6; 2-76; 1-6AF6;
1-1523. This unit is equipped with
loop output junction box, flexible trans-
mission line, input transformer, deck
bearings, cable drums, operating pedes-
tal, hand wheel, azimuth scale, loop an-
tenna assembly, and loop pedestal. A
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VLA9, 21.60, will also carry this beam on Fridays and Saturdays only.

On Fridays and Saturdays, sports events are to be carried on VLB5, 21.54, VLG6, 15.24, 2215-0030.

To West Coast of United States, 2345-0045, VLA5, 15.32, VLB8, 21.60, VLG6, 15.24; and to South Africa, VLC9, 17.84; VLB8 and VLG6 off Fridays. Apparently, Sunday DX session remains at 0025.

To Europe in French, VLC9, 17.84, 0100-0145, same program to Tahiti and Pacific islands, VLG6, 15.24; latter off Fridays.

Austria—Radio Wien celebrated its first postwar anniversary (having returned to the air in April 1946 after 7 years' interruption) with a festive edition of its weekly radio publication in April. Much progress has been made by Vienna during the past year, it is noted.

Swedes report FOFA, the AFRS station, Salzburg, is now off the air. Same applies to Radio Vorarlberg, 6.005, Dornbirn. (Kary)

A station heard on 9.575 (may be the one reported some weeks ago as in Germany) gives calls of "Salzburg, Vienna, Linz," and is heard in Britain R-7 at 1630 with musical program; news in German at 1700; also heard earlier. (Pearce) I believe this is U.S.-controlled.

Azores—Ponta Delgada has moved from 4.040 to about 4.845, fair in 1700-1900 schedule. (Nankervis) Announces

after a gong, "Emissora Regional dos Azores." (ISWC) Heard in Ohio. (Sutton)

Belgian Congo—Leopoldville's 17.77 is now announced as used to 1645. (Balbi) Probably has replaced 9.745 in the beam to British Isles which begins with news at 1530.

Radio Congo Belge has three transmissions; scheduled on 9.380 and 6.282, 0000-0200, in French and Flemish, with music; on 11.72 and 6.282, 0515-0730; in same languages; and on 9.380 and 6.282, 1100-1500, mostly in French and Flemish; at 1200 on Monday and Thursday has "The Voice of France," on Tuesday and Friday, "The Voice of America," and on Wednesday, "The Voice of Great Britain." (Kary)

Ceylon—Colombo's 4.900 outlet is heard in England with "Epilogue" at 1145, R-5. (Pearce) The 15.12 outlet of Radio SEAC is widely heard, 1930-1200 and on Sundays also (to Britain) between 1330-1530.

China—XGOY, Chungking, has moved from 6.143 to approximately 9.665; announces 9.658 but is slightly above Brisbane's VLQ3, 9.66. (Dilg) A letter from XGOY quotes frequency as 9.66. (Kary) Most Chinese frequencies vary from day to day. The 9.665 frequency is usually a poor signal in East; has news at 0900, probably also at 0700; some mornings there is English also at 0730; runs to 1040; uses the 11.918 frequency, 1045-1145. It is believed the 7.152 frequency

parallels in both these transmissions.

XGOA, 9.73, Nanking, is strong mornings on West Coast; 11.835, in parallel, is good to 0900 when fades out. (Balbi) The 9.73 frequency definitely identifies as XGOA, Nanking. (Park) Both frequencies are heard in East. (Harts, Kary) Signs off at 1100. (Nankervis)

XORA, 11.69, Shanghai, has fine signal on West Coast, signs off at 1000. (Balbi) Is good level in East at 0600 when has news. English programs are now expanding.

Costa Rica—TIGPH, 5.870, "Alma Tica," San Jose, off since 1942, is now back on short-wave; at 2200, "Alma Tica" signs off and "La Reina del Aire" signs on, using the same transmitter; latter signs off at 2300. (Legge)

Curacao—PJC-1, Willemstad, is heard in Louisiana at 1945, playing American records; carries AFRS programs, but appears to have no fixed schedule. (Crandall) Schedule believed to be 1830-2200. (Ferguson)

Czechoslovakia—For a time, OLR5A, 15.23, Prague, was being QRM'd badly in its beam to North America, 1900-1800, in English, Slovak, and Czech, but signals are now improved; news at 1935. (Beck) Prague is now sending verification cards. (Pearce) Letters and reception reports are desired by the Prague stations and should be sent to Czechoslovak Radio, Foreign Language Broad-

Fahnestock Clips

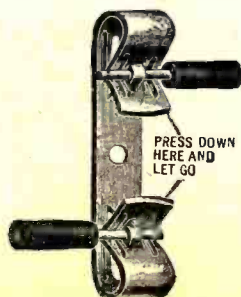
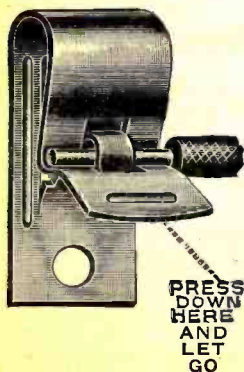
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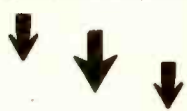
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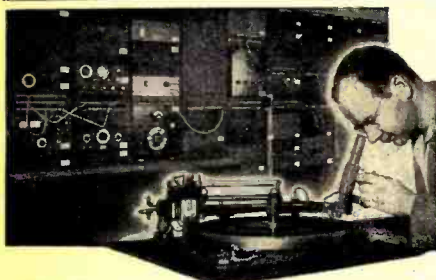
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casts, Prague XII, Czechoslovakia. Occasionally, reports are read over the air.

OLR3A, 9.55, has news at 1345; OLR2A, 6.010, has news at 1545 and 1745.

Other Prague schedules include 19.35 meters and 31.41 meters, 1130-1315, in seven different languages, including Esperanto at opening, German at 1300; the 31.41 meter outlet continues to 1410.

Ecuador—HCJB, Quito, has recently been using about 6.359 to parallel 12.455, 15.155 and 9.958; has fair signal; still uses a 4-megacycle channel with the Home Service program. (Howe)

Egypt—SUX, 7.86, is heard in England at 1530 with Arabian music. (Pearce)

England—Britain is now on second
(Continued on page 132)

At Your Service Madame

(Continued from page 46)

That is a good place to start. When you call at the house to inspect a set, make sure you are presentable. Your hands and face ought to be well-scrubbed, and it is a fine idea to wear a uniform coat. The ladies are impressed by a uniform, and there is something established and reassuring about a uniform coat that bears your name and firm name embroidered on it.

Take along a piece of clean canvass and spread this on the floor next to the set. Lay all your tools on this cloth. Ask the lady to move any pictures, vases, etc., that may be resting on top of the receiver. If you dropped and broke one of these, your goose would be cooked before you ever began. Then pick the radio up—do not slide it for fear of scratching the floor—and turn it gently about. It does not matter if the cabinet looks as though the kids have been using it as a target for their dart games, treat it as gently as though it were a delicate bit of Ming porcelain.

As soon as you turn it around the little woman will let out a little shriek and say something like, "Oh, I'll bet you never saw such a dirty set in all your life!"

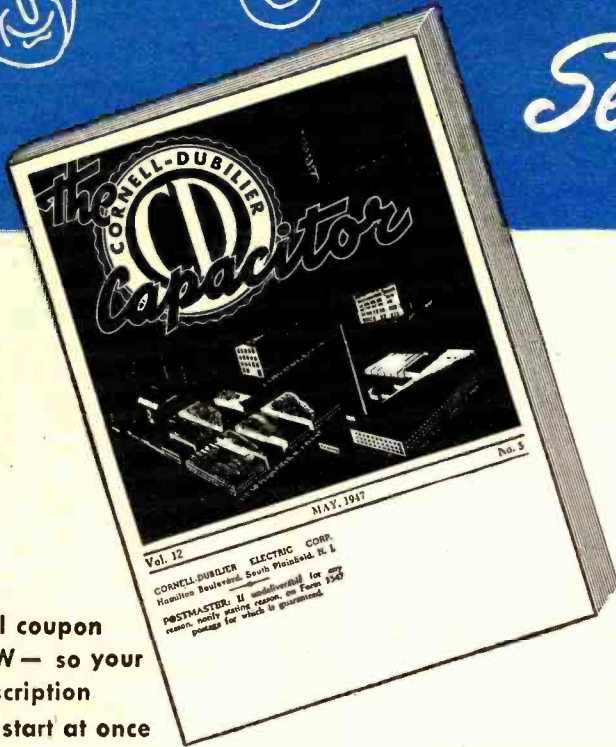
There is your opportunity. No matter if the grime is a quarter of an inch thick, you must say immediately, "Lady, this is one of the cleanest sets I have seen all day." Give this white lie a little time to take effect and then add casually, "You should never try to dust out a radio, you know. It is too easy to damage the delicate wiring. Cleaning a radio, like cleaning a watch, is a job for the serviceman."

This last remark is a natural build-up to your removal of the receiver to the shop for service. Be gentle but firm about this. Making repairs under the watchful eye of the woman is no good. If she sees you tapping the tubes to locate a noisy one, she will

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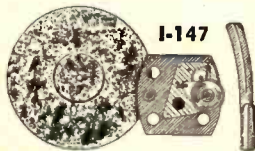
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think you are trying to break them; if you unsolder a wire to locate a short and then you solder it back again, she will suspect you of killing time. What is more, unless you are a better man than I, you will have trouble concentrating while she is keeping up a constant barrage of comment upon the radio's symptoms, the shortcomings of the last serviceman she had, and her husband's very valuable opinion as to just what is the matter with it. Simply explain that you will have to take the set to your shop where you have facilities for testing it completely and for blowing out the dust. Hit this last point hard. You will be surprised how often it will gain permission to take the set out of the house when all else has failed. If you still have trouble, just suggest that no good doctor would agree to performing a tonsillectomy on the kitchen table, and that you are just as loath to turn her living room into a shop while you half-fix her set.

If you take cabinet and all—personally, I think this is best—be sure and wrap the cabinet up like a new baby on its first outing. Carry it as though it were loaded with warm nitroglycerin. You cannot overdo this particular act; so ham it up for all your histrionic ability is worth.

Before you leave the house, though, take out a notebook and ask her to state any faults she found with the radio, even before it developed the one about which she called you. Write these gravely down, no matter how silly they sound. If the set has push-buttons, make a list of the stations she wants set up. If the receiver uses an external antenna, and if you believe it has sufficient gain, suggest that you can install a loop antenna. Point out that this gets rid of the unsightly wires and also permits her to move the set about to her heart's content. This item is a great hit with ninety-five per-cent of the women; but do not sell it unless the gain of the receiver and the proximity of broadcasting stations warrant the change.

If you take only the chassis and speaker, be sure that all the screws are neatly stored in the cabinet and that this is returned to its original place before you leave. Ask the lady what hour of the day would be the most convenient for you to return the set, and also ask if she wants you to phone before returning it.

Once at the shop, go ahead and service the set in the regular manner so that it is placed in first-class operating condition. That is for the man of the house. Then you are ready to concentrate on the things that will please the lady. Since she has little conception of what goes on inside the set, she is especially observant of the externals. The time you spend on improving the looks of the set will bring her just as much satisfaction as that spent on making it sound good.

Clean the chassis, speaker, and cabinet thoroughly. Do not just blow off

the top layer of dust. Use a little brush to rout out the dirt hiding in those tight spots between i.f. transformers and tube-shields, on the back of the speaker cone, and in the crevices in the back of the cabinet. A woman who can overlook three big yellow STOP signs in a row will spot a cobweb at twenty paces. Use carbon tetrachloride freely to loosen dirt and gum that is bonded to the chassis. When you are testing the tubes, wipe them off with a damp cloth and then polish them a bit with a paper handkerchief. Make that chassis actually gleam.

By all means clean the dial and its covering thoroughly. If the cover is glass, a little Bon Ami, followed by polishing, will make it dazzle. Even though the inside of the glass is a little hard to get at, it will pay dividends to remove that smoked appearance that it acquires. If the cover is celluloid, carbon tetrachloride will remove the dirt, but it will leave a thin white coating that can, in turn, be wiped off with a vigorous polishing with a cloth or paper. Do not miss the face of the dial itself, taking care to clean off all specks or spots. Watch that tough spot around the hub, and inspect your handiwork with and without the dial light on. Quite often one form of lighting will reveal a smudge that the other kind conceals.

When the chassis is thoroughly cleaned, turn your attention to the controls. These are the radio as far as the woman is concerned, so make sure that all function perfectly, smoothly, and quietly. Do the hands rub on the dial anywhere? Does the dial cord slip? Does the dial cord shaft squeak in its bearing? Is the volume control absolutely quiet, smooth, and positive in its action? Do the push buttons work easily and with a minimum of effort? Are the correct station tabs all in place? Do the band indicators align up exactly with their windows or pointer marks? Are all the knobs on tight? (A man can understand a knob's working loose, but a woman cannot.) Does the magic eye function properly, with an unfaded green background and a sharply-etched shadow?

When you can answer all these questions satisfactorily, you are ready to work on the cabinet. Clean off all dirt and grime, using a good cleaner. Do your level best to cover up all scratches and other mars of the finish in accordance with the instructions given with a good touch-up kit. Make sure there are no wrinkles, tears, or spots in the grille-cloth. Should there be, repair them if you can; if this is impossible, put on a new grille-cloth. Finally, go over the entire cabinet with a good furniture polish and rub this to a high luster. Do not spare the elbow grease; you are being paid for it.

This final polishing should be administered just prior to the delivery of the set. A pair of cheap cotton gloves are excellent for handling the polished radio without leaving any

marring finger-prints. See that the set is wrapped up as securely for its return as it was when you got it, and handle it with the same exaggerated caution.

Consult the lady as to the exact position in which she wants the set, and be patient while she has you move it an inch to the left, then two inches to the right, and finally an inch to the left again. Under no circumstances point out to her that the radio has ended up right back where it started. If there is slack in the antenna and ground leads, see that they are carefully and neatly stored out of sight.

Insist that she operate the set herself to determine if everything is satisfactory. Take out your notes of her complaints and tell just what you did to take care of each of them. Be sure that she has ample opportunity to see your cleaning job, even if you have to resort to a strategem of pointing out a new part, tube, etc., in the rear of the receiver. State emphatically that if she is not satisfied in every respect you want her to call you.

As a clincher, try to say something that will make her like you. In doing this, do not make the common mistake of thinking that people like us because of what we are. They like us most when we make it easy for them to think well of themselves. That sounds a little involved, but it really is not. For example, if the cabinet has been in fair condition, ask the woman to tell you what treatment she gave it to make it retain its beautiful finish. Listen very attentively. She will be put in the pleasant role of giving advice that is sought after, and she is a hard one indeed if this does not leave her pleasantly disposed toward you as you take your leave. With a little practice, you will always be able to find something about which the little woman can advise you and for which you can display proper gratitude.

The general idea is to keep the lady in the spotlight. It is *her* radio that you are treating with such cautious care. It is *her* wishes that are being scrupulously carried out. It is *her* advice that is being sought. Such flattering attention is hard to resist.

There is one other point. You will encounter many women who are extremely reserved, and you will meet others who are practically calling you by your first name by the time you have set down your tube-checker. No matter what the attitude and apparent friendliness of the lady, you can never go wrong in treating her as just that, a lady. Such treatment is the most subtle form of flattery you can use; so see that you use it.

I know that these methods will work, for I have put them into practice and have observed the gratifying results that other servicemen achieved in using them. It is simply smart business to cater to the person in the household who is the most influential in bringing you business, and in the average household, the woman is certainly that.

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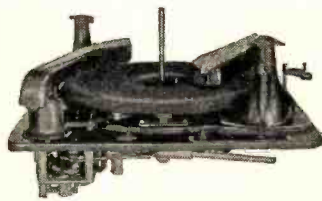
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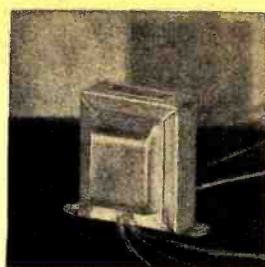
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It's the "know how" and experience that is essential . . . Halldorson Transformers are manufactured to meet the most rigid requirements . . . designed to solve your needs and withstand severe operating conditions. Our complete line of transformers are undoubtedly exactly what you're looking for. While the supply is limited at the present time, we anticipate being able to deliver in ample quantities in the near future.

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HANDY SOLDERING IRON FOR HOME & HOBBY SHOP

Now you can own a home soldering iron which has the same kind of Calrod* heater found in G-E industrial irons, the irons that professionals use. Rated at 85 W, 115 V, G-E Handy irons are perfect for a score of home repair jobs, for building radios, making electrical connections, and for many kinds of metal working and model building.

You'll like the quick way this G-E Handy iron gets down to work with a steady, efficient supply of heat . . . the high-speed soldering it gives you. You'll appreciate its light weight . . . its cool easy-to-grip handle.

Ask to see the G-E Handy soldering irons at your dealer's. Price only \$3.95. Or write to Dept. D667-1V, Apparatus Department, General Electric Company, Schenectady 5, N. Y.

FREE: An up-to-the-minute manual on soldering techniques with every purchase of a G-E Handy iron.

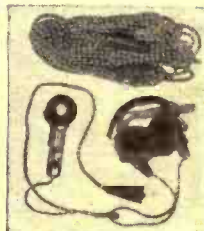
*Reg. U.S. Pat. Off.

GENERAL ELECTRIC
667-1V-194

106

B 19 SET OWNERS

**AUTHENTIC REPLACEMENT PARTS
And SERVICE DATA FOR MARK
II And III NOW AVAILABLE!**



SPECIAL INTRODUCTORY OFFER!

Dynamic Microphone & Headset—Moving Coil Type

Gives excellent response over wide frequency range. Buy two and receive 60 foot extension cord as GIFT! Ideal for battery-less phone. **\$2.75 ea.**

5 wire 60 foot extension cord as above . . . only **\$1.50**

15 TUBE KIT Consisting of 6 6K7G; 2 6B8G; 2 6K8G; 2 6V6G; 1 807; 1 E1148; and 1 EF50 tubes, original cartons. **\$10.00 KIT**

DYNAMOTORS For Mark II, 12 volt DC input, 275 volts and 500 volts output **\$1.95**

For Mark III, 12 volt DC input, Receiver 275 volts output, Transmitter 500 volts output **\$1.25 ea.**

CONTROL BOXES Nos. 1, 2, and 3 contain 2 six point 3 position switch, red light, buzzer, push buttons, and asstd. **\$.75 for all three resistors**

COAXIAL CABLE Aerial feeders for "A" or "B" set with connectors **\$.25 ea.**

Coaxial cable, 20 feet. **\$1.00**

INDUCTANCES 1, 2, or 3 IF transformers 465 KC (iron core tuning) **\$1.00 ea.**

RF or Oscillator coil **.75 ea.**

VARIABLE CONDENSERS 4 Gang "air", complete with vernier dial assembly, shielding, and trimmers, .000530 mfd, max.; 14 mmfd, min. **\$1.50**

PA Tuning, "air", .000563 mfd. **\$1.00**

500 MICRO-AMMETER 0-600 volt DC scale. Some complete B-19 sets still available. Write for prices. We have any circuit diagram or part you need. **\$2.50**

25% Deposit required on C.O.D. Orders. Shipped F.O.B. Lima, Ohio Minimum Order \$2.00

FAIR RADIO SALES
223 S. MAIN ST. • LIMA, OHIO

And in parting, I feel more or less obliged to admit that in trying to please the woman we are undoubtedly raising the standards of our service to the level it should have occupied when we were working for the less-critical men. Does that, ladies, win me forgiveness for some of the mean little things I said about you before?

-50-

From a Tiny Acorn

(Continued from page 43)

of the deck. It's a rotten deal on the Commodore and that beautiful boat of his, but, as you say, it's the only trick left to play and even though it's a shady one, I'm with you on it even though we ruin the yacht and do time for it."

After an ideal spot had been located far down the lake, the yacht was beached and the men jumped overboard with the tools and material needed for the unholy job. Their wicked work proved more difficult than anticipated. It was not an easy task to control unwieldy, heavy and unmanageable sheets of metal, keeping them in an upright position tight against the hull while striking hammer blows at nails which could not be seen, but were being held by the fingers . . . all under water. The sheets of copper constantly shifted and flapped against or away from the boat in obedience to the swaying waves driving ashore from a fast rising choppy sea as the men tried to maintain their balance and keep afloat, for they were not touching bottom.

After superhuman effort the difficult job was finished and when tested, the plates proved to be a perfect and satisfactory "ground." The workers were satisfied but not entirely elated. True, one obstacle had been removed and the problem solved, but the reckoning with a probably infuriated yacht owner did not brighten their enthusiasm.

Criminals are in the penitentiary for far less dastardly deeds than this, but Dr. deForest did not intend taking any chances with failure. He did not ask permission beforehand because it was a foregone conclusion that had he done so he would certainly have been refused.

Sneaks! Here they were, these two adventurers, specially invited guests of Commodore W. R. Huntington, not only aboard his private yacht but likewise at his hotel, the Beebe House at Put-in-Bay which he also owned. His hospitality was unbounded. Nothing had been denied deForest and Butler. He treated them princely yet, weighed against all this, the success of the first practical wireless telephone test was paramount to all else.

The Angel of Destiny . . . the very destiny of radio itself hung over these critical and crucial moments. It was then never dreamed how momentous and dramatic that fateful decision of deForest's to "Not Give Up the Ship" but to fight it through until her sides were riddled, not with bullets but even

RADIO NEWS



When You Buy From Us, You Get The Lowest Prices In U.S.A. We Are One Of The Largest Surplus Suppliers.

NEW SURPLUS at LOWEST PRICES

For the first time, you can buy the BC-221-D frequency meters, brand new, in original containers, for only



\$34.95

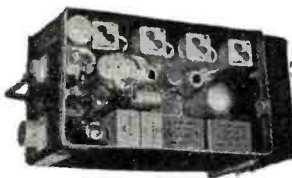
Most accurate made (.01%). Complete with tubes, crystal and calibration chart. Never sold before at this price. Made by Bendix. The 221-M Series is a much later model than the "D" series. You get the latest and the best when you buy from us!

● Telegraph Your Order—Or Send It by Air Mail. We are the only jobbers who stock these instruments in brand new condition. Why Pay the Same Price for Second-Hand Sets?

ARN-5A 11-TUBE SUPERHET 332 to 335 mc. Fixed Tune.

● This "Glide Path" Receiver sold for \$150.00 as SURPLUS a month ago. Today you can buy this superhet for \$13.95, complete with 11 tubes, 7-6AJ5, 1-12SR7, 2-12SN7, 1-28D7. Frequencies 332.6, 333.8, 335.0mc. 6 Relays are included. Requires only 28v. Total "A" & "B" drain only 1.7 amps at 28 volts. Tubes alone worth more than price of complete receiver. Has 3 crystals which allow operation in the 6-Meter Band.

Our Price, Complete with Tubes. Only \$13.95



OFFENBACH AND REIMUS Co.

372 Ellis St., San Francisco 2, Calif.

SCR-522 VHF XMTR-RCVR.



\$34.50

● 100-156Mc Transmitter-Receiver for Amateur, Civilian, Commercial and Airborne or Mobile Service. One of the most versatile surplus items—can be operated by anyone. 4 crystal-controlled channels, push-button operation, fixed frequencies. Transmitter output 15 watts. Transmitting tubes include 1-6G6G, 1-6SL7, 3-12A6, 2-823. The 4-channel superheterodyne receiver uses 10 tubes, as follows: 1-9002, B-9003, 3-12SG7, 1-12C8, 1-12J5, 1-12AH7G. The dynamotor power supply is included in the purchase price. Control box and other accessories also supplied. Operation is from 28v DC, but can be converted for AC operation, simply and easily. Get one of these SCR-522 sets NOW, while stock lasts. A GREAT BUY!!



COLLINS ART-13 TRANSMITTER

ONLY **\$119.50** WITH TUBES

We offer, subject to prior sale, a small lot of Collins ART-13 Transmitters at the lowest price at which this excellent equipment has ever been sold. The frequency range is 2,000-18,100 KC. in ten channels, voice, CW or MCW. This auto-tune transmitter is too well known to require detailed description. Included with each set are the following:

1 28-volt dynamotor, 1 Pilot's Control Unit and the necessary connectors, as illustrated. Output power is 100 watts normal at 90% modulation. This equipment is in PERFECT condition, having been removed from naval aircraft, and much of it has had "test service" only. Appearance is like new. Here is the buy of a lifetime.

THE FINEST CODE-PRACTICE EQUIPMENT

OPERATES anywhere—ANY VOLTAGE—Batteries, AC or DC, from 6 to 250 volts by the



Big, rugged durable code-practice set in heavy reinforced trunk. Heavy-duty power supply with 2 tubes, plus rectifier, 10 telegraph keys with bakelite bases and 10-ft. cords. All keys can be paralleled for 10 operating positions. Loudspeaker has tone pitch adjuster. Two separate panel controls for oscillator frequency response and volume. Six separate fuses for battery, AC or DC operation. Rotating switch for input voltage selection. Large neon blinker light for visual training. Heavy transformers, oil condensers and finest parts throughout.

mere twist of a voltage-changing switch.

Brand new—spick and span—in sealed crates. Made by McElroy. A beautiful job in appearance and operation. One of the finest pieces of surplus equipment we have ever received. The illustration fails to do it justice. You'll have to see and hear it to appreciate its construction and operation. Ideal for Schools, Boy Scouts, Radio Clubs, etc. It operates anywhere—from any battery or line voltage available. A limited stock on hand. We suggest you telegraph your order.

ONLY **\$49.50** COMPLETE WITH TUBES

ONE-TUBE PHONOGRAPH AMPLIFIER

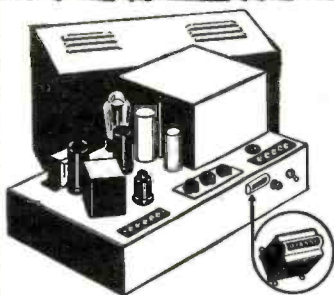
● Amplifier volume for small phonograph. Good tone. Requires 117L7 tube (available anywhere). Lowest price ever. **OUR NET PRICE ONLY \$1.95 EA. WITHOUT TUBE.** (1 DOZ., \$21.60).

LOOK!

● Astatic 15-inch tone arm (Model S-12) with B-2 crystal cartridge, in original cartons. Brand new. All-time Low Price. **\$7.75 Net**



HALLICRAFTER ARR7
● Airborne version of SX-28A. 3 stages RF (one of which is a re-radiation suppressor), BFO, Noise Limiter, AVC, XT Phasing, Manual or motor tuning, S-Meter, 550KC-42MC. 12 tubes. Net Price. **\$152.75** less speaker.



All-Purpose High-Power Amplifier

Licensed by Western Electric for Use in P. A. Systems and Phonographs

er's over-run. **JUST COMPLETED!** Parts alone cost more than full price of the amplifier. Standard RCA tubes (2-6L6, 1-6SL7, 1-6C5, 1-5U4G). Input for crystal or magnetic pickup, 600-ohm telephone line, and microphone. Separate Bass and Treble controls. Volume control. Output for standard 8-ohm speakers. Relay-operated COUNTER (10,000 count) for coin-machine plays. Heavy duty power supply. Gray cracked case with lid. 10"x17"x8". A big, husky job. 15 watts output. 110-120 volt 60 cycle AC operation. Complete with all tubes and wiring diagrams. This is one of the greatest bargains ever offered. You'll have to act **AT ONCE!**

\$49.50 NET
Retail Price \$147.50

LIMITED QUANTITY. FIRST COME—FIRST SERVED. ORDER TODAY!

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I.F.F. XMTR-RCVR. 435-500 MC 15 TUBES!!!



BC-645 . . . \$16.85

● LAST CHANCE! War Surplus Agencies have no more. This 15-tube set will operate on frequencies for Citizens' Radio, Amateur, etc. Tubes alone worth \$26.00 net. Too well known to require description! Be safe. Order yours TODAY!! Our Price. **ONLY \$16.85**

12/24V. DYNAMOTOR-PE-101C, SUPPLIES ALL POWER FOR BC-645. 400V, 135MA. DC, ALSO 9V., 1.2a. AC. **ONLY \$9.95 NET**



32-FT. MAST

& Complete Antenna Kit. Another small lot just received.

This is your last chance to get in on this bargain. Four round wooden poles (1 1/2" dia.) each 8 ft. long; when fitted together make a 32-ft. mast. Can be erected to heights of 8, 16, 24 or 32 ft. Complete with guy ropes, hardware, 100-ft. PB antenna wire, 80-ft. PB ground wire, hand reel and heavy Army canvas carrying bag, suitable for use as sleeping bag. An excellent kit for field use, FM or TV antenna supports, flag poles, etc.

Our low price Complete, **ONLY \$8.95**

"THE HOUSE OF A MILLION RADIO PARTS"

HARVEY

for ham gear



MILLEN R-NINER

Antenna Matching Preamp for the 6, 11 or 20 meter bands. Uses 6AK5 tube, derives power from receiver. Less tube but with coil for 10 meters.....\$24.75
 Coils for 6 or 20, per set, \$ 3.15
 6AK5 tube.....\$ 1.90

Atom-X-800—UHF rcvr for 144-240 mc. Compact, with built-in spkr. 6AK5 trf; 6C4 super-regenerative det; 6AU6 and 6AK6 audio. Less tubes, coils and power supply \$36.95
 Coils, per pair.....\$ 1.40

Atom-X-700—matching UHF xmitter, MOPA or xtal control from 12 or 13 mc xtal. Panel lamps indicate circuit conditions, eliminate need for meters. Less tubes, xtals, power supply.....\$36.95

Micro-Match for measuring standing wave ratios and rf power..\$29.50

Type 1616 high vacuum rectifier; peak inverse 500 volts, average plate current .130 amps; list price \$7.50, Harvey Special Price.....95¢

Desk Mike, single button carbon, with press-to-talk switch, 6 ft. 3-wire cable and plug.....\$4.95

Receivers:

- Collins 75A\$530.00
- Hallicrafters S38 complete..\$ 47.50
- Hallicrafters S40A.....\$ 89.50
- Hallicrafters SX 42.....\$275.00
- Hammarlund HQ 129X and speaker\$173.25
- Hammarlund SP-400-X and speaker\$347.25
- National NC173 complete...\$189.50
- National NC-2-40D (complete with speaker.....\$240.00
- National HRO-5TA1 complete\$306.71
- National NC-46 less speaker \$ 97.50
- National 1-10A with tubes and coils.....\$ 67.50
- RME-45 complete.....\$198.70
- Hallicrafter panodapter complete\$ 99.50
- Meck 60T transmitters.....\$150.00
- Millen 90700 ECO.....\$ 42.50
- Millen 90800 exciter.....\$ 42.50
- Millen 90281 power supply..\$ 84.50
- Millen 90902 scope.....\$ 42.50

Gordon, Abbott and other rotary beams and rotators.

Note: All prices are Net, F.O.B. N.Y.C. and are subject to change without notice.

Telephone: 7 HRC Longacre 3-1800

HARVEY

RADIO COMPANY INC.

103 West 43rd St., New York 18, N. Y.

worse, with ugly nail holes, deep hammer dents and a leaky hull. Had that decision been otherwise, radio might have been sidetracked.

Near midnight, as the two guilty culprits returned the yacht to its docking berth at Sandusky, the Commodore and his crew were there awaiting an explanation of this daring deed. Alongside them was stacked a profusion of food, fruit, liquor, cigars, etc., in keeping with the Commodore's generous policy of always maintaining a well-stocked galley.

"*Thelma*" looked as though she had been out on a spree. When the owner saw the terrible condition of the sides of his beautiful boat his jaws dropped. He turned white. His expression was one of horror, mingled with surprise and anger. Momentarily he was stunned and speechless, until deForest broke the silence:

"Commodore, that ground connection we nailed to the sides *now does the trick*. I'm sorry we had to do it, but . . ."

Without permitting deForest to finish the sentence the sporting yachtsman replied smilingly:

"That's fine, Doc! I'm glad to hear it, for after all *that* is the only thing that matters. If these wireless telephones are a success, which I know they will be, then '*Thelma*' will have the honor of being the first boat in the world to talk from sea to shore. Never mind the holes and dents in the wood. They can be calked up again and varnish is cheap. Don't worry about that. I appreciate your ingenuity and refusal to be stumped. Let's all go into the cabin and drink a toast to '*Thelma*' and the success of the test."

Such was the fine sportsmanship displayed by Commodore Huntington and on the following day the badly battered yacht shoved off from its moorings and headed for Put-in-Bay where the yacht races were held. Thus on July 18th, 1907, wireless telephony history was made. From log notes made at the time and in the presence of reporters, the story of these races was published in *The Toledo Bee* on the next day. These meager spattering flashes of information comprise what was, in effect, the first sporting event to be broadcast by radio—the first story—the first drama, over a distance of ten miles and to an audience which could be counted on the fingers of one hand.

Strangely, it was the success of this pioneer venture and its unimpeachable published record in the press, which a few years later, when brought into Federal court, proved after all other efforts failed, that Dr. deForest's dual invention of the Audion and the wireless telephone was not a toy, fake or fraud as claimed by an ignorant prosecution.

Ironically, it was the result of this "*Thelma*" test which was carried out in spite of a prison threat because of the method used, which a few years later saved deForest from being ruthlessly railroaded to the Federal penitentiary for his rash claims and pre-

dictions of one day being able to "talk across the ocean" . . . a simple, now-a-day feat so easily accomplished aboard the *Queen Elizabeth*.

The unknown, unglorified yacht "*Thelma*" saved him and radio for posterity. The story of this bygone event should go down in history as the occasion when an "acorn" was planted by this little boat, which within the span of a lifetime, has grown and spread to the amazing proportions of the magnificent *Queen Elizabeth* "electronic oak."
 —50—

Sweep-Frequency Generator

(Continued from page 50)

heterodyne oscillators, a half-wave push-pull mixer, and a single-ended amplifier output stage.

The frequency-modulated oscillator uses a pair of 955 triodes connected in push-pull. Frequency modulation is accomplished by means of a variable capacitor in the tank circuit, of the same type as the variable capacitor used in the sweep generator shown in Fig. 1. This condenser consists of concentric cylindrical plates, one set of which is stationary, and the other set movable and actuated by a mechanism similar to that used in permanent magnet loud-speakers. Filament voltage at line-frequency is applied to the actuating coil, and by varying the applied voltage the amplitude of vibration and hence the amount of frequency excursion is adjusted as desired.

Another pair of 955's in push-pull make up the adjustable-frequency beat oscillator. The signals from the two beat oscillators are fed into the grids and cathodes of a 6AC7 push-pull mixer, whose output is applied through a low-pass network to the grid of the output tube operating as a cathode-follower. The marker oscillator signal, which is variable between 5 and 70 mc., is impressed on the cathode of the output tube.

(For the benefit of those who may be interested in purchasing a commercial sweep generator at the present time, it should be pointed out that although the units shown in Figs. 1 and 5 are commercially available at this time, they were developed some time ago. Considerable further development is being done on these sweep generators, and greatly improved models may become available in the very near future.)

A more recently developed high-frequency sweep generator is shown in Fig. 6, and the schematic in Fig. 9 It has a center frequency range which is continuously variable from 500 kc. to 110 mc., and a sweep width adjustable from 5 kc. to 10 mc. The circuit consists of an electronically frequency-modulated oscillator operating at a fixed center frequency, a heterodyne oscillator with variable frequency, a mixer-output stage, and two marker oscillators to provide frequency reference points at 1 mc. and 10 mc. intervals.

SPRAGUE TRADING POST

SWAP-BUY OR SELL

FOR SALE—BC-375E Transmitter, complete, brand new with 7 tuning units including ant. tuner, new mike and dynamotor. Calvin Raleigh, 3821 Lansdale, Cincinnati, Ohio.

SWAP—Late \$120 Nilson radio course complete, for Meissner signal shifter; electric code machine and tapes; 6' transformer rack and parts; good communication receiver or what do you have? 820 Maud, Poplar Bluff, Mo.

SELL OR SWAP—500V. 175MA power supply. Well built with Thordarson and Stancor Transformers, 7.5 V. A-C filament, 6 Amps., G.E. oil filled condensers. Sell \$20 or swap. What do you have? J. L. Smith Jr., W5LLE, c/o KTRH, Houston, Texas.

FOR SALE—BC-348Q converted to A-C. \$50 f.o.b. Rodney Grant, W6WSS, Box 306 Imperial Beach, Calif.

WANTED—To buy L.C. checker. Must be in good condition. Will pay cash or swap for meters, crystals or high-voltage transmitting mica condensers. Oscar S. Marder, 1694 Selwyn Ave., Bronx 57, N.Y.

FOR SALE—For \$8 plus postage, Lingua-Phone International Morse Code course, 5 double side records, instruction book. A. Nelson, WOJFT, Hallock, Minn., Route 2.

FOR SALE—Army J-36 bugs, some new, some used. Guaranteed perfect \$5.95; Roller-Smith 3 1/4" round meter, 0-1 mil. movement, 0-4 KV scale \$4.95. A. Di Giovanni, 1921 Belmont Ave., Chicago 13, Ill.

SELL OR SWAP—BC-1072A transmitter, BC-1068A receiver converted for 2 meter band. Both have 110 V. A-C power supplies. Trade for test equipment. D. R. Ringold, 132 N. Doheny Drive, Beverly Hills, Calif.

SWAP—Rider's manual Vol. 4, new, for Vol. 5, 6, 8, 9, 11, 12, 13 or 14 and pay difference. Want also phono code record set for beginners. Will trade 35L6, 50L6, 35Z5, 25L6, 25Z6, 12SA7. Clinton Carroll, Shrewsbury, W. Va.

FOR SALE—Excellent 5 V. D-C, 115 V. A-C 20 watt amplifier with phono top. Tested, but not used \$75. For technical data write E. St. Arnaud, 24 Arch St., Meriden, Conn.

SELL OR SWAP—New postwar Meissner analyst in perfect condition \$90 cash or \$20 and portable typewriter in good condition. C. H. Hartwell, Armstrong Radio Store, 2528 E. 75th St., Chicago 49, Ill.

FOR SALE—Latest model National HRO-5T1A receiver complete with speaker, power supply, 4 coils. Cost \$306. Used 2 months, will sell for \$245 complete. Satisfaction guaranteed, or your money refunded. M. C. Alford, Rt. 1, Box 538-A, Dallas 8, Texas.

FOR SALE—T23/ARC-5 crystal controlled transmitter for 2 meters. Uses 2-807's, 2-832A's, never used, complete with tubes, crystals \$25; 1.0 amp. 2-12 heavy swing choke for \$7.50; commercial power supply 1250V. D-C at 600MA. complete \$90. J. E. Stacy, 84 Faun Bar Ave., Winthrop, Mass.

FOR SALE—National 156-1, 11 tube receiver, 300-16,000 KC in five bands, crystal filter and speaker \$60. Laurence Arenson, 1316 1st Ave., North, Fort Dodge, Iowa.



Replacing Wets IS ONLY THE BEGINNING!

Sprague Type WR Capacitors are especially designed can type dry electrolytics having very high voltage formation. They'll stand high surges or peak voltages. They'll handle the strong a-c ripples that often cause ordinary 450v. dry electrolytic capacitors to break down. In short, they're absolutely "tops" for replacing ANY wet electrolytic capacitor in a radio set — and a lot more besides! Actually, they're "just what the doctor ordered" for JUKE BOXES, television sets or any application where ordinary condensers have the annoying habit of breaking down to cause a whale of a lot of trouble — not to mention dissatisfied customers. Buy them from Sprague distributors in 8, 16 and 25 mfd. sizes — to fit standard "wet" mounting holes — and CONSERVATIVELY rated at 500v. D.C. working voltage and 600v. surge! Ask for Sprague Type WR!

SWAP—7 mc. crystals; 1000 kc. crystal; 316 A's; audio osc.; RCA 8012; and others. Wanted: transistor transformer, 2 1/2 mtr. transceiver. Send list for my list. E. G. Wohmann, 1655 72nd St., Brooklyn, N.Y.

FOR SALE—5-tube electric sig. tracer, tuning eye and speaker indicate signal presence. Built carefully to plans, Radio News Mag. works fine, \$25; 44 NRI radio course books, \$5. Carl Bombal, Shobonier, Ill.

FOR SALE—BC-348 receiver with a-c power supply. Needs one i.f. input transformer, \$35. David Appleton, 300 E. Houghton St., Santa Fe, N. Mex.

WANTED—Receiving tube 25B8/GT; 1 gang midjet 350, 360 or 365 mmfd. var. condenser; audio transformer, 3:1 ratio. All for cash. Vance Field, Biltmore, N.C.

FOR SALE—Transmitter-receiver 40-90 mtr. phone c-w., complete, ready to operate including 12 V. motor-generator, antenna, tubes. New. Also includes a-c power supply. \$60. Ben Shimshak, 27 Sartori Ave., Mt. Ephraim, N.J.

SWAP—Following tubes taken from converted 2 V. radios: 951; 33; 32; 30; 1E4; 105; 1J6; 1F7's. Want good camera or 0-1 mil. 4 1/2" or larger foundation meter. A. Robertson, Alex, Okla.

FOR SALE—Slightly used National receiver and speaker, NC-100, range .18 to 30 mc \$200. Harry V. Gray, Searsport, Maine, R-1.

SELL OR SWAP—New 8" field coil loud-speaker and universal trans.; 1800 ohms c.t. coil; 10 b. choke 200 ohms; audio trans. 2 1/2:1 ratio; power trans. P-110V. 60 cy. Sec. 350-0-350, fl. 6.3 and 5 v; train trans. adjust. sec. 7-13 V. P-110, 60 cy. M. Springetti, 317 Grove St., Brockton 2, Mass.

WANTED—Communications receiver with speaker. Hallicrafters SX-25 or similar model; plate transformer 1000 V, 200 ma. each side c.t. Cash. Albert T. Murri, 4137 N. 9th St., Philadelphia 40, Penna.

SELL OR SWAP—Railway telegraph morse code course, like new, \$10 or will swap. P. Mayert, Revelstoke, B.C., Canada.

SWAP—All parts for 400 V., 200 mil. power supply for 813 tube and socket. C. L. Piester, WOMZV, 608 Yellowstone Ave., Alliance, Neb.

SELL OR SWAP—For 1000-1250 V. power supply or parts, complete for final amplifier: T-55 Thordarson fil. transformer. Bud condenser, RLS assembly with 40 mtr. coil, National neut. cond. J. Pyvyt, 252 Lanza Ave., Garfield, N.J.

WANTED—RME 69. Will trade McMurdo Silver Voxam or pay cash. E. T. Felder, Box 184, Tylertown, Miss.

WANTED—Used Hallicrafters S-29 or HQ-120X; used Meissner signal shifter. State condition of coils and price. All letters answered. J. F. Flores, 41 San Jose Ave., San Jose, California.

FOR SALE—SCR-536 handie-talkie chassis complete with everything including batteries. Ready to operate with mike and headphones extra. Brand new for \$16. Rex Bean, W7JJG, 271 S. 5th St., Payson, Utah.

FOR SALE—Hammarlund HQ-120X with speaker, excellent shape, \$137. No C.O.D.'s. G. D. Griffin, 222 Eddy St., Ithaca, N.Y.

WANTED—Complete instruction book on RAK 7, 15 kc to 600 kc Navy ship receiver. Also known as type CND-46155, 110 V. 60 cy. supply. Radio Corp. contract NXar 38089. State price. Art Hansen, 559 Stepney St., Inglewood, Calif.

FOR SALE—Sky Buddy receiver, A-1 condition; Lincoln Eng. school radio course, complete with answers: 25-watt, 6 tube P.A. system, 5 mike inputs. Many others. K. Ballard, Radio Service, Mason City, Ill.

FOR SALE—Sig. C. U.S.A. radio receiver BC-455-B, made by W.E., complete with 24 V. dynamotor. Only \$12.95. Sam Weinstein, 504 S. Edith St., Albuquerque, N. Mex.

WANTED—Type CK-505-AX, CK-506-AX or CK-503 hearing aid tubes; personal type radio; camera sized portable; will buy or swap. Have Coronada farm-style radio, 1.5 V, without speaker, with tubes. W. S. Boyden, 1409 8th St., Aurora, Nebr.

FOR SALE OR TRADE—New Lincoln radio 5A-170, 5 tubes \$27; Rider manuals Vola. XV; record changer; records. Bouien Radio Shop, 610 Campus, Beaumont, Tex.

SELL OR SWAP—W. E. public address system amplifier, 41-A, 42-A, and 43-A. Output two fifty watt tubes, push-pull at 500 ohms. System takes standard 5' rack. Want Hallicrafters SX-24 or what have you? A. H. Dreesen, Mansfield Centre, Conn.

FOR TRADE—80 mtr. phone xtals, 3932 kc., 3957 kc., 3895 kc. Want 40 mtr. xtals for trade. W2UGM, P.O. Box 368, Closter, N.J.

SELL OR SWAP—New RCA Freq. Modulator—auxiliary unit for study of wave forms on scope. Want radio or test equipment, cameras, etc. N. G. Denaro, 8148 102 Ave., Ozone Park 17, N.Y.

FOR SALE—S-20-R receiver, needs BFO, that's all. Good condition. Will swap for instrumentograph and \$20. C. Santore, 318 E. 124th St., 26351 New York, N.Y.

SELL OR SWAP—For photo equipment Hammarlund Comet Pro, Peak P-11, Pre-selector, Rotary converter. W. Greene, 30 Ridge St., New York 4, N.Y.

FOR SALE—Mark II 15-tube transmitter-receiver (Zenith) complete with dynamotor, antenna, 5 sets phones and mikes, key, spare parts, spare set tubes, etc. Would like good communications receiver. Harry Kudrath, 115 Anchor Place, Garwood, N.J.

SWAP—Foth-Derby candid camera, German made. Foth Anastigmat 2.5 lens; shutter speed 500; 16 exposures, 127 film, tripod head; electrophot exposure meter. Want vacuum tube voltmeter. D. G. Shannon, Box 204, Merigold, Miss.

SWAP—Canadian stamp collection, over 600 valuable items almost complete 1900 to date. value over \$300. Want Collins autotune transmitter AN/ART-13 complete. Chas A. Piché, 25 Mance St., Hull, Quebec, Canada.

WANTED—2 or 3 25B5 tubes. Thomas Lusher, 2100 E. Washington St., West, Charleston 2, W. Va.

FOR SALE—R.M.E. Communications receiver model 43, \$75. John K. Bryan Jr., ATO House, Durham, N.H.

SWAP—Model airplane with engine and accessories worth \$35 or more for volt-ohm-milliammeter or what have you? Chas. Firestone, 29 Stephen St., South River, N.J.

WANTED—Philco 37-690 radio receiver in good condition, complete, no parts missing. May be working or not. Joseph Jorden, 850 Wabash Ave., Chicago 11, Ill.

WILL SWAP—3.2 H.P. Champion outboard motor; new Winchester 16 gauge pump gun; fishing rods and reels for good communications receiver, or medium power transmitter. C. P. Aoklin, 79 Ranger Drive, Waylin Naval Base 58, S.C.

FOR SALE—New Speed-X 500 transmitting speed key, absolutely new, never used \$7. Frank Adams, Jr., c/o Montgomery Ward, Hopkinsville, Ky.

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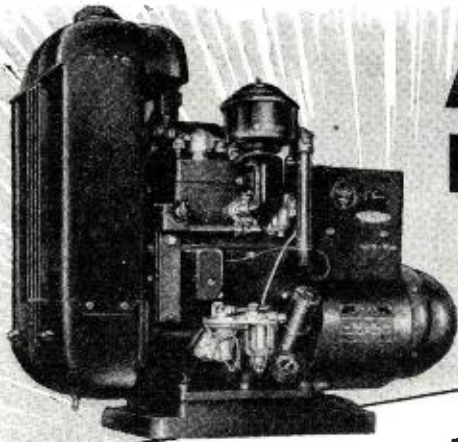
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The frequency-modulated oscillator consists of a 6AK5 oscillator whose frequency is varied by means of another 6AK5 operating in the normal manner as a reactance tube. The voltage applied to the grid of the reactance tube, which determines the deviation of the oscillator frequency, is obtained as shown from the power line voltage. Thus the frequency of the oscillator is varied at a rate of 60 cycles per second, and at the same time the horizontal deflection of the oscilloscope is synchronized to this frequency.

The reactance oscillator operates at a fixed center frequency of 135 mc., and its frequency may be varied by any amount from $\pm 2\frac{1}{2}$ kc. to ± 5 mc. above and below this center frequency, thus giving a sweep range in the output which is adjustable from 5000 cycles to 10 mc. at any output frequency. The output of the frequency-modulated oscillator is heterodyned against the signal from the 6AK5 beat oscillator, whose frequency is adjustable from 135 to 245 mc. Mixing of the two signals is accomplished by the normal grid-leak method, by applying the signals from both the reactance oscillator and the beat oscillator in parallel to the grid of the 6AK5 mixer stage. (The outputs from the two oscillators are taken from their cathodes, in order to add as little capacity as possible to either of the tank circuits, and to help the frequency stability of the over-all output.) The mixer is also made to act as a limiter by driving the grid from zero bias to beyond cut-off, while at the same time the screen and plate voltage are run somewhat below their normal ratings. Although lowering the voltage decreases the output, it gives an output which remains reasonably constant in any one sweeping position. In addition, because of this method of limiting, the harmonic content of the output signal is relatively high, which makes it possible also to use the second harmonic output for measurements up to 220 mc. The output of the mixer-limiter stage is taken through a high-pass filter, in order to avoid power supply ripple being superimposed upon the output signal. The output attenuator is not calibrated, since gain measurements can easily be performed by use of standard signal generators which are not frequency modulated.

The marker consists of two crystal oscillators, one operating at 1 mc. and the other at 10 mc., which can be turned on or off separately or together. Harmonics of these oscillators are present throughout the entire frequency range, thus providing a complete set of crystal-controlled frequency reference points throughout the range of the instrument. The amplitude of the marker signal is independently adjustable, and is injected into the sweeper output ahead of the output amplitude control so that the percentage of marker voltage in the signal remains constant with adjustment of the output control.

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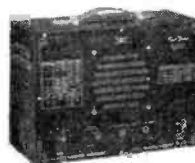
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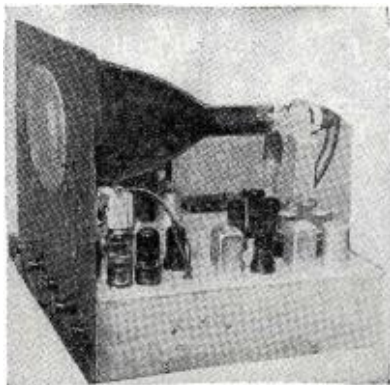
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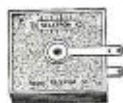
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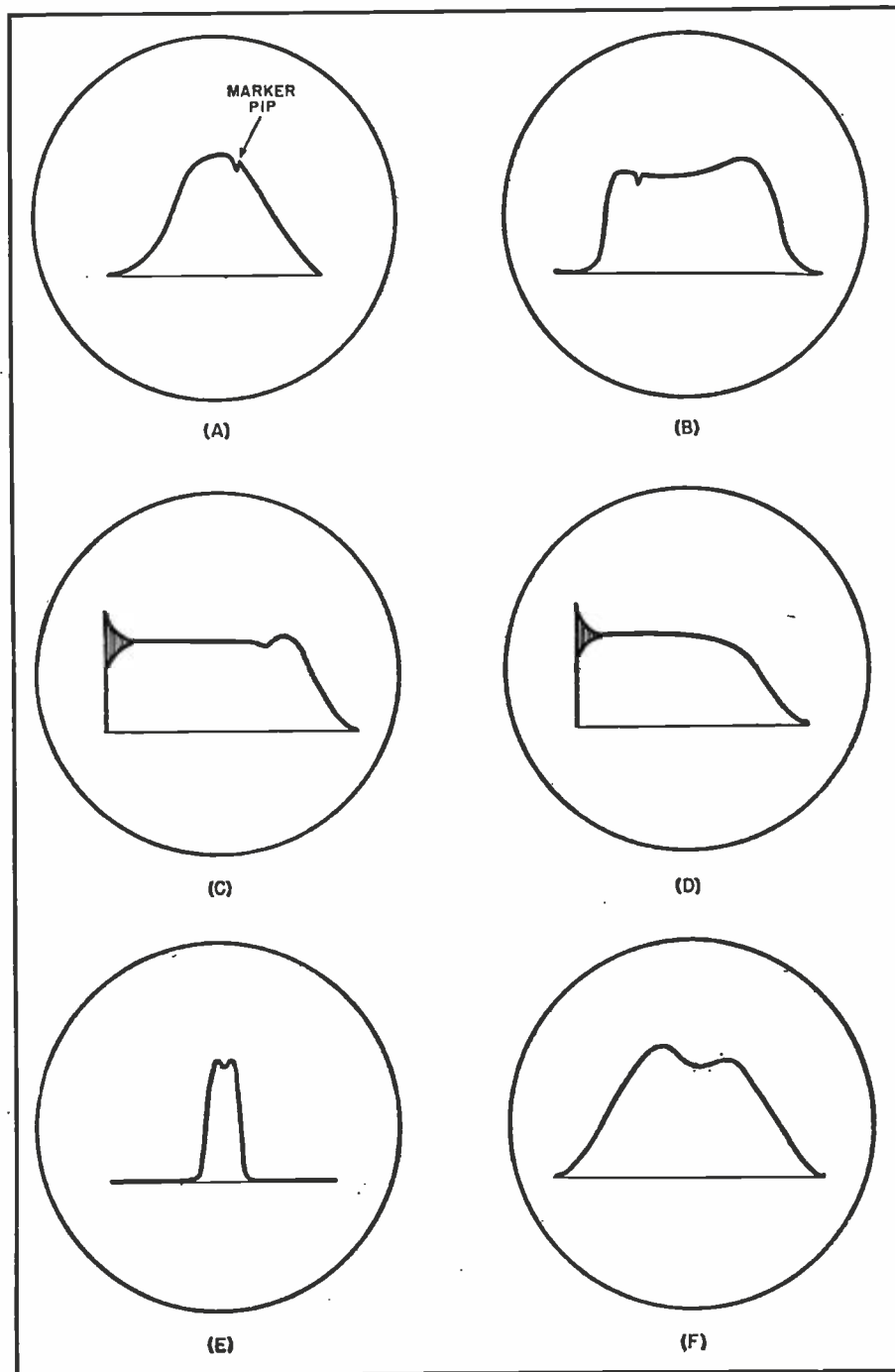
commercially built sweep-frequency generators available for use in the high-frequency experimental television band of 480-920 mc., but as this band comes into more general use, such equipment will probably become available. Only a few experimental ultra-high-frequency sweep generators have been built for laboratory use. The principles involved in the construction of u.h.f. sweep generators are essentially the same as in the lower frequency units, with a few differences. Because of the smaller relative percentage frequency variation, in some cases it is practical to vary the fun-

damental frequency of an oscillator directly without making use of the beat-frequency method. When the beat-frequency method is used, the two beat oscillators must operate in the microwave region, between 1000 and 2000 mc. Frequency modulation of the oscillator cannot be accomplished by reactance tubes; it must instead be performed by mechanical variation of the resonant circuit frequency by means of a motor

Use of the Sweep Generator

The basic principle of visual alignment by use of a sweep-frequency gen-

Fig. 10. Typical oscilloscope patterns obtainable with sweep generators. (A) Frequency response of a narrow-band television receiver; (B) frequency response of a wide-band television receiver; (C) response curve of video amplifier with peaking coil; (D) response curve of video amplifier without peaking coil; (E) pattern of narrow bandwidth network with generator set for maximum sweep; and (F) pattern of same narrow bandwidth network with generator sweep bandwidth reduced.



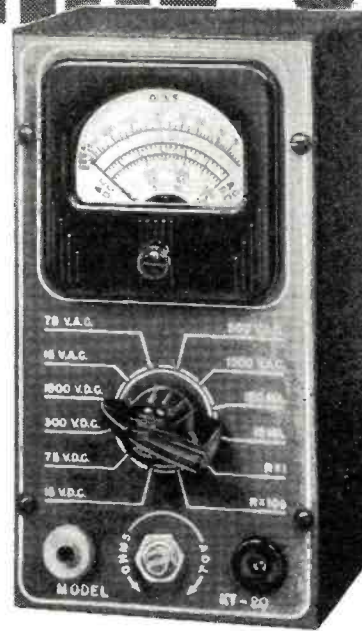
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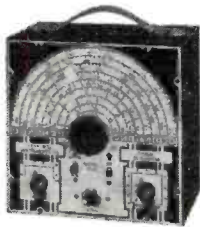
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- 4 A.C. VOLTAGE RANGES:
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0-15/75/300/1500 volts.
- 2 D.C. CURRENT RANGES:
0-15/150 MA.
- 2 RESISTANCE RANGES:
0-10,000 ohms; 0-1 Meg.

\$950
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THE NEW MODEL B-45

SIGNAL GENERATOR

Complete, ready to operate **\$27⁷⁵**

Self-modulated—provides a highly stable signal. RF frequencies from 150 Kc. to 12.5 Mc. on Fundamentals and from 11 Mc. to 50 Mc. on Harmonics.

Modulation is accomplished by grid-blocking action—equally effective for alignment of amplitude and frequency modulation as well as for television receivers. Self-contained batteries. All calibrations are etched on the front panel, permitting DIRECT READING.

Model B-45 uses a beautifully processed dualtone front panel. Comes housed in a heavy-gauge crystalline steel cabinet complete with shielded test lead, self-contained batteries and instructions.



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SUPER METER \$28⁴⁰

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

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500.
A.C. VOLTS: 0 to 15/30/150/300/1500/3000 Volts.
OUTPUT VOLTS: 0 to 15/30/150/300/1500/3000.
D.C. CURRENT: 0 to 1.5/15/150 Ma.; 0 to 1.5 Amps.

RESISTANCE: 0 to 500/100,000 ohms 0 to 10 Megohms.
CAPACITY: .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics).
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The Model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5½" x 7½" x 3".



THE NEW MODEL CA-11

SIGNAL TRACER \$18⁷⁵

Simple to operate . . . because signal intensity readings are indicated *directly on the meter!*

- ★ SIMPLE TO OPERATE—only 1 connecting cable—NO TUNING CONTROLS.
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- ★ Tube and resistor-capacity network are built into the Detector Probe.

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- ★ Provision is made for insertion of phones.

The Model CA-11 comes housed in a beautiful hand-rubbed wooden cabinet. Complete with Probe, test leads and instructions.



THE NEW MODEL 450

TUBE TESTER \$39⁵⁰

Speedy operation—assured by newly designed rotary selector switch which replaces the usual snap, toggle, or lever action switches.

SPECIFICATIONS

• Tests all tubes up to 117 volts. • Tests shorts and leakages up to 3 Megohms in all tubes. • 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 4½" 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.

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SUPERIOR 2 KVA POWERSTATS

SUPERIOR 2 KVA Powerstats; input 115 volts 50-60 cycle—output voltage range 0-135 volts; maximum rated output current 15 amp. available over entire range of output voltage; weighs approx. 20 lbs. **\$29.50**

SUPERIOR 2 KVA 3 1/2 KW powerstats, 2 in tandem, each 115 volt AC single phase. Same as the above but twice the input and output voltage. **\$54.50**

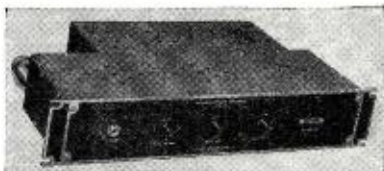
6 TUBE Brand New Receiver with tubes Only \$5.95

Receivers of the SCR-274-N (AN/ARC-5) Series. All-aluminum aircraft receivers 5" wide, 8" high, 12 1/2" long; weight 6 1/2 lbs. Typical tube line-up is: 12SK7 RF, 12K8 Converter, two 12SK7 IF's, 12SR7 Detector and BFO, 12A6 Output, gas-filled antenna-signal voltage limiter, and gas-filled output signal voltage limiter. Each set comes complete with all tubes in sockets. Item 1: 3 to 6 Meg. less dynamotor; Item 2: 6 to 9.1 Meg. less dynamotor.

- HIPOWER quartz Crystal units, type CF5, 5000 KC, complete with holder. **\$1.95**
- BEEDE METER, New, in black finish bakelite case, 3" round; 0-1000 MA DC. While they last only. **1.95**
- WESTINGHOUSE 3" meter, 0-15 Mil. DC. **3.00**
- GENERAL ELECTRIC RF Meters, model 8DW44, 0-1 amp. 2" scale in bakelite case. **2.50**
- WESTON Antenna current indicator, model 507, complete with external thermocouple, 0.75 amp. 2" scale, in metal case. **3.25**
- GENERAL ELECTRIC 0-30 DC Milliammeter—3" bakelite case. **3.50**
- WESTON Milliammeter Model 506, 0-1.5 ma. DC 2" scale, in metal case. **2.50**
- WESTINGHOUSE 0-15 MA-DC 3" meter, bakelite case. **3.00**
- WESTERN ELECTRIC types 1N21 & 1N23 Crystals; 35c each or 3 for. **1.00**

WILCOX F3 6 Tube Receiver \$13.95

Brand New, in original carton; complete with set of 3.5 to 6.1 meg. coils and set of spare tubes; 110 VAC 60 cycle. Tubes 2—6K7, 1—6K8, 1—6F7, 1—6C8G, 1—80.



This receiver is equipped with a radio frequency sensitivity control, an audio gain control, automatic volume control and an inter-carrier noise suppressor. The audio amplifier is capable of producing zero level db output across a 500 ohm load.

The F3 Receiver is a crystal controlled-super-heterodyne receiver consisting of a single stage radio frequency amplifier, an oscillator-mixer, a single stage intermediate frequency amplifier, a second detector and automatic volume control voltage amplifier, and an inter-carrier noise suppressor and audio output stage.

Prompt Delivery—Write Dept. RNJ
25% deposit required on C.O.D. order

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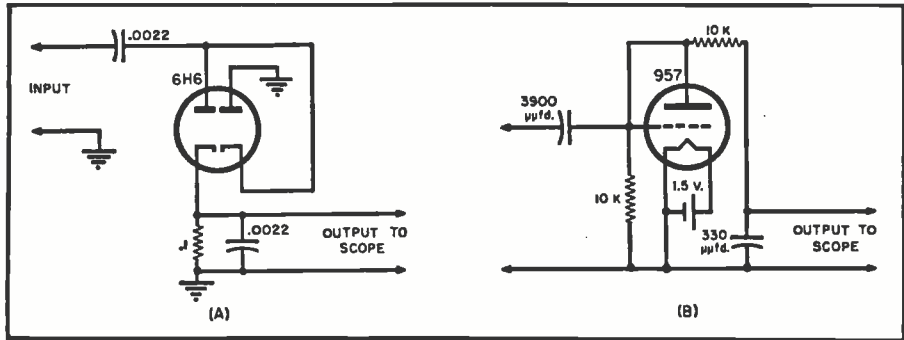


Fig. 11. Circuit diagrams of two diode detectors that may be used in testing equipment which does not have its own self-contained final detector.

erator has been illustrated in Fig. 2. There are, in addition to the basic method, a few practical techniques which are of interest in connection with the use of sweep generators:

1. Fig. 8 shows a block diagram of a set-up by which a high-frequency sweep generator of the type illustrated in Figs. 5 and 6 can be employed to produce a video signal which is swept over the range from 100 kc. to 10 mc. The signal from the sweep-frequency generator is mixed with the signal from a simple fixed-frequency oscillator in a mixer tube to produce the desired video signal. Both the local oscillator and the mixer are extremely simple in design, and can very easily be constructed from the schematics given in Fig. 7. The relationship between the local oscillator frequency and the sweep generator frequency (which must be set for a total frequency excursion of 10 mc.) should be such that at one end of the frequency excursion the two frequencies are equal, then at the other end there will be a 10 mc. difference. Thus the mixer output will be a 0-10 mc. swept signal, the higher frequencies being eliminated by a low-pass coupling network.

2. Whenever it is necessary to construct a sweep-generator for some particular application, the use of a motor-driven rotating air condenser is an extremely useful method of frequency modulation. The use of mechanical components is not objectionable in experimental equipment, and it simplifies the circuit by eliminating the need for reactance tubes and blanking circuits. If the sweep signal is needed at only one frequency, or if the range of frequency variation is not large, the circuit becomes extremely simple. It then consists only of an oscillator whose fundamental frequency is modulated by a rotating condenser in the tank circuit, and a marker circuit of any type to serve as a frequency reference.

3. Two types of diode detectors which may be used for testing equipment not provided with a final detector are shown in Fig. 11. The circuit in (A) is a voltage doubling detector, employing a 6H6 double diode, which is particularly useful for video frequency work. The circuit in (B) makes use of a high-frequency tube, and may be used for rectification of the output of r.f. and i.f. amplifiers operating up to

frequencies of the order of several hundred megacycles. By use of these external diode detectors it is possible to measure the output of a video, i.f. or r.f. amplifier and observe its response to a sweep-frequency signal without the need for a wide-band oscilloscope. (It may be noted here that if an amplifier stage with logarithmic response is inserted between the diode detector and the oscilloscope, the vertical scale on the response curve will be in decibels rather than linear.)

4. Sketches of a number of typical oscilloscope patterns showing a few of the different frequency-response curves which may be observed by use of sweep-frequency generators are shown in Fig. 10. By correct observation and interpretation of the oscilloscope trace, the entire frequency characteristic of the circuit under test can be known with sufficient accuracy for most purposes.

As the use of sweep-frequency techniques becomes more familiar to the radio technician, they can be expected to assume an important place in his collection of experimental techniques.

-30-

Raytheon Manufacturing Company has recently completed installation of the first commercial "Radarrange," the electronic cooking device which cuts cooking time and facilitates the preparation of foods. This unit, for example, will cook a hamburger with raw onion in a roll in 20 seconds as compared with 7 minutes usually required to prepare such a food item. The United Farmers store in Dorchester, Massachusetts, first users of this unit, report enthusiastic acceptance.



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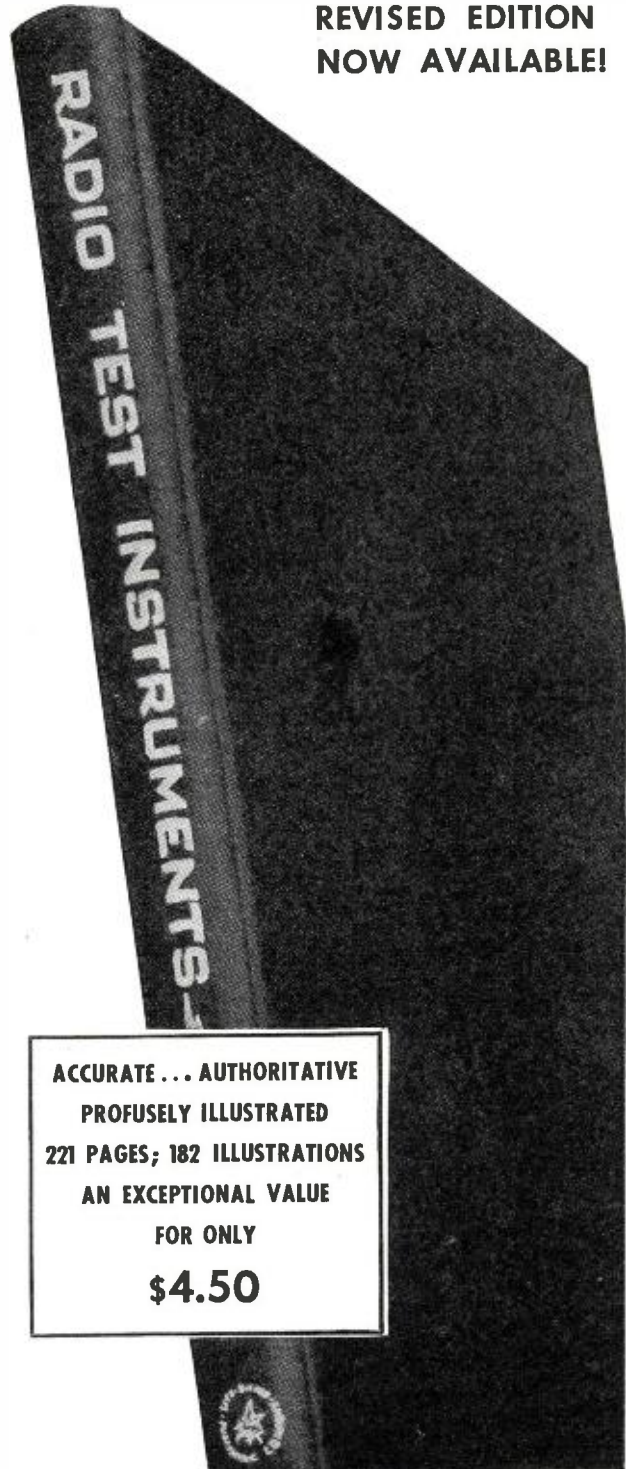
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* * *

"TELEVISION RECEIVING EQUIPMENT" by W. T. Cocking. Published by *Iliffe & Sons, Ltd.*, London, England. 351 pages. Price 12/6d.

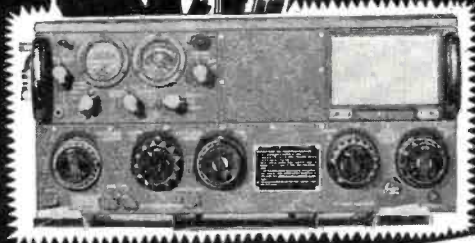
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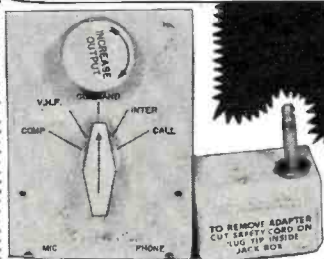
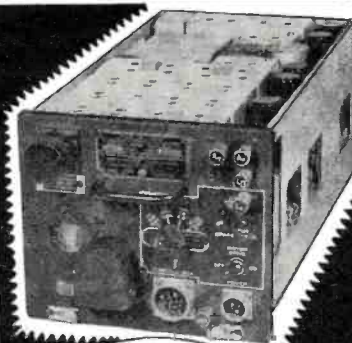
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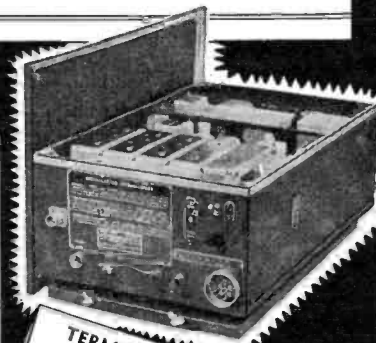
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Many engineers have contributed to this handbook on FM and from their extensive experience the reader may absorb much valuable data of interest.

This first edition has been divided into fifteen chapters covering the background of FM including Major Edwin H. Armstrong's testimony, theory of FM, FM broadcasting, FM broadcast studio techniques, coaxial lines for FM transmitters, audio distortion and its causes, high fidelity reproduction, antennas for communications frequencies, selective calling methods, maintenance of communications systems, alignment of FM receivers, WWV signals for checking frequency meters, railroad radio installations, notes on facsimile equipment, and FM standards of good engineering practice.

From a listing of the contents, it may be seen that this book will be of value to broadcast engineers, program directors, servicemen, amateurs and maintenance staffs of police and railroad systems.

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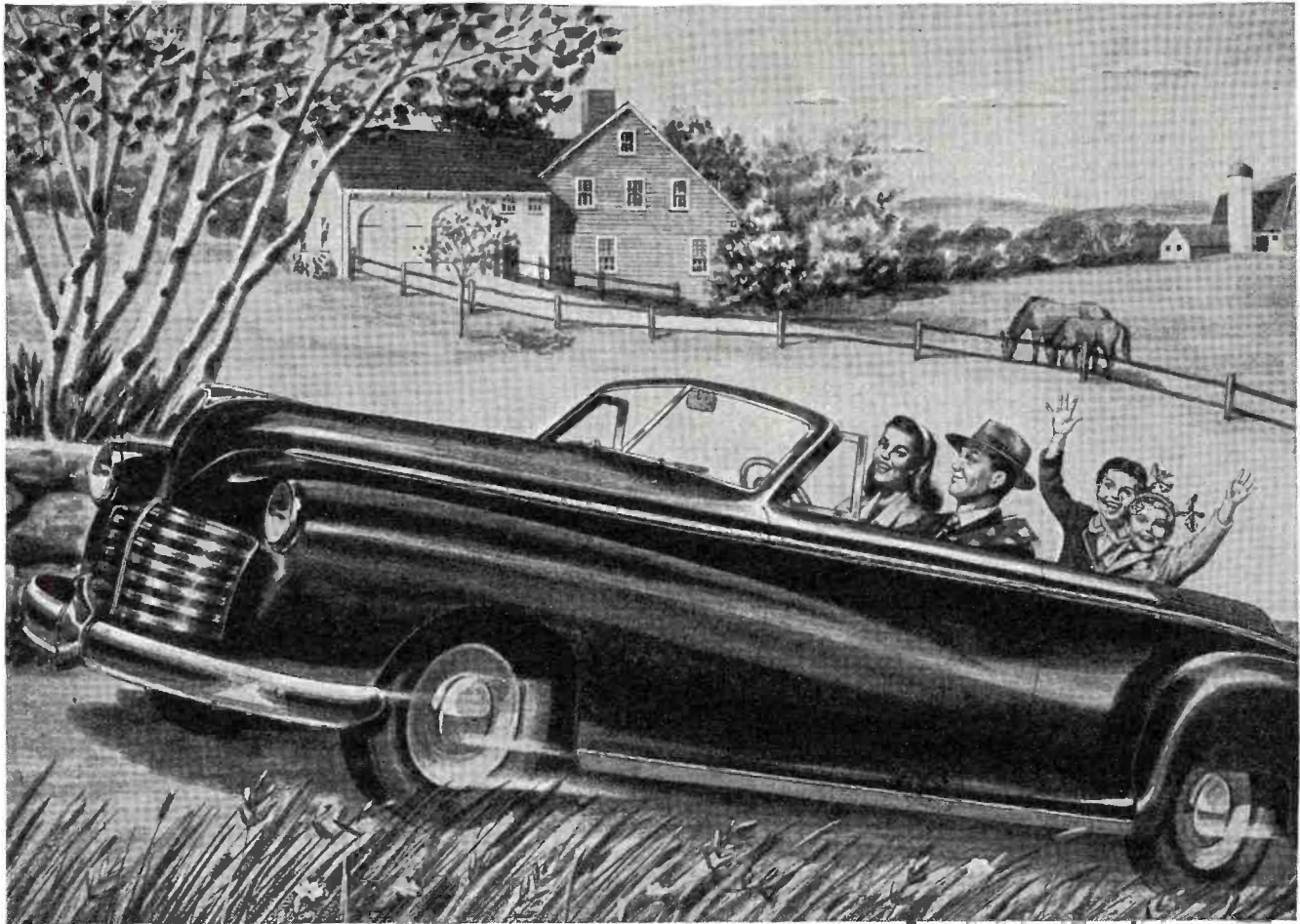
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The Good Old Days

(Continued from page 57)

just like a local for him and how we were having trouble getting out of our back yard, etc., etc. He proved he was a real ham too—he believed it.

About that time I decided to go CW myself so I got a transmitting tube, war surplus too. Yep, a VT2 it was, and quite a tube—*Western Electric* five watter it was called. Well, I made a four coil *Meissner* transmitter—wound the coils on a Quaker Oats box with No. 18 bell wire. As I remember it the circuit called for three condensers but I only had one so I tried it in all three places and left it where it worked the best. Didn't have any meters so there was nothing to worry about—at least that I knew about. Used the tube with 115 volts a.c. on the plate. Sure, it worked—had a lot of QSO's with it all over Iowa. Decided about that time I needed a bigger antenna and that's where I really got in the dough. Stuck a pole up out in the back yard and hung a fifty foot cage on it. A cage? Son, that's the tops in antennas. Listen, I'll tell you how I made it. Made some hoops out of five eighths copper tubing by winding it around a five gallon gas can, then I soldered six wires equally spaced around the hoops bringing them down to an insulator a few feet from the end hoops with the whole thing about sixty feet long. The hoops were about twelve feet apart or so. The lead-in was a little four wire cage about six inches in diameter. Son, that was a thing of beauty, but it had one bad fault. It was conductive to double pneumonia, then for a—pneumonia? Well, it was like this, every time there was a sleet or ice storm you spent half the nite stumbling back and forth across the cold floor from the bed to the window in your bare feet to see if the dang thing was still up. Usually along about three a.m. it wasn't, so you could stay in bed the rest of the nite. Now for the counterpoise—yep, that was a lot of wires, covering about five acres run under the antenna about five feet off the ground. Boy, I had a beauty but that had one bad fault too—my old man was six feet tall! It was amazing how doggone narrow minded that guy could be at times, 'course the wear and tear on his Adams apple was a little bad. No, I couldn't raise it—I got four-tenths amp more antenna current at five feet than at any other height.

Now let's see—along there somewhere I chiseled a 110 to 1100 volt line transformer from the power company. So I dug a center tap out of it and decided to QRO. Made a chemical rectifier, that was the dangest thing. Had a heck of a time rounding up enough lead and aluminum for the plates. Had a little trouble convincing mother she never could get those Mason jars clean enough to use again anyway when she finally caught on

to what happened to 'em. S'funny how much she thought she needed those 24 jars. Anyway, according to the book, the thing should work with each piece of aluminum showing just a faint glow in the dark but just try to get it that way. One jar would be dark and the next look like Coney Island. And that dang thing had the nastiest habit of eating the aluminum off right at the water surface, then just when you were right in the middle of calling that DX over in Ohio that so-and-so plate would eat through and drop off. I'm tellin' you, son, those were the good old days.

Oh, yes, forgot to mention that my increase of plate voltage caused a financial crisis. It was this way—my old VT2 took 110 volts OK but with 550 on it the grid got unduly agitated about something and about the third time I hit my old side swiper it—huh? Say, young squirt, do you mean to sit there and tell me you don't know what a cootie key or side swiper is? Well, just a minute. Anyway about the third dash I sent that darn grid took off—say, son, I thought someone was holding a fourth of July celebration right inside that glass. Never saw so much fire inside a tube before or since. After I got the thing shut down all I had was a diode and an awful poor one at that. Well, after I recovered from that blow I got an old *RCA* five watter UV202—nine bucks for five watts plate dissipation—cripes, I think one of the James boys must have been the first one of those displaced people you hear about—anyway his brothers were all in Oklahoma or some place out there I guess.

Oh, yes, about that side swiper or cootie key as we called 'em. It was just a blade with two contacts on it and a handle. You sent with it by swinging it back and forth between two contacts, just like a big single poled knife switch with the contact spread until there was no contact till the blade was swung to one side or the other. Best thing there is—I still use one—same one in fact. QSO's must be darn near five figures by now with it. Those were the things that made the old "Lake Erie Swing." A fist with that, swing was a beautiful thing to hear, son. Boy, I can still hear those guys with a clear bell-like spark battin' along about 30 per with one of those things. Yes, sir—you sure missed something, son.

Well, after I got my 202 I changed to a Hartley circuit—wound the inductance on a wooden form about ten inches in diameter. Didn't need a tuning condenser—just varied the taps. The antenna was at the plate end and the counterpoise was at the grid end with the center tap, so called, placed somewhere in between. You just kept changing the taps around till it worked somewhere in the band. Mine really worked OK too—I got all kinds of 8's and 5's with a few 2's, 3's, and 4's sprinkled in. Didn't get any 1's or 6's that first winter with it,

a 7 or two but couldn't raise any 6's or 1's. My receiver had developed into a detector and two step by that time, so I could hear a few but couldn't raise 'em. Used to get up at three a.m. three or four mornings a week too. My teachers at school couldn't figure out why three days a week I was more of a dope than usual but the Roman Empire was secondary to what happened that morning between three and seven. The empire just passed away I guess and it's a wonder I didn't follow suit with all the sleep I didn't get.

Well, things went along like that till the next winter when by the addition of another 5 watter I managed to get a 6 and a 1, just one each but that made all districts. I had just got relaxed and started to sit on *all* my chair when I began to hear some funny things—every once in a while I'd hear some guy telling about short waves and how wonderful some place called 80 meters was, how he could work clear into Chicago at noon and how the 6's and 1's would roll in at nite. Heard a faint mention of another place called 40 meters too, but 40 meters—that couldn't be, it couldn't possibly be any good—why we hadn't done very well since they kicked us down off 300 meters. Those guys must be nuts, I thought. The neighbors all had been predicting some big guy would be around after me with a net for some time but it looked like I was going to outlast some other guys at that. Well, I kept hearing more and more mention of 80-&-40, some guys even asked me if I'd been down there, till pretty soon I began to have a faint suspicion maybe it was me—maybe I wasn't going to outlast them at that. Anyway along that spring, in March, I guess it was, I was setting at the old rig listening to the first real spring QRN—couldn't hear a darn thing but noise so decided to see what this 80 and 40 stuff was all about. After pawing around through about fifty old circulars and magazines I found a description of a short wave receiver. Got the old junk box out and started, wound my coil around the core of a roll of toilet paper, you didn't know there was a use for them things, did you son? It sure looked like I had a gosh-awful small amount of wire on it, but the book said 40 meters so I hooked it up to a 201A and listened—by gosh, son, there was signals and, for gosh sakes, listen to who they are! Well, I got up and staggered out in the kitchen and mixed myself a glass of soda and water and had half of it gone before I realized that that last nite out couldn't possibly be affecting me yet, I *had* to be sober, so I went back and sure enough there they still were 6's, 1's, 4's, 7's, the whole darn country—not many on the band, that's sure, about a dozen or so, but every district and I was sure getting 'em LOUD.

I just sat there and looked at that old Hartley oscillator. Oh, I forgot to tell you that in the meantime I had

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wound an antenna coil for it and set it on top of the other coil for the antenna and counterpoise and had a condenser across the main inductance instead of direct coupled like it was at the start. Well, anyway, I just sat there looking—turned the darn thing on and just looked some more. After a while I reached over and unclipped the tank condenser—it still oscillated! What frequency? Son, you ask the darnedest things, how'd I know what frequency? Pretty soon I reached over again and moved the grid and plate taps a turn closer together—it still oscillated—another tap—and another, until, by gosh, son, I could hear the darn thing on the 40 meter band. Just sat there lookin' and thinkin' about that a few minutes—shucks I didn't think there was any use calling anyone, the antenna meter wasn't moving off the peg a darn bit, couldn't work anyone that way but well, I figured I might as well call just one CQ. Anyway I beat out a short CQ and started down the band kinda feeling like the guy with the net should get me before I did something really violent. Was about halfway down the band when—what was that? A guy calling 9DEX—just as sure as I was alive and it was a ONE! Yes sir son—a 1,—1BDR in fact, I'll never forget it—I kinda remember he was the guy that beat me out of first place in the national Sweepstakes contest quite few years after that too.

Well anyway son the gate was open, got three or four sixes some 1's, 2's, 3's, NAJ and a bunch of 8's etc. All with no antenna current at all and that big antenna tuned to 175 meters. I didn't know from shucks why but boy there was my log. I was sure sold, hook, line and sinker. But son that wasn't the best part of it—all during the evening I was hearing the harmonic of 9AEF and 9AFW (who had consolidated with a UV203) pounding away on 200 with the QRN beating them on the head something awful and them not hearing much of anything else. Well the next day I slipped AEF a list of my QSO's and you shoulda seen him turn green.

I guess after that I just went along through the usual stuff—new transmitter, new antenna, new receiver, new transmitter, new antenna, etc., etc. Got clear up to a fifty watter once, didn't work a dang bit better than my old 202's though. Went down to twenty about that time—we really had a good thing down there then, 14,000 to 15,000 kc. I think it was, 7000 to 8000 kc. on 40 too. The hams got a few dealt off the bottom of the deck along about 1929 they darn near lost 40 and 20 for sure—The ARRL put up a fight I guess but most of us thought someone sold us down the river. It ain't never been the same since—that really ended the good old days for sure.

Well son it's getting kinda late, I can't miss my sleep like I used to. Come around tomorrow and I'll give you a little code practice.

—50—

Sound Recording

(Continued from page 67)

mately as $10 \times 15 / (10 + 15) = 6$ ohms. The ratio A in this instance is $15 / 10 = 1.5$. If this parallel combination is now connected in series with a 3 ohm monitoring loudspeaker voice coil, the total 400 cycle impedance of the load will be $6 + 3 = 9$ ohms.

Again, if, for the purpose of monitoring, a 6 ohm speaker voice coil is connected in parallel with a 1 ohm resistor, and this parallel combination is connected in series with another parallel combination consisting of a cutter (10 ohms at 400 cycles) and a 10 ohm resistor, the total load impedance will be

$$\frac{1 \times 6}{1 + 6} + \frac{10 \times 10}{10 + 10} = 5.86 \text{ ohms.}$$

This series-parallel circuit then can be connected into the 6 ohm winding of the output transformer.

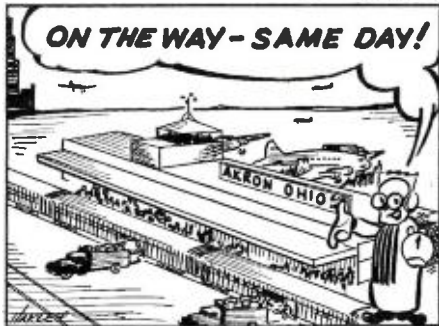
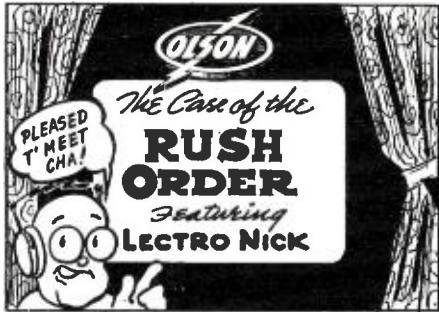
In general, level indicating devices consume a negligible amount of power. However, in the case of relatively insensitive indicators such as pilot lamps, the indicator impedance should be considered as part of the total load of the circuit.

Magnetic Cutters for Professional Applications

High fidelity recording heads, such as the RCA MI-4887, are high quality magnetic units precision built and accurately adjusted. They are primarily intended for use on composition coated discs, or can be used on wax, since they do not depend on the record material for damping. The unit illustrated is held within close frequency limits and does not depart from an ideal response curve more than two decibels between 50 and 10,000 cycles per second. Heads are matched for sensitivity within two decibels at 1000 cycles per second. In physical construction, it represents a bandpass mechanical network terminated in a dry mechanical resistance material. The armature is of the balance type and is centered by means of an adjustable tempered steel spring. The armature is supported on rugged knife-edge bearings. Pole pieces are made of nicaloi. (Fig. 8)

Recorders using these professional heads should be operated in a temperature controlled room for most uniform results. Frequency response and sensitivity are standard at 72 degrees F. and vary slightly with temperature. Between 65 degrees F. and 80 degrees F. the cutters will remain fairly close to normal characteristics, the variations not exceeding 3 db. from the response at 72 degrees F.. Performance data at the time of manufacture is obtained by scientific optical means, thus excluding errors which might arise from commercial tolerances in cutting styli and disc materials.

A typical response frequency characteristic of the head is shown in



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- 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.

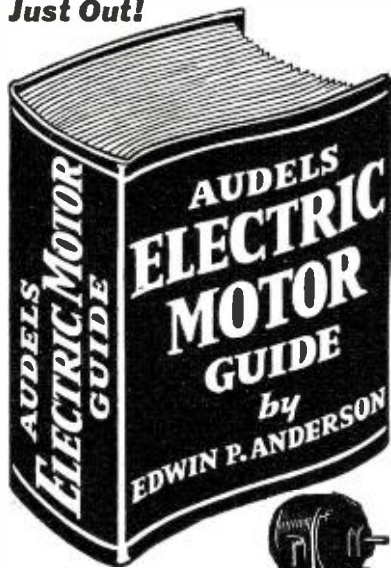
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Fig. 9 and is based upon measurement of the stylus tip motion for constant input. It does not include transfer or needle losses which occur in both recording and reproduction and which are rather severe at high frequencies (at low record surface speeds).

Distortion in records made with this head is extremely low. If distortion should be observed, it can usually be attributed to overmodulation which results in failure of the reproducer stylus to follow the groove. Such heads, when properly used, can consistently produce records equal in quality to the finest commercial transcriptions.

A compensator pack (Fig. 10) is provided to nullify the inductance of the head and present to the amplifier a nearly constant impedance. The recommended connections provide a resistance of 10 ohms in series with the cutting head. This resistance is bypassed with a 0.5 μ f. condenser. The only purpose in making the compensator adjustable is to permit obtaining identical sensitivity among heads when more than one is used. Critical operators may wish to compensate for manufacturing tolerances by slightly increasing the value of series resistance in the high sensitivity units and slightly reducing it on the low heads. This should be done in steps of not more than 2.5 ohms which is possible by series-parallel connections. See Fig. 10. In no case should the total resistance in series with the head be less than 7.5 ohms or the frequency response will be seriously affected. High frequency response can be altered by varying the value of the capacitor.

The proper depth of groove can be found by observing the width relative to the remaining wall. The wall should be approximately two-thirds of the groove width. Or, in other words, forty per-cent wall and sixty per-cent groove. Some operators prefer to measure the thread thickness with a micrometer having a ratchet for insuring uniform pressure. Because of its shape, the thread will always lie flat in the micrometer. It should measure between 0.0018 and 0.002 inch. When grooves are too shallow, the pickup may slide across the record. Care should be taken that the feed mechanism is adjusted sufficiently level so that the depth of cut remains substantially constant over the entire record.

The cutting stylus should be nearly vertical to the record. Some prefer a

lagging angle two or three degrees off vertical, while others favor a leading or "digging in" angle of about two degrees off vertical. Laboratory tests have shown a slight lag or lead to be superior to an exactly vertical stylus in producing a highly polished groove. This applies to sapphire styli in particular.

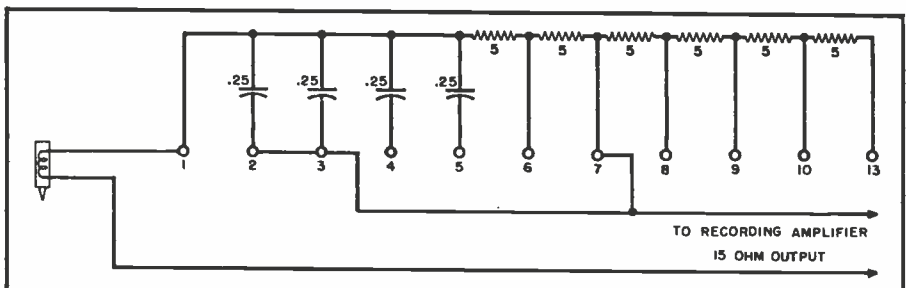
When using professional recording heads, it is well to make surface noise tests and high frequency response measurements with all the styli which are on hand, selecting those that produce quiet, clean cuts. There should be a reasonable number of spare points available to prevent unnecessary use of worn styli. Noise tests from time to time will indicate the condition and degree of wear of the stylus. This can be accomplished by cutting unmodulated grooves with each stylus and measuring the relative noise output, using the high fidelity pickup and a volume indicator preceded by a 1000 cycle high pass filter. High frequency response measurements on styli can be made on one frequency, (for example, 8000 c.p.s.) and the relative reproduced output noted. For this and the noise measurements recording tests should be made as closely as possible at the same diameter on the disc. The results change rapidly with surface speed.

Determining Recording Level

It is impractical to make a plain statement of the correct recording level for any head. While sensitivity of the heads does not vary more than 2 db, the correct level can be established only by experience and tests. There are no fixed boundaries for disc recording representing 100% modulation. At low frequencies, it is true that the groove spacing limits the amplitude. At higher frequencies, the wave slope is the limiting factor. This slope varies with applied voltage and with record surface speed.

The correct maximum recording level is governed by a number of factors; the subject matter being recorded, the energy distribution with respect to the frequency, whether high frequency needle loss compensation is used, the record surface speed, the type of pickup to be used, the type and length of recording stylus, the type of indicating meter used and its dynamic characteristics, whether peak or average reading is used, the accuracy of program monitoring, the uniformity of average program levels,

Fig. 10. Variable compensation for matching cutters and to nullify inductance.



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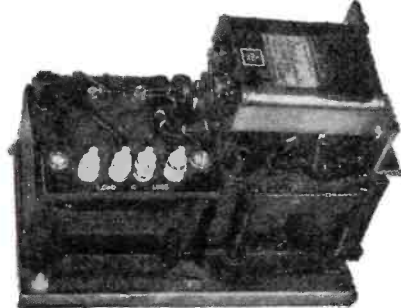
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whether limiting amplifiers are used, temperature of the studio, type of recording blanks, and how much distortion the user is actually willing to tolerate.

It is not difficult to find the correct operating levels for a complete installation by making test cuts of speech and music at the slowest record speed and smallest diameter that can be used. These tests should be made at gradually increasing levels and the results noted upon reproducing. When the reproduced sound ceases to be clear from a quality standpoint, the maximum level has been exceeded. The presence of barely perceptible distortion is sometimes less objectionable than high surface noise which is one reason, from a practical commercial angle, for not being too strictly guided by measured distortion. The proper volume indicator and attenuator setting can then be marked. In cases where an accidental change in gain of a recording amplifier might occur, a volume indicator or voltmeter should also be used at the output terminals.

Broadcast records at 33.3 r.p.m. cannot be cut at as high a level as those for 78 r.p.m. service because of increased wave steepness resulting from reduced surface velocity of the record material. The difference in velocity, roughly 2 1/2 to 1 for a given diameter, makes it necessary to hold down the recording level at least 6 db. on 33.3 discs.

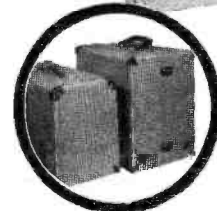
A higher level is usually maintained for 33.3 lacquer master discs for processing than when the original is to be played back repeatedly, as high level, soft lacquer records will not stand up. Furthermore, surface noise of the direct cut disc is low and there is no need for the maximum level. Obviously, in a busy transcription department a variety of recording levels cannot be observed and a compromise level usually results. Whenever there is compromise, the maximum quality cannot be reached in each type of service. Most commercial transcriptions are cut at too high a level from the standpoint of distortion. This distortion is usually due to failure of the reproducing point to track properly because of the steep wave fronts and the departure of the reproduced wave form from the original because the original groove was made with a flat, plain surface but is reproduced with a spherical needle.

When attempting to duplicate (on lacquer discs) the level found on regular studio transcriptions, one should observe the same precautions against overmodulation that were used in making the transcriptions. This means careful control of levels and a simultaneous duplicate recording at a lower level to be used in case the louder one is over cut. By following the same procedure, one will be safe in attempting to equal these levels.²

(To be continued)

² High Fidelity Recording Head MI-4887 manual, RCA Manufacturing Co., Inc., Camden, N. J., U. S. A.

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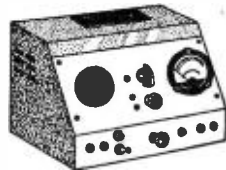
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<p>UHF Mobile Transmitter Using 955 tube. Freq. Complete ranges: 144-148 MC @ 1.1 watts; 230-250 MC @ .8 watts. Current req.: 250 V.D.C. @ 25 MA; filament: 6.3 @ 15 amps. Diagram included. UHF Kit No. 63</p> <p>\$5 per kit</p>	<p>UHF Mobile Transmitter Transmitter with MODU- LATOR. 7N7. Freq. Complete ranges: 144-148 MC @ 2.1 watts; 235-250 MC @ 1.7 watts. Current req.: 250 V.D.C. @ 25 MA; filament: 6.3 @ .75 amps. Diagram included. UHF Kit No. 64</p> <p>\$10 per kit</p>
<p>UHF Mobile Receiver Freq. ranges: 144-148 MC Complete -2 1/2 mtrs.; 235-250 MC -1 1/2 mtrs. Using 6C4, 6SL7, and 6X5 tubes. Current req.: 250 V.D.C. @ 40 MA; filament: 6.3 @ 1 amp. Diagram in- cluded. UHF Kit No. 65</p> <p>\$10 per kit</p>	<p>UHF A.C. Super-Regen. Receiver Complete Frequency ranges: 2 1/2, 1 1/4, 1 meters. With Power Supply, 5" Speak- er. Nothing else to buy! This is not a toy. UHF Kit No. 66</p> <p>\$18 per kit</p>
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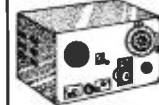
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5U4, 5Z3, 6AG5, 6C4, 6F6, 6H6, 6J6, 6K5, 6SA7, 6SG7, 6SJ7, 6SK7, 6SQ7, 7N7, 12AT6, 12SN7, 12SQ7, 3SL6, 3B7, VR150, 6BE, 6K7, 12SA7, 12SK7, 35W4.	Your Choice	1R5, 1S4, 1T4, 6AL5, 6SL7. Each 90c 6X5, 6Y6, 12BA6, 12BE6, 6SN7, VR105.	6AB7, 6BB, 6J5. Each, \$1.10 600E, 6AG7. Each, \$1.15
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Complete with tubes.



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Specially priced 4 prong 6 volt vibrators. **\$1.29 each**
10 for \$11.59

FLASHLIGHT BATTERIES

Specially priced nationally known flashlight batteries. **10 for \$.50**
100 for \$3.99

Radio Direction Finder

(Continued from page 69)

power supply, unsatisfactory for high altitude operation, has been completely eliminated by operating 14 out of the 16 tubes with 28 volts d.c. direct from the battery to the tube plates. This increases power use efficiency by 300 per-cent over former models, since only five amperes are needed from the battery, by banishing high altitude brush and commutator troubles, reducing weight and space requirements, power supply noises, and aiding installation by lessened cable requirements. This feature thus assumes the proportions of a major engineering advance.

The new circuit design achieves high antenna and compass sensitivity even at this low plate voltage. The normal antenna sensitivity is five microvolts and the loop sensitivity is 25 microvolts-per-meter. The a.c. for loop phasing and indicator circuits and for the two thyatron loop-control tubes is supplied by a small hermetically sealed vibrator, and the new loop control circuit gives a bearing accuracy within one degree.

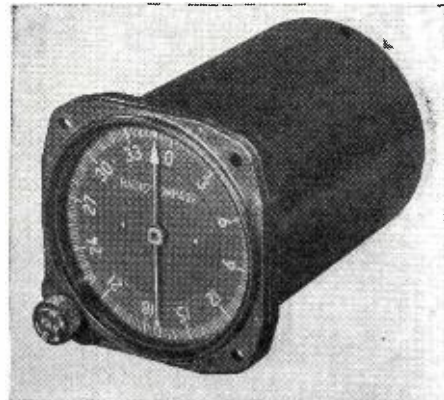
A small, hermetically sealed high altitude vibrator, for the 100-cycle a.c. loop control circuit, does away with two matched saturable reactors and a dual reactor, which required careful selection and matching of electrical characteristics. The new circuit requires no special selection of any components, and the small current that passes through the vibrator is well below its rating. The life of this vibrator has consequently been increased to more than 1500 hours.

Ease of servicing has also been carefully considered in the design of the receiver. Complete subassemblies may be removed and replaced with a minimum of time and effort.

Receiver Mounting

The receiver mounting is unique in that it not only provides shock mounting for the receiver, but also contains a junction board that serves as the

front view of pilot's indicator with a face size of 3 1/4" x 3 1/4". The navigator's indicator is similar with the face size measuring 5 1/2" x 5 1/2". Hermetic sealing protects the improved and more powerful autosyn indicator and provides trouble-free operation.



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for IMMEDIATE delivery



AN OUTSTANDING OFFER

SELF-CONTAINED AUTOMATIC RECORD CHANGER

No wires to connect. Just plug in and play through radio. 45 minutes of uninterrupted plays of 10 or 12 inch records without reloading. For 110V. 60 cycle operation. Complete with leatherette covered cabinet.

B-6260 Reg. Dealer cost....\$39.95

SPECIAL PRICE, NET \$34.95

Lots of 6 or more, Net, ea....\$34.50

Send for FREE Bargain Bulletin



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Dept. N CHICAGO 6, ILLINOIS

NEW!!!—High Fidelity P.A. and Home Use MEISSNER AM-FM TUNER

You will need this tuner, so buy now at this low price. Has 18 tubes including tuning indicator and rectifier. I.F.—455 kc (AM)—10.7 mc (FM). Less than 10 microvolts sensitivity. Self-contained power supply. 2 low-gain audio stages. Flat within ± 2DB from 30 to 15,000 kc. Hum level: 60 db below rated output. Bands covered: AM—527 to 1620 kc; FM—88 to 108 mc. Dual channel tone control. Both 500 ohm and high impedance output. Chassis dimensions: 16 1/2" wide by 10 1/4" deep. Cabinet finished in black wrinkle. **\$144.06** less cabinet List \$245.00
Cabinet with matching panel \$11.18
New GE Reluctance pickup ideal for above unit.
Designed for high-fidelity reproduction. \$4.47 net.

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List 95c
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SPEAKER**
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Imp.—3.2 ohms. Matched
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35A5. Your low cost
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**TWIN LEAD
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**FULLY SHIELDED
UTAH POWER
TRANSFORMER**
650 V.C.T. 40 mls. 5V
—2A; 2 1/2 V.C.T. — 4A.
Mounting centers 2 1/2"
1 1/2". Boxed. Ideal for a
4-tube or 5-tube set.

Your low cost
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**MALLORY
VIBRATOR 534C**
Same as Radiart 5605
Synchronous vibrator. Ad-
justed to handle high out-
put voltage. Used in
Mallory and Radiart Vibra-
packs.

Your low cost
\$2.29 ea.
List \$7.65



Top view of control box. All controls are centralized in this box which measures 8 1/4"x5 1/4"x2 3/4". Button control for switching from pilot's to navigator's control box is mounted in center of band change switch. Easy accessibility for cleaning and adjustment is provided by simple plug-in connections and mountings.

central electrical interconnection point for the entire equipment. Also located in the mounting is a special control changeover relay, providing the transfer from one control box to the other. Connections to the receiver are made automatically as the receiver is slid into the mounting. These features reduce the number of electrical cables and components required, and reduce weight and installation space.

Control Box

The control box, due to its narrow rectangular shape, conserves cockpit space and facilitates placement for ease of operation. Loop rotation control provides linear speed variation from 0°-35° per second. The intensity of indirect illumination is varied through a clever diaphragm slit, so that the light is always white, and the controls are at their maximum legibility regardless of light intensity.

New Type Loop

Within the small streamlined housing, extending only 6.1 inches outside the aircraft, is a new type loop. It can be mounted normally or inverted, externally in metal planes and internally in non-metal planes, and the small size and careful aerodynamic design reduce the drag of the loop to only two pounds at 200 m.p.h. when mounted externally.

The large reduction in size from previous types of loops, accomplished with improved performance, is the result of a specially developed iron core and loop winding, designed especially for this ADF. The dehydrator and its hose, a feature of other models, is eliminated since the humidity problem is solved by hermetic sealing.

The entire loop mechanics, including a new squirrel cage motor and autosyn transmitter, and a new type compensating cam that has 12 adjustment screws operating through pressure-tight bellows, is hermetically

SILVER EXPERTS CHOOSE



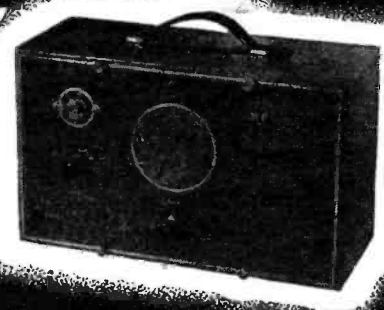
"VOMAX" is the overwhelming choice of experts because it's the finest, perfected v.t.v.m. . . . because greatest demand makes greatest production and lowest cost to you.

"VOMAX" gives you a total of 51 ranges to directly measure d.c., a.c., a.f., i.f. and r.f. volts up through hundreds of megacycles, six resistance ranges covering 2 10ths ohms through 2,000 meg-ohms, three output meter-decibel ranges from -10 through +50 db., six direct current ranges measuring from 50 microamperes through 12 amperes. Most important is the absolute stability, complete freedom from usual grid current errors . . . and its astronomical input resistance . . . an honest 6.6 megohms upon a.c., a.f., i.f. and r.f.; 51 and 126 megohms upon d.c. Voltage ranges measure from .1 through 3000 volts d.c., .1 through 1200 volts a.c.

If you want to guard your meter dollar investment . . . to make it only once for many years to come . . . then "VOMAX" at its present low \$59.85 net price is your logical choice . . . as thousands more wise technicians like yourself have proved to their profit.

Let's look at this matter of what meter you buy seriously . . . for your choice of this, the service technicians basic instrument, can spell either peace and profit . . . or annoyance and loss to you. You must have the best meter to meet "smart" competition. And "smart" competition overwhelmingly uses "VOMAX." The reason is simple. Other manufacturers have had to copy "VOMAX" inventions to try to satisfy your demand for a modern, post-war, obsolescence-proof universal meter. Yet, "VOMAX," the perfected v.t.v.m., stands head and shoulders above all other meters. This is proved by its heavy purchase and use by the Bureau of Standards in Washington, by Western Electric, G. E., Westinghouse, university after university, by top-ranking industrial laboratories, F.C.C., C.A.A., Veterans Administrations, schools, colleges . . .

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Thousands of technicians today rely on "SPARX" dynamic signal tracer to save time . . . increase efficiency . . . cut their costs. It lets you hear and see signals . . . traces signal right on thru every receiver circuit from antenna thru voice-coil . . . is 'shap test speaker, too. Continuous laboratory research has now improved "SPARX" immensely . . . created the Improved Model . . . tremendously increased sensitivity . . . greatly expanded general usefulness. And the SILVER policy of protecting your dollar investment pays out handsomely . . . a free bulletin tells every user how to convert his "SPARX" into the new, Improved Model in a jiffy . . . goes to prove that for the really serious, profit-conscious technician there's no substitute for SILVER, that "SPARX" costing you only \$39.90 is outstandingly the world's best signal tracer. "SPARX" will earn you, too, more profits in less time than any other instrument you can buy.

906

Thanks for your patience, Model 906 Signal Generator is now flowing to your favorite jobber. And what an instrument . . . 90 kc. through 170 mc. on fundamentals . . . 8 air-trimmed bands . . . variable 1/4 400 ~ amplitude modulation . . . built-in variable electronic FM sweep . . . laboratory triply adjustable attenuator . . . metered microwatts . . . output 1/2 microvolt to over 1 volt . . . multiply shielded . . . strays lower than \$500.00 laboratory generators! Yet all this costs you only \$89.90 net. Better order your 906 now for demand far exceeds production capacity on this precision instrument for months to come.

Send Post Card for Catalog of new measuring equipment, communication receivers, transmitters, kits, parts. See them at your favorite Jobber.

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Ready for easy, rapid assembly. No knowledge of television required. Complete easy-to-follow instruction sheet gives

you all the knowledge you need. Reception is clear and sharp... comparable to a moving picture.

All necessary components are included: nothing is required except a screw driver, cutting pliers and a soldering iron. Only the highest quality standard parts are used—the list price value of these parts alone is more than \$300. 110 volts, 60 cycles A.C.

\$159.50

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Complete with L70 crystal & Hard-ware **\$1.98**

I.F. INPUT & OUTPUT TRANSFORMERS
1 1/4" x 1 1/4" x 2 1/2" 456 kilocycles (10 for \$5.40) **.59 ea.**

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(Contains motor, turntable, pickup arm complete) **\$5.95**

PLASTIC KNOBS

(White, Red, Red Mahogany and Tan.) (In lots of 100, \$4.25.) Slip-on type 1 1/2 in. with 1/4 in. shaft..... **.05 ea.**

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8x5 1/2 Primary and Secondary (10 for \$3.60) **.39 ea.**

GUARANTEED VOLUME CONTROLS
Less Switch..... **48c** 10 for **\$4.45**
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500,000, 100,000, 25,000 ohms; 1/4 meg, 1 meg, 2 megs.

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6 or more..... **.99 ea.**
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RESISTOR CABINETS

All wood construction, 6 drawers, 24 compartments **\$3.89**
Complete with 100 assorted 1/2 w and 1 w resistors..... **\$7.95**

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100 Assorted Bypass Condensers 600V
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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**

Write Dept. N-6. 20% Deposit with order required. Please add sufficient postage. Excess will be refunded.



Variety ELECTRIC CO., Inc.
601 Broad St., Newark 2, N. J.

sealed and filled with dry nitrogen, to eliminate the necessity of dehydrating attachments. They are sealed under a glass dome with a special induction-heated solder seal.

Indicators

The indicators are hermetically sealed, and the autosyn system being 25 per-cent more powerful than previous, make possible bearing indications of 35° per sec. It is possible to use three indicators simultaneously if desired. This will be of assistance in some applications in overseas aircraft with larger crews. All indicators have an adjustable dial scale, to permit the pilot to orient the azimuth scale to his compass heading, and thus take true compass bearings rather than relative bearings.

With the advent of this postwar radio direction finder, radio compass design is now in line with the increasing trend of simplification in all aeronautical instruments. This important navigational device is now available to much smaller aircraft such as fighter planes, executive transports, sportsmen's planes, and the like. The radio compass, long an essential instrument in larger aircraft, will now contribute to the advancement of air navigation as a whole by making accurate use of the vast network of radio aids possible in small as well as large aircraft.

Signal Generator

(Continued from page 56)

quencies can be set up with an accuracy of 0.1%. From 425 to 550 kilocycles the second harmonic can be heard in the broadcast band. From 550 to 1000 kilocycles the fundamental can be logged.

The modulator is a 6J5 blocking oscillator. R_2 and C_2 provide grid leak bias. T_1 is a push-pull output transformer with a ratio of 40 to 1. Any push-pull transformer would be satisfactory. The center tap of the primary is grounded. One side is returned to the grid and the other side provides audio to the suppressor of the 6SJ7. If at first the audio oscillator is inoperative the connections to the grid and suppressor should be reversed.

The cabinet and chassis were constructed at home of 22 gauge sheet metal. The dimensions of the cabinet are 6 1/4" x 9 1/2" x 7 1/2". The chassis is 2" x 6" x 9". All small components and the 8 henry choke are mounted under the chassis. The 6SJ7 is mounted directly behind the coil as may be seen in the photographs. All other components may readily be identified. Approximately twenty hours should be all the time required to construct this unit.

JAPANESE MIDGET METERS

By ROBERT E. HARRISON

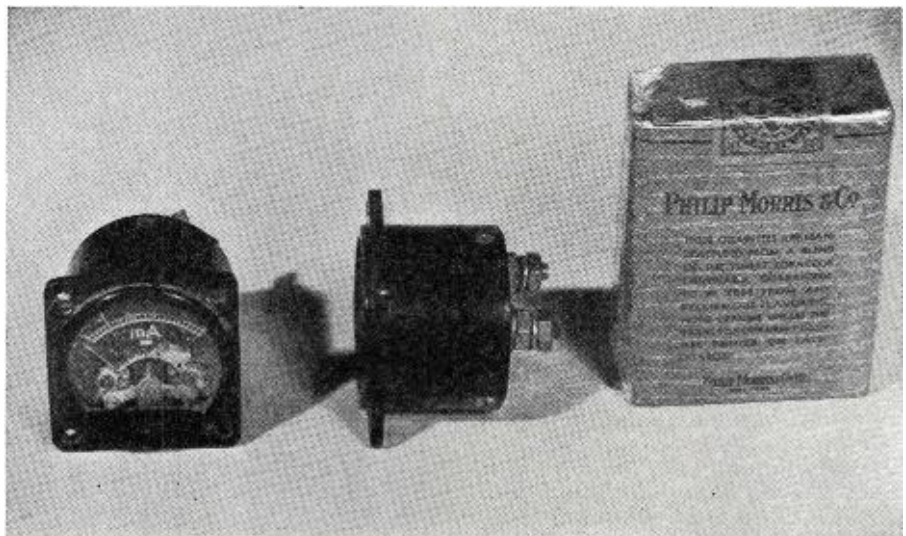
ALTHOUGH most of the enemy radio equipment was inferior to ours, credit should be given where credit is due. The Japanese beat us to the use of miniature panel meters. They were in use in almost all of their radio equipment during the latter part of the war.

These meters were not toys but featured a full-fledged D'Arsonval type movement with rectifier, thermocouple, or shunt as needed, all enclosed in a plastic case. The meter fits a one and one-half inch hole and extends one inch deep.

Rugged? They sure are. The one pictured is a 0-.5 milliamper movement.

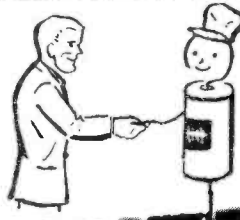
It was found submerged in salt water and had apparently been there for some time, yet when the water was removed from the case and the meter dried, it not only worked but when checked against a precision laboratory instrument, it had no readable error throughout its range.

The faults found with the meters in general were, poor workmanship in the fitting of the movement into the case, very few movements were interchangeable, and the fact that the cases did not fit snugly over the movement and back piece to prevent moisture and dirt from getting in.



Mr. Dealer and Service Engineer:

Shake hands with
now in this



"Illini Hycap"

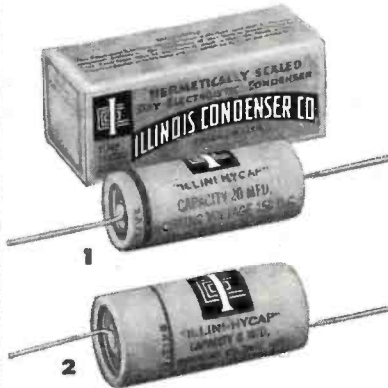
"GET-ACQUAINTED PLAN"

This is an unusual test offer—
now you can test for yourself the high
efficiency and quality of the well known "Illini-Hycap" condenser.

HERE'S THE SIMPLE "GET-ACQUAINTED" PLAN: 1. Advise us right away which one of the two illustrated condensers you wish to test (select one). 2. Enclose 15c only in stamps or coin (to cover cost of mailing and handling), along with the name of your local jobber and we will promptly send you the condenser of your choice, together with our latest catalog.

You'll want more of these long-life "Illini-Hycap" condensers when you see how they improve your service work and customer satisfaction. Buy them from your jobber. This offer may not be repeated again—

ACT NOW!



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OZ4	\$.08	7B7	\$.07	35Z3	\$.07
IA7	.72	7C5	.72	35Z5	.48
IA5	.72	7B8	.72	36	.55
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IH5	.59	7Y4	.72	43	.59
ILA6	.53	12A8	.55	45	.44
ILB4	.53	12J7	.59	47	.59
ILC6	.53	12Q7	.49	50A5	1.08
ILE3	.53	12SA7	.55	50L6	.59
ILH4	1.28	12SA7	.72	50B5	1.28
ILN5	1.28	GT	.72	50Y6	.59
IN5	.72	12SK7	.72	57	.49
IQ5	1.04	12SQ7	.59	70L7	1.56
5Y3	.55	14A7	1.08	75	.48
6A7	.55	14B6	.88	78	.49
6A8	.55	14Q7	.88	80	.39
6C6	.55	24A	.49	84	.59
6D6	.55	25L6	.59	85	.49
6K5	.59	25Z5	.55	117M7	1.53
6K7	.59	25Z6	.72	117L7	1.53
6SQ7	.59	27	.39	117P7	1.53
6X5	.55	35	.55	117N7	1.53
7A4	.72	35A5	.83	117Z3	.88
7A8	.72	35L6	.72	117Z6	1.04
7B6	.72	35W4	.59	XXL	.88

Minimum Order: 10 Tubes
Orders of 100 Tubes or more—10% discount
on above prices.
We carry a complete line of Tubes.

TRANSMITTING and SPECIAL-PURPOSE TUBES "Jan" Inspected, Fully Guaranteed

807	\$.08	866A	\$.08
2050	.98	717A	.98
2051	.98	9001	.98
9005	.98	9003	.98
9006	.98	9004	.98
829B	2.75	VR 105/30	.89
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2A4G	1.25	884	.89
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- Acorn Tubes: Nos. 954 to 957 ...49c
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POPULAR-BRAND CONDENSERS FIRST QUALITY, FRESH STOCK

ELECTROLYTICS	BY PASS		
		at 400	at 600
		Volts	Volts
20/20 @ 150	.39c	Mfd.	
20 @ 150	.25c	.001	.9c
10 @ 450	.27c	.003	.9c
16 @ 450	.45c	.005	.9c
20 @ 450	.52c	.01	.9c
10 @ 25	.18c	.02	.9c
25 @ 25	.19c	.03	.9c
50/30 @ 150	.49c	.05	10c
		.1	12c
		.25	14c

Minimum Condenser Order: 10 Condensers

VOLUME CONTROLS

500,000 OHMS, S.P.S.T. Switch, 2" Shaft	47c
500,000 OHMS, D.P.S.T. Switch, 2" Shaft	58c
2-Tube Phono Oscillator—Uses 35W4 and 50B5—Packs terrific wallow	\$4.25
5" Alnico #5 P.M. Speaker (1 oz. Magnet)	1.45
Output Transformer for 50L6	.69c
6 ft. Approved AC Line Cord	.25c

THIS MONTH'S SPECIAL

6AK5 tubes

New and Guaranteed
in sealed cartons **89c**

20% deposit required with all orders. We ship your order the same day we receive it. Money-back guarantee on all items. Write for our free catalog and order blanks.

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International Short-Wave (Continued from page 102)

hour of Summer Time, thus, is two hours ahead of GMT. New schedules were not at hand at the time of compiling the Department; watch for them over the air as the BBC gives schedules frequently.

GSK, 26.100, is now heard to 1200; excellent signal in East. (Howe)

Ethiopia—Radio Addis Ababa, 9.620, is audible in Australia at 1000; *English* session is at 1030. (*Radio Call*) Has been heard occasionally in Omaha, around 1055-1110, very weak signal. (Patterson)

Listeners should keep a lookout for *Radio Addis Ababa* on 15.074, supposed to come on any time now with regular daily schedule; would appreciate reports on this one.

Finland—Finnish stations announce as "Finland Calling," station calls are seldom used; current schedules include OIX4, 15.190, Pori, 0715-0740; 1245-1255, 1705-1715, 1925-1945. OIX2, 9.500, Pori and Helsinki, parallels. News of about 10 minutes duration is heard at 0715 and 1925 (not on Sundays at latter time). These stations use 15 kw. Have news in French at 1245 and 1705. (von Harpe, Helsinki)

France—The 7.28 frequency is heard at sign-off of European Service at 1715, in parallel with 9.52, 9.62, 11.845, and 11.885. This frequency is also used to Latin America, 1730-2045, and to North America, 2100-2245. (Beck) Other transmitters used to North America, 2100-2245, are 9.55 and 11.845.

French Equatorial Africa—Radio Brazzaville announces news for its 25- and 31-meter outlets (11.97, 9.44) as follows: For Europe and the British Isles, 1345, 1545; for East Coast of U.S.A., 1715; for Central U.S.A., 1900; for West Coast of U.S.A. and the Pacific, 0100 (this may mean the news-cast reported by listeners as heard at 0030); and for Far East, 0715. (Pearce) Other frequencies are used in parallel at various times, including a new one on 17.843 (measured).

The 17.843 frequency is heard in Eastern U.S. to sign-off at 1700. (Kary) Is also heard in the beam between 0000-0100. (Balbi)

French Indo-China—Current schedules of Radio Saigon, 6.19, 11.78, and 1050 kcs., are 1800-2000, 2130-0040, 0300-1030, with *English* periods between 1945-2000, 0500-0545, and 0830-0930; the Letter-Box (answering letters from listeners) is radiated on Fridays at 0550.

A news bulletin is now read by the "Voice of Viet Nam," *Radio Pnompenh*, at 0745; station has had CWQRM in Australia. (*Radio Call*) Frequency is about 12.364. Has been heard on West Coast with news at 0645. (Nankervis) Also scheduled with *English* at 1045. (Dilg)

Direct from monitor in Saigon comes word that *Hanoi Radio*, of the

Opportunity Knocks

Build Your
Own Business
NOW!



With TRADIO . . . the radio FUNCTIONALLY DESIGNED for coin operation in Hotels, Motels, Stopovers, Clubs, Hospitals, Stations, etc. Big Earnings . . . Steady Income . . . No Clock To Punch . . . Full or Part Time!

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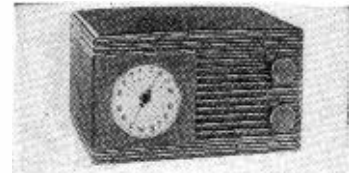
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New Viet Nam Government, operates in the 25-, 31-, and 62-meter bands, and has *English* periods at 1130 and 1900 Hanoi time (probably 2330 and 0700 EST); *English* news has been heard from this station at 1845 by this Saigon monitor for RADIO NEWS. Exact frequencies are not yet known.

Germany—Berlin does not operate on 9.73 as has been reported in the past; this is Leipzig's frequency *only*. According to a translated version of a German letter of verification from *Berlin Radio*, Leipzig relays Berlin's programs. The short-wave transmitter on 6.070 is equipped with a circular-emission antenna and is situated at Konigswusterhausen, about 60 km. from Berlin; power is 5 kw., while Leipzig's power is 12 kw. Address of *Berlin Radio* is Technical Director, Berliner Rundfunk, Berlin-Charlottenburg 9, Germany.

The American relay stations in Munich are scheduled: Munich I—7.290, 1100-1615, to Balkans; Munich II—11.87, 1100-1400, to Europe, and 6.170, 1415-1615, to Europe; Munich IV—9.54, 1100-1615, to Europe. Evidently, Munich III in the 49-m. band has been dropped for the summer.

Gold Coast—ZOY, *Radio Accra*, 7.295, is good signal in Australia at 1230 when light music is broadcast; at 1245 there is news; station closes at 1300 with "God Save the King." (*Radio Call*)

Greece—SVD-2, 7.295, Athens, is now scheduled 1400-1545, during which time news is radiated in all languages, including *English*. (Pearce)

Guatemala—TGWA is being heard evenings on 19.520; is second harmonic of 9.760. (Howe) TGWA is also widely reported on 26.125 from about 0800 to 1800; mornings has QRM from London's GSK, 26.100. (NNRC)

Hawaii—KRHO, 9.650, Honolulu, is scheduled 0245-0345 and 0400-1100; the 17.800 outlet is scheduled 1700-2015 and 2030-0100.

Holland—In celebration of its 20th anniversary on the air, PCJ, Hilversum, announced a contest for the best answer to the question: "Can International Radio Promote World Peace?" Essays were to be of 200 words or less; closing date for the contest was not learned. First prize will be a trip (via air) to Holland, and other prizes will also be awarded.

PJC, 9.59, usually has good signal in the newscast and commentaries read daily *except* Sunday, 2300.

Hong Kong—ZBW3, 9.515, now has fair signal on West Coast to 1000 sign-off; announces return at 1230 Hong Kong time (2330). (Balbi) Heard in British Columbia daily to sign-off; gives call of ZBW; has same characteristic hum on carrier as in prewar days, but is a far weaker signal, with considerable QRM. (Park)

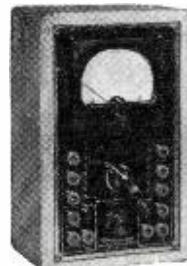
India—The 11.87 frequency is an excellent signal in New York in the 0630 news session. (Beck) In the news period from Delhi at 2230, I note good signals on 15.16, 17.83; weak on 21.51; the 15.19 frequency is good level

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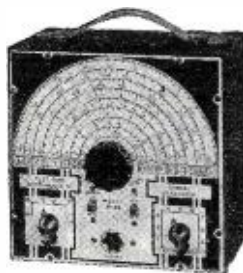


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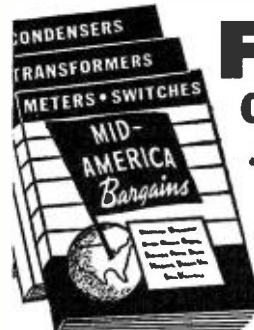
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here in the East at 2130 when news is given, at times being "local" in strength. Frequencies that sign on at 2215 include 15.16, 11.87, 17.83, and 21.51.

Delhi has replaced 15.29 with 17.76 between 0730-0740 when news is radiated. (Legge)

Iran—In a verification letter to Paul Dilg, California, *Radio Tabriz* stated: "Since the date of your letter, we have added *English* to our list of foreign languages; our *English* transmission comes on the air at 0650, *daily except Fridays*; it last only 10 minutes, the news being followed by a couple of gramophone records." It was further stated, "We should be much pleased if you would write us every so often and let us know how you receive our station, and make any suggestions that you can on every phase of our work as comes to your attention at such a great distance as you are from us. We are surprised and pleased that you can hear us at all." The letter was signed by Manuchehr Tranj, an official of the station, and address was simply Radio Tabriz, Tabriz, Iran.

Mr. Dilg comments that it is likely the station by this time has gone on Summer Time, in which case the *English* news period probably is presented at 0550. During the winter the station presented Iranian news at 0500, Russian at 0530, and French at 0540. Frequencies used are 6.087 (varies) and 12.120.

EPB, 15.100, Teheran, now appears to have news daily, including Sunday, at 0715; announces 6.155 outlet in parallel. (Pearce) The 6.155 frequency is now scheduled 2300-0030, 0700-0900, and 1100-1530. The 15.100 frequency parallels in the 0700-0900 transmission. (Logan)

URDXC lists the news for 0615; this would likely be correct if Iran is now on Summer Time.

Ireland—Arthur Levi, ISW monitor in Belfast, secured this data direct from the Engineer-in-chief, Department of Posts and Telegraphs, The Castle, Dublin: "The Irish Short Wave Station still transmits news daily from 1340 to 1400 on 17.840, and from 1710 to 1730 on 9.595. A new 100 kw. short-wave station is in course of construction which it is hoped to complete towards the end of the present year." However, Mr. Levi does not hear these transmissions; *does anyone?*

Italy—The American Expeditionary Station in Rome, 6.060, is scheduled 0100-0400 and 1600-2000; reports should be sent to Signal Officer, Rome Area, Allied Command, APO 794, c/o Postmaster, New York City. (RSGB)

Jamaica—ZQI, 2.330, Kingston, signs off at 2210. (Crandall)

Japan—JKD appears to have replaced JLR as the callsign of the AFRS station on 6.015; heard in Louisiana with news at 0800. The Home Service is heard there also at 0710 over JLW, 7.258. (Crandall)

The 9.695 frequency is heard at

0130 on West Coast, paralleling 15.325, 15.225, 9.655; the 3.475 frequency is heard there between 0530-0630. (Baxter) The Japanese station heard on 3.475, around 0530 and later, paralleling 4.910, may be JO4E, Hiroshima, with a relay of the Japanese National Program. (Dilg)

Java—The Dutch in Java have been conducting extensive experiments in the use of different frequencies for their Soerabaya station. One of these outlets, *Radio Batavia*, 9.470, signs off at 1130. (Radio Call)

Indonesian stations are appearing "all over" these days; among frequencies on which they are noted are 6.370, 6.940, 5.450, 5.000, 7.660, 8.920, 4.370, 4.835, 4.945, 5.615, around 0500-0930, or later. (Baxter)

The 10.060 Javan definitely identifies as "Radio Omroep Bandoeng." (Kary)

The 10.365 station appears to be scheduled regularly for 1100-1130. (Dilg) Is reported heard irregularly at other times.

The Dutch station in Batavia using 18.135, has been heard on a Sunday around 0925-1015 sign-off, announcing "Hier ist Radio Batavia;" had devotional service in Dutch at 1000; fair signal in Pennsylvania. (Kary)

PMA, 19.350, Bandoeng, heard Sundays, 0800-0900, with broadcast in Dutch. (Legge)

Kenya—VQ7LO, 4.890, Nairobi, appears to now be on the low frequency side of Colombo, Ceylon, 4.900; heard with classical recordings at 1330 to sign-off (after time pips) at 1900 with "Cable and Wireless Broadcasting Station, Nairobi, now closing down until 1 p.m. tomorrow." CWQRM at times. Heard in England as early as 1130 with native music; news and commentary from the BBC heard at 1300. (Pearce)

Madagascar—Australians report good signals from *Radio Tananarive*, 9.695, around 1100, in relay with the outlet on about 6.065; identifies as "Ici Radio Tananarive." (Radio Call)

Malaya—*Radio Malaya*, 4.83 (listed on 4.82), Singapore, has had exceptionally strong signals on West Coast mornings during the spring, to 1030 sign-off; occasionally is on to 1100 or later; this station is not to be confused with Singapore on higher frequencies. The British Far Eastern Broadcasting Service, Singapore, is now using all channels (6.77, 11.73, 15.27) simultaneously to 1100 or later; news is relayed from London's BBC at 1000 and 1100; strong signals on West Coast from all frequencies. (Park) This network also uses 15.300.

Monaco—From July, *Radio Monte Carlo* will increase power to 25 kw. on its short-wave outlet, 6.130, and the medium-wave station on 731 kcs. will use 120 kw. Schedule on 6.130 is 0130-0330, 0600-0800, and 1300-1715; present power is 300 watts. (Pearce)

Norway—Australians report Oslo's LKJ, 9.54, opening at 0545 with good signal.

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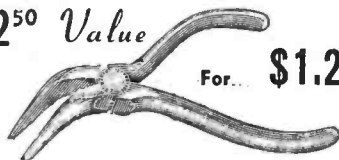
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tralia reported LKQ, 11.735, LLI, 6.185, LKJ, 9.54, and LLS, 7.21, all scheduled 1100-1700; only one heard in New York is LKQ, fair to good, 1400-1700. (Beck)

Philippines—KZPI, 9.71, Manila, has good signals in British Columbia, using 250 watts power; on daily, 1630-1100 (announced); relays BCB outlet on 800 kcs.; verification of correct reports promised. (Park) KZPI has news at 0400. (Nankervis)

KZRH, 9.64, Manila, has good signal mornings in British Columbia, but there is heavy QRM and heterodyne. (Park) Has news at 0730 which

"originates in the newsroom of KZRH"; reports in club publications that this newscast came from the BBC were in error. (Dilg) Some overseas sources list call of this outlet as KZRM; latter may be a medium-wave call.

Poland—Warsaw, 6.114, has news daily at 1550-1605; strong signal in Britain. (Shankie) Radio Warsaw hopes to move to a better channel following the international radio conference scheduled for the U.S. in May. (Kary)

Portuguese China—Macao is reported on frequencies varying from

ULTRA-MODERN RADIO AND APPLIANCE DEPARTMENT OPENS

By HARRY L. SPOONER

THE opening of Livingston's new radio and appliance department in Bloomington, Illinois created quite a stir in Illinois retailing circles recently.

The radio and appliance department, the company's first venture into this type of merchandising, is located in the basement of the store. A wide stairway leads from the main floor to the department. At the base of the stairway and to the left is a spacious platform where feature merchandise is displayed. This section has its own indirect lighting system which is used to highlight the display.

The entire department is decorated in gray, rose, and blue-green. The ceiling is gray, while rose and blue-green are combined in the decoration of walls and fixtures. Walls, ceiling fixtures, and floor equipment are streamlined throughout. A streamlined wall with alcoves is used to display major appliances while separate alcoves toward the rear of the store are used for the record section, radio displays, a complete modern kitchen and a modern laundry unit.

The record alcove has a semi-circular back, around which is built a fixture of vertical compartments for the display and storage of single records. Albums are displayed in a special rack in front

of this unit. The radio alcove is designed to permit the display of several different makes and models of receivers.

The store has utilized the space around the three pillars which support the ceiling by building in circular fixtures made up of a ledge or platform at the bottom and three shelves above, each shelf becoming successively smaller. All but the top shelf of this "pyramid" are divided into compartments to permit the display of varied types of merchandise.

Movable display fixtures and tables are used extensively throughout the department to permit complete flexibility in the display of merchandise.

The lighting system is made up of three different parts. Around the edges of the ceiling and down through the center is located a continuous lighting trough which is installed approximately eight inches below the ceiling. Fluorescent lamps are used in this fixture to provide over-all general lighting for the department. Below this trough is a second unit whose fluorescent lighting is directed downward onto the displays below. A third variation of the lighting consists of a series of lamps housed in metal baffles which are used to "highlight" merchandise on the various display fixtures.



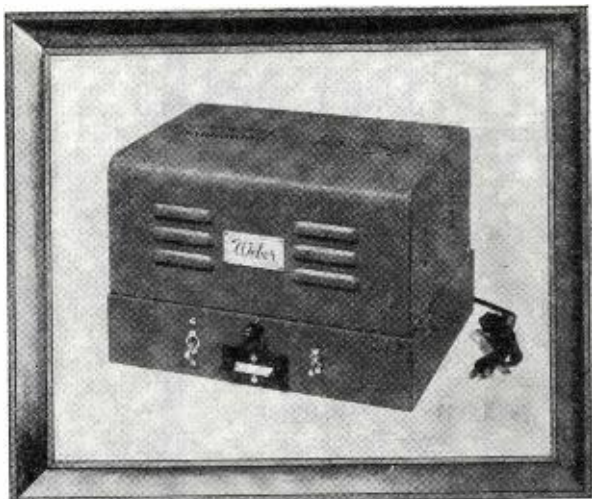
More Power to You

From WEBER

D.C. Power supplies for specific applications—whatever the need. THERE'S A WEBER SUPPLY TO FILL THE BILL.

Are you doubtful of how to convert your surplus equipment from battery to A.C. operation? Are you bothered by the charging and re-charging of storage batteries? Looking for a power unit to operate that 24 volt dynamotor? Then WEBER model 28DC4B, yielding 24-28 volts DC at 4 amperes is what you're looking for, at only \$34.50 or, if your set draws more current, you'd want model 28DC10B giving 24-28 volts at 10 amperes, net \$48.75.

All units come attractively housed in steel cabinets finished in black or grey crackle enamel and equipped with toggle switch, pilot light and binding posts. Long-life Selenium Rectifiers form the heart of our units. Our models will also feature a built-in thermal circuit breaker.



All you need do is to plug into 110v 50/60 cycle.

For your complete satisfaction why not see one of these models at your distributor today, or order direct from us. Satisfaction guaranteed by WEBER.

Listed below are our standard models

MODEL 12DC4C	12 VOLTS DC AT 4 AMPS.....	NET \$16.50
MODEL 12DC12B	12 VOLTS DC AT 12 AMPS.....	NET 32.50
MODEL 28DC4B	24-28 VOLTS DC AT 4 AMPS.....	NET 34.50
MODEL 28DC10B	24-28 VOLTS DC AT 10 AMPS.....	NET 47.50
MODEL 28DC20B	24-28 VOLTS DC AT 20 AMPS.....	NET 77.50

Literature on above models available on request

A letter to our engineering dept. will bring a prompt reply as to which model will best serve your particular surplus equipment. 20% deposit required on C.O.D. orders.

WEBER RADIO LABORATORIES

1793 NOSTRAND AVENUE

BROOKLYN 26, NEW YORK

JOBBERS-DEALERS AND SERVICEMEN! If You Need Tubes—We've Got 'Em!

Type	Each	Lots of 10 Each	Type	Each	Lots of 10 Each
1H5GT	65c	55c	7Y4	50c	35c
1U5	39	35	7X7	50	40
1V	60	50	7AF7	45	40
5U4G	50	40	XXL	50	40
5W4GT	50	45	12A8GT	60	49
5Y3GT	40	37	12J7GT	50	42
5Y4GT	45	37	12Q7GT	53	45
6A7	62	50	12SA7GT	50	39
6A8GT	62	44	12SQ7GT	50	39
6AB7	69	65	12SK7GT	50	40
6AC7	69	65	24A	50	39
6C6	50	42	25L6GT	68	50
6BA6	75	50	25Z5	63	50
6F6GT	45	40	25Z6GT	62	51
6H6	48	44	27	42	38
6J5GT	63	50	32L6GT	60	50
6K6GT	59	39	35Z3	65	60
6K7	60	50	35Z5GT	65	42
6K7GT	60	44	43	90	60
6K8	60	54	45	66	50
6L5G	65	40	47	92	55
6SA7GT	50	45	50L6GT	65	50
6SF7	65	56	56	51	45
6SJ7	50	49	75	67	44
6SK7	55	48	77	45	39
6SK7GT	60	38	80	40	38
6SL7GT	60	52	84/6Z4	58	45
6SQ7	50	45	117Z3	85	60
6SQ7GT	50	45	12A7E	75	45
6U7G	60	48	12BA6	75	45
6V6GT	83	50	12BE6	75	45
6X5GT	55	45	50B5	54	42
7A4	69	40	32L7GT	90	80
7B6	50	40	1A5 GT	60	50
7B7	50	40	1A7 GT	60	50
7C6	50	40	1N5 GT	60	50

1625 Transmitting Beam Power, Amplifier. Same as 807 except 12.6 volt filament medium.
7 Pin Base.19c ea.
1629 Tuning Indicator—Tri (Magic eye) Tube. 29c ea.
All Tubes Fully Guaranteed

Adjustable Panel Lamp Assembly

Mounts in 3/4 inch hole on panels to 3/4 inch. The red jewel assembly is with shutter that controls the visible glow. Takes standard miniature bayonet base lamps replaceable from the front panel.
Closeout Special.25c each

XTRA SPECIAL BUYS!

AC PHONO MOTOR



60 cycles, 115 volts with turntable and standard make crystal pickup.

\$4.95 Complete

SIGNAL CORPS DUAL HEADSETS

2,000 ohms with 6 ft. cord and tips, also 8,000 ohms high impedance, with two rubber ear cushions, cord and phone plug, individually boxed. List price \$12.50.

\$1.85 each



BRAND NEW WILLARD #20-2 2 VOLT STORAGE BATTERY

Used in General Electric Model #530 charge A pack portables. Suitable for all farm radio sets. Individually boxed. List price \$8.95.

\$2.95 Special each



Convert any record player to wireless— with this complete assembled and tested 2-Tube Wireless. Phono Oscillator less tubes.Special \$3.95

Standard make 6 volt 4 prong Auto Vibrator. \$1.19 each

Send us a trial order. This will convince you we merit your patronage, based on low prices, quick delivery and fully guaranteed tubes and standard brand merchandise.

STANDARD BRANDS AT OUTSTANDING PRICES

- 12" P.M. Speaker, Alnico 5 Magnet. Packed 4 in a carton. \$ 5.95 ea.
- Lots of 12. 66.00
- 8" P.M. Speaker. \$ 2.75 ea.
- Lots of 12. 30.00
- 5" P.M. Speaker. \$1.39
- 6" P.M. Speaker. 1.89
- 4" P.M. Speaker. 1.29
- P.P. Input transformers. \$0.95 ea.
- Lots of 12.85 ea.
- 40x40 Electrolytic Cond. 150 V. \$0.49
- 50x30 Electrolytic Cond. 150 V.49
- 30x20 at 150 V and 20 mfd at 25 Volts.45
- 500 M ohm V.C. with Switch, 2 1/4" Shaft. Popular Brand. \$0.42 ea.
- Lots of 12. 4.80
- 50 Mil Power Transformer, Primary 110 V. Secondary 6.3, Rectifier 5 V. H.V. 480 V C.T. \$1.95
- 456 K.C. 1F Coils Input and Output, medium size. \$0.49 ea.

Write, wire or phone for our Special Quantity Prices
25% Deposit on all orders, balance C. O. D.

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TS-47 TEST OSC

40-500 Megacycle Continuous

AIR CORPS TYPE TS-47/APR hi-freq Sig Gen mfd. by Fairchild. Range 40 to 500 MC (in 2 ranges). Mfg. specs—1% accuracy at 88 F. Silver plated butterfly oscill. tank circuit. Extremely rugged. 500 cps pulse or 1000 cps sine wave A31 mod. from self contained Heising mod. Output up to 3 milliwatts 40 to 400 mc. up to 1 milliwatt 400 to 500 mc. Self contained vert. radiator or 52 ohm co-ax. cable term. Contains power sup. designed 115-230 vac 50-2400 cps or ext. bat. RF output variable. Excellent for Pre-flight check of VHF receivers and hi-freq work demanding accuracy and versatility in above freq range. Brand new and complete with tubes in carrying case. Dim. 11 1/4" H X 9 1/2" W X 6 3/4" D. **YOUR COST \$165.00**

FIELD MICROPHONE

For Sonde Equipment



- Condenser Head
- 2-Stage Amp. (Self Contained)
- Portable
- Rugged Cylindrical Brass Case

FIELD MICROPHONE T-21-B designed by Sig. Corps. Mfd. by Cardwell. Used to determine range & direction of artillery fire & blasting by triangulation and oscillographic recording.

Ideal for sound pressure studies. Geophysical Sonde applications. Mine Safety Alarm, etc. Diagram supplied. Brand new! Your Cost **\$23.50 ea.** (Less Tubes)

In Lots of 5—\$19.50 ea.

HI-VOLTAGE SUPPLY SCOPE—TELEVISION



HIGH VOLTAGE KIT

3500 V. DC Up to 15 MA.

\$14.00

In Lots of 10 **\$12.50**

Contains following list of three (3) hermetically sealed components, made by outstanding mfrs.
1 ea.—Trans. Pri.-115 V 60 ~ Sec. 3000 V—15 MA.
1 ea.—Trans. Pri.-115 V 60 ~ Sec. 0.3 V & 2.5 ~ @ 3 amps HI-insul.
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DELCO DUAL BLOWER

Brand New in Original Cartons
200 Cu. Ft. per minute. 115 V 60 ~ Continuous Operation with Mounting Brackets.

Your Cost **\$14.90 ea.**

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TUBES

Sold in Lots of 10 Only

BRAND NEW

1L5	\$.75	12A6	\$.90
1R5	1.00	12SN7	.75
3A4	.95	12L5	.75
3Q4	.75	12SR7	.90
6AK5	1.20	12C8	.75
6M6GT	.55	1625	.70
6L7	1.25	1626	.70
6SQ7	.90	1632	.70
6V6	1.00	1633	.80
6AC7	.90	35W4	.80
6SH7	.85	884	.90
6SJ7	.85	885	.95
6SK7	.75	2050	1.00
5U4G	.65	2051	1.00
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KELVIN ELECTRONICS

74 Cortlandt St., New York 7, N. Y.

9.23 to 9.254; has news at approximately 0740, and has been heard to announce as "Macao Radio Club," with a call of CR8AA; according to *Radio Call*, the station leaves the air around 0940 with the Portuguese National Anthem.

Siam—Direct from Nai Sunthorn Hongladarom, Chief of the Foreign Division, The Publicity Department, Bangkok, comes official schedules of *Radio Bangkok*. The Overseas Service is heard on HS8PD, 49.6 m., 6.040 (actually appears to be around 5.995, according to listeners), 0500-0630, in daily program in *English*, as follows: Three chimes and opening announcement at 0500; music on records; The News at 0515; musical entertainment at 0525; press review (Mon., Wed., Fri.) or talks (Tue., Thur., Sat.) or The Passing Week (Sun.) at 0545; musical entertainment at 0550; The News at 0615; musical interlude at 0625; program announcements; close-down at 0630. The Home Service is transmitted over HS7PJ, 363.32 m., 825.65 kcs., 0700-0915 (programs in Siamese). While this period is not listed for transmission on short-wave, it has been reported heard from the 6.040 outlet. "The Overseas Broadcasting Station," as *Radio Bangkok* is now called, is sending out a very nice (new) verification card. It was stated, "We will gladly reply to any queries or verify any reports from listeners abroad and we do not demand reply coupons." Normal input power of the short-wave station was listed at 900 watts with an output of 500 watts.

Southern Rhodesia—ZEA, Salisbury, is scheduled on 3.65, 1200-1700. Umtali, 3.40, is on daily, 1000-1300, and also broadcasts on 6.08, 0300-0330. (ISWC) Australians report Salisbury signs off at 1535 with "God Save the King"; identifies as, "You are tuned to Salisbury." (DXSA)

Spain—New schedules of Madrid, 9.369 (announced), are 1330-1600 and 1930-2200; news at 1500. (Beck)

Tahiti—FO8AA, 6.98, Papeete, was recently logged by Paul Kary, Pennsylvania, at 2258 in French on a Friday; a man spoke in a Polynesian language from around 2308-2332; signed off at 2338 with a march which was not "La Marseillaise." (This station is usually covered by CW, but occasionally comes in with fair level in the East; heard often on West Coast.) At last report was scheduled Tuesday, Friday only, around 2200-2330.

U.S.A.—The World Radio University has resumed its broadcasts to Europe over the Boston transmitters, WRUL, 15.29, and WRUW, 11.73, 1500-1700, in *English*, Dutch, French, Norwegian, Greek, and other languages.

U.S.S.R.—Reception of Moscow continues unreliable. Best bet in the evening beam to the United States appears to be 9.48, 1820-2100, but this frequency often has bad CWQRM. The 7.24 frequency is audible some evenings. (Beck) The 11.89 frequency, used widely for sending press

For Your New Direct-Reading STANDING—WAVE METER

2" sq. 0-1 DC Milliammeter, Blank Dial or 0-1 MA Scale as Illustrated.



\$3.95 each

Variable Capacitor 3—15 mmfd 4 Plates Slickles #7767343-2..... **79¢** each

1/2 w. Resistors \$2.50 per 100.

Bathtub Capacitors .1 mfd—.25 mfd .5 mfd—3 x .1 mfd & 1.0 mfd 400 & 600 Volts D.C.W. **14¢** each

Mail Orders filled. Send check or money order. All orders sent Postal Prepaid.

UNITED RADIO & SOUND AMPLIFICATION CO.

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LOOK AT THESE GOV'T SURPLUS VALUES!

FAMOUS BC-312 CHASSIS

Built by RCA

Chassis with hundreds of parts mounted. Condensers, transformers, sockets, wiring, individually boxed. **\$1.95**



RCA HIGH IMPEDANCE CUTTING CRYSTAL HEAD AND ARM

REGULARLY — \$17.50—
YOUR **\$2.95** COST.



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Export Orders Filled Promptly — Cable ALRAD



AUTOMATIC IRON TESTER

for setting thermostats. Meter calibrated to read directly—cotton, silk, rayon, linen, wool. Also calibrated in degrees 0° to 800° F. Checks opens and shorts and temperatures on most all types of appliances—complete... **\$27.50**

AMPLIFIERS

5-Tube Guitar Amplifier with 12" speaker. Has 2 guitar and 1 micro input. Volume and tone controls. Pilot light and fuse. Assembled complete in attractive cases.

LIST PRICE **\$84.50**

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Copper Tip Heats in 5 Seconds
Original Exclusive GRAPHCO HEATING Element

Solders better, faster, easier on heavy or light work. Operates from 6-volt storage battery car, truck, tractor or 110 A.C. transformer. Extremely efficient for radio repair shops and for model radio enthusiasts. Handy around shop or home. Send check, money order, C.O.D. for \$5.95. Satisfaction guaranteed.

MET-ELEC CORPORATION
2616 East 29th St. Minneapolis, Minnesota

RADIO NEWS

dispatches to the U.S. around 1900-1930, appears now to be transmitting the *English* language beam to the United States, 1820-2100; poor signal. (Patterson) In the morning North American (*English*) beam, best signal is heard on the 15.18 (announced) frequency, 0700-0800. (Patterson)

Last Minute Tips

In a recent dispatch from Geneva, it was stated that United Nations representatives and a Swiss government delegation have concluded an agreement for the use of certain wavelengths and broadcasting facilities. The agreement is ready for submission to the United Nations. It is proposed to use the old "Radio Nations," property of the League of Nations and now acquired by the Swiss government, as temporary premises pending the establishment of a permanent station by the U.N. (Callahan)

HVJ, Vatican, now has *English* session at 0900 instead of 1000 on 9.66.

YSUA, not YSU, is correct call of *Radio Mil Cincuenta*, Salvador, 6.250. YSU is BCB call. (Kary)

Cape Town's 9.608 is heard with good signal mornings to 1045 sign-off. (Balbi)

XMAG, about 11.250, Nanking, is heard on West Coast around 0520-0950 or later, seems to have irregular schedule; 4.275 is in parallel. XOPD seems to vary a great deal; has been logged on 9.910, 9.895, 9.880. (Baxter)

A station heard on about 21.450, with fair signal, at 1145, in French, may be Brussels. (Baxter)

In a recent DX session, *Radio Australia* reported VQ7LO, Nairobi, Kenya, had moved from 4.95 to 4.885. (Beck)

XLRA, about 11.49, Hankow, is probably scheduled 0530-0945. XOPD, Hangchow, has been "jumping around," in vicinity of 9.795. Formosa on about 7.220 has Chinese news at 0800, and relays XGOY's news at 0900, has been heard around 0930 with news at dictation speed. (Dilg)

HI2T, Monsenor Noel, Dominican Republic, appears to have moved to 7.275. (Beck) Heard signing off at 0000, announcing as "HI3T and HI2T, "La Voz del Yuna, Ciudad Trujillo." HI3T may be medium-wave call. (Baxter) Widely heard.

Mervyn P. Laubscher, South Africa, has secured these current official schedules direct from *Radio Clube de Mocambique*, Lourenco Marques:

Portuguese—Weekdays, 0000-0100, CR7BJ, 9.645; 0400-0630, CR7BJ, 9.645; 1100-1500, CR7AA, 6.137, and CR7BJ, 9.645; Sundays, 0400-0700, CR7BJ, 9.645, and 1100-1500, CR7AA, 6.137.

English—Weekdays, 1100-1700, CR7BV, 4.900, and CR7AB, 4.390; Sundays, 0200-0700, CR7BE, 9.580, 1000-1700, CR7BV, 4.900, and CR7AB, 3.490.

In monitoring Lourenco Marques for RADIO NEWS, Mr. Laubscher makes this comment: "I find schedules for weekdays are in order, but the Sunday data do not 'click.' The Portuguese morning program is not on

JUNE LEOTONE SPECIALS

Minimum order \$2.00—20% deposit required on all orders. Please add sufficient postage. WRITE DEPT. RN-6

SELENIUM RECTIFIERS. Half wave. Max. input: 50V. AC @ 1 amp.; approx. 25% volt. drop when used in full-wave bridge. With hook-up for half or full wave rect. 1 1/4" O.D. ea. 69c; 4 for \$2.49

Western # 301 0-50 voltmeter (modulation) AC rectifier. 1000 ohms per volt. 3" bakelite. 3.95

Wafer Loctal Sockets. 1 3/8" mtg. Each—6c; 20 for 1.00






Variable Condensers. 2 gang. 365 mmfd. All with trimmers. 3/8" shaft. 1 3/16" long. Cadmium plated .75

Precision Resistors. ± 1% wire-wound. Ohmages: 2.35, 11, 24.5, 100, 3330, 5290, 7800, 30K, 50K or 400K .35

5AG Fuses. Hvy duty cartridge, 1 or 3 amps @ 250V. (1 1/2"x3/8"). Either—9c. 8 for 1.00

AC-DC NEON TEST-LITE. Use as probe or fixed indicator from 90V up. Each—15c. 8 for 1.00

ALNICO MAGNETS

#1  #2  #3  #4  #5 

1—Bar. 8 1/2"x5/16"x1/8" .50.59

2—Face 1 1/2"x1 3/4"x7/8" high .98

3—Heavy Duty Bar, 2 1/2"x5/8"x5/16" .39

4—Face 3/4"x5/8"x5/8" high .98

5—Polished 7/8"x9/16"x3/8" high .35

6—Polished bar, 9/16"x1/4"x1/8". 20 for 1.00

7—Face 1/2"x1/2"x3/8" high .70

8—ALNICO V. h'shoe, poles 3/8" Sq.; 1 1/4" high .15

9—ALNICO V. h'shoe, poles 9/16" Sq.; 1 1/2" high .98

10—ALNICO V. h'shoe, poles 1"x1 1/2"x23/4" high 5.95

11—Horseshoe, pole 1 1/16" O.D. 2 1/4" high 1.29

12—(Similar to # 5) 3/4"x2 3/8"x7/16" high .35

14—Polished hvy duty bar 3"x1 1/2"x7/8" (magnetized lengthwise, wide or narrow sides) 1.29

15—Polished Block 3"x2 3/4"x1 1/2" Magnetized wide or narrow sides (wt. 9 lbs.) Unmagnetized 2.49

16—Flat Bar. 1 1/4"x15/16"x5/16" thick 1/4" groove ea. end .49

17—Circular. 1 1/16" O.D. 3/8" hole; semi-circular poles on flat sides. .49

18—Round bar, 1/4" O.D. 5/16" long, polished .13

19—Round h'shoe, 1/2" O.D. 7/16" high. .12

20—Round bar, polished, 1/8" O.D. per inch. .10

21—Round bar, polished, 3/8" O.D. 4" long. .35

22—Round bar, polished, 5/8" O.D. 1 3/4" long .39

23—Round bar, polished, 5/8" O.D. 2 1/8" long .59

24—Round bar, polished, 5/8" O.D. 4 1/4" long 1.25

25—Round bar, polished, 3/4" O.D. 5 1/16" long 1.49

26—Round bar, polished, 3/8" O.D. 2" long. .49

27—Polished block 3/4"x3/4"x3/8" .39

Telegraph Key & 6V. Buzzer (Western Electric). Gap & tension adjust; bakelite base. \$1.25

Telegraph Key only. Adjustable platinum contacts. .49

9" McGuire Changer Pick-up Arms (Astatic). Light cast metal, brown enam. finish. Less L-70 type cartridge .69

"SPECIAL!"—GIANT "GRAG-BAG" RADIO PARTS KIT. A real buy for the Serviceman, Amateur or Experimenter. FULL STOCKS of useful resistors, condensers, coils, wire, speaker repair parts, hand-ware, transformers, etc. An amazing value at \$1.95

SELSYN Control Transformers (# 2J1G1) Originally 110V-400 cycle, will operate on 50V, 60 cycles. \$1.95

SELSYN Synchro-Transmitters (type 5) 115V, 60 cycle. Used in pairs as trans. & follower. 3 1/2" x 1 1/2" ea. 3.75

2" Meter Case & Housing (round). Complete with glass & adjust screw. 1" deep. .39

Weston # 301 meter glass & frame; adjust screw. .89

EXPERIMENTAL TUBES. 20 asstd. receiving types for testing, research etc. Filament tested. 1.00

TUBES: Perfect condition, but not in sealed cartons. Guaranteed for 90 days. # 28, 27, or 56 .28c; # 42, 45, 74, 77, 78, 80, 89, 5Y3, 6H6, or 6K7 .50.39

6A8, 6C5, 6F5, 6J7, 6SK7 or 35/51 .49

1A7, 8A3, 6G5/6U5 or 50 .59

Brand new R.C.A. UX-20 tubes in sealed cartons. Ideal diode detector. 8 for 1.00

SPEAKER GRILLES 5 1/2" sq. Flocked musical design on gilt perforated metal. \$0.19

Speaker Grille Cloth. Decorative gold or silver weaves. Per sq. foot. POUNDS of useful resistors, condensers, coils, wire, speaker repair parts, hand-ware, transformers, etc. An amazing value at \$1.95

Cone Centering Shim. Kit of 16. 4 thicknesses in durable leather case. .35

HEADPHONES (Army HS-33) 2000 ohms. Leather covered, adjustable. With PL-54 plug. \$1.25

Sponge rubber phone cushions. Per pair. .20

HS-13 2000 ohms Phones (2-R14 receivers) with 13" double cord and PL-54 plug .98

HEADBANDS (HB-7) with PL-54 plug & cord. .39

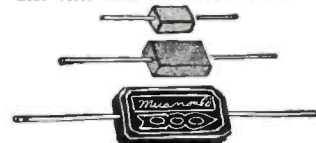
PL-54 plug & 13" tipped double phone cord. .19

JK-26 ext. jack for PL-54. Bakelite shell .23

SERVICEMEN'S KITS

1—R.F. Antenna & Osc. coils. 10 asstd. \$0.98

2—Speaker Cones: 12 asstd. sizes, 4" to 12" moulded & free-edge (magnetic incl.) Less voice coils 2.00



3—BAKELITE MICA CONDENSERS: 50 asstd. .0001 to .2 mfd. 200-600V. Clearly marked 2.95

4—TUBULAR BY-PASS CONDENSERS: 50 asstd. .001 to .25 mfd, 200-600V. Standard brands 2.49

6—Dial Scales: 25 asstd. airplane & slide rule (acetate & glass included) 2.98

7—Escutcheon plates: 25 asstd. airplane, slide rule & full vision types 2.95

8—Knobs: 25 asstd. wood & bakelite, including push-on & set screw types. 1.00

9—Wafer Sockets: 12 asstd. 4 to 7 prongs .25

10—Voltage Dividers: 10 asstd. standard multi-tapped. High wattages included. 1.98

11—Shield Cans: 15 asstd. for coils, tubes, transformers etc. 1.00

12—Mica Padders & Trimmers: 15 asstd. including multiple & ceramic base types .69

14—Volume & Tones Controls: 10 asstd. wire-wound & Carbon. Less switches. 1.98

15—Wire-Wound Resistors: 15 asstd. ohmage, 5 to 20 watts. .98

16—IF Coils: 6 asstd. including shielded & slug tuned. Peak unmarked. 1.95

17—Flat Windows: 12 asstd. sizes, incl. flat & moulded acetate and convex glass 1.29

18—Bakelite Coil Forms: 18 asstd. popular sizes up to 3" in diameter. .98

19—High Resistance Units: 25 asstd. 1 watt, carbon-wire, ferrule-end 25K to 5 megohms .49

20—SPEAKER REPAIR KIT. A real money & time saver. Contains: 25 asstd. paper rings, 10 spacers, 25 asstd. voice coil forms, 25 felt strips, 20 chamois leather segments, kit of 16 shims & tube or Speaker cement. All for 2.49

21—Metal Case By-Pass Condensers: 10 asstd. paper-wound multi-section. 200-400V .49

22—Resistor Assortment: 20 carbon & wire wound, asstd. ohmage, 1/2 to 3 watts. .49

23—RADIO CEMENT & SOLVENT KIT. Contains 3 oz. each of all-purpose cement solvent (thinner), with applicator brush .69

Bendix Amplifier (Line of Sight rotary indicator). 1150 cycle. Contains: power transformer, 3 audios, 6 oil condensers plus other components worth many times the price. Black crackle case. 7"x5 3/4"x4" \$1.95



"OUNCER" INPUT TRANSFORMERS (7/8"x1 3/16") # 56—Carbon mike to grid; # 58—Dynamic mike or low impedance pick-up to grid. Either—49c. 12 for \$5.00

Frequency Meter Tech. Manual (Navy) Theory & Operation. 58 illus. & diagrams. 98 pp. \$0.15

RADIO HARDWARE TREASURE. An indispensable assortment of approx. 1000 screws, nuts, washers, etc. etc. .49

Victor Power Transformer for models R-32, 45, 52 or 75. Unshielded 5.95

ALUMINUM PANELS (.051") 7"x10" .39

7"x12" .45; 7"x14" .49; 7"x18" .59

BAKELITE PANELS 3/4" glossy brown. 7"x10" .39

7"x14" .69; 7"x18" .79; 9"x14" .85

1/4" Linen Bakelite Strips, 11"x1 1/2". 3 for .25

"Acro-Snap" Momentary Switch SPDT. Needle plunger (2 oz. pressure) 10A/125V. Bakelite case .39

"PHONO MOTORS!"—Twin-coil 110V AC quiet rim-drive, fan cooled. With 9" turntable. \$2.95

DYNAMOTORS (Navy DY-9) DC input: 26V-DC output: 360V. @ 135ma or 310V. @ 355ma. Black crackle finish with mtg. base 6 1/2"x3 1/2". \$3.95

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MAKERS OF CONES AND FIELD COILS
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WORTH 2-0284-5
12,000 SQ. FT. OF RADIO PARTS

Every Radio Serviceman
Needs This New **FREE**

AC-DC BALLAST TUBE MANUAL

JFD's new 68-Page Ballast Manual is a treasury of information for Radio Servicemen and Dealers — **AND ITS' FREE!**

10,000,000 radios now in use employ plug-in ballasts. Eliminate guesswork when replacing — consult the JFD Ballast Manual. It lists:

1. More than 3000 radio ballasts.
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Revolutionary
WIRE RECORDER



Simple to operate . . . providing accurate, life-like reproduction, the RCA magnetic Wire Recorder is an invaluable tool for schools . . . business offices . . . public speakers . . . musicians. • No complicated threading. • No handling of wire. • Simply plug in, turn on power, and record speaking or singing voice or instrumental music. Timing dial calibrated in minutes running time for both wires.

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RADIO SUPPLY CO.
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Greenwich SPECIALS

OIL CONDENSERS, 4MFD 2000 Volt DC 2 for	\$ 5.00
NEW BUD COILS, 160 meters, 150 watts. 2 for	1.25
BC-499 FM RECEIVER, 2-29 MC—Used condition. Some complete with tubes and crystals. Dynamotor, 11-tube set; compact. As they come. . .	10.00
RG-11/U Coaxial twin-shield cable; 72 ohms; 100 feet. . . .	7.50
MEISSNER FIXTURED 30 Mc IF Transformers; unshielded. 4 for	1.00
FILTER NETWORK contains 5-670UH Chokes across 4 180MMFD condensers, wax impregnated, in an alu- minum shield can. 5 for	1.00

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2X2 . . . \$0.90	6J5 . . . \$0.65	304TL . . \$3.75
5Y345	6SJ765	8136.25
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6AC790	VR75-90 .75	954-5-6 .65
6AK5 . . .1.00	VR105 . .75	9002-3-6 .85
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25% deposit required on all C. O. D. orders.
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NEW YORK CITY 7, N. Y.

CR7BJ, in fact, I do not hear it at all on short-wave; and the *English* program definitely does not use CR7BE (haven't heard this frequency in use yet), but instead uses CR7BJ on 9.645."

An Indonesian station on about 14.550 has *all-English* program between 0900-1000; announces as "Voice of Free Indonesia"; news varies around 0945 to 0950; parallels 7.420; announces as 14.490 and 7.420. (Baxter)

Moscow is using 15.300, *new*, in parallel with 15.340 at 0030. (Baxter)

OZH-2, Copenhagen, is reported scheduled 0800-1245, *Sundays only*, on 15.32; has not yet been reported as heard in the United States.

Bucharest, 9.25, is reported scheduled 0000-0015 and at other times. (Beck) *Is it heard on this side of the Atlantic?*

XGOA, Nanking, on 9.73 and 11.835, carries the news from XGOY at 0900. (If now on Summer Time, this XGOY *English* news service, relayed by many Chinese stations, including Formosa, may be heard an hour earlier, that is, at 0800.)

Radio Rangoon, Burma, is reported back on about 9.54 from 6.035, for the *English* transmission, 0840-1015, news at 0845.

Frequency for CR7IB, Beira, Portuguese East Africa, has been measured at 7.165 by Henry Ecksteen, Pretoria, South Africa, a RADIO NEWS monitor. Paralleled by CRTIC, 3.498, CR7IB is scheduled *daily*, 0445-0545 and 1300-1500; *Sundays*, 0400-0700; uses Portuguese, *no English noted*. (Laubscher)

PRL-9, 17.85, Rio de Janeiro, has been heard mornings to 0745 sign-off. (Legge)

Radio Roumania, Bucharest, appears to be on in 15-min. periods on the hour at various times, such as 0900, 1000, and so on; has been heard in Britain at 1500, 1800; gives multi-lingual call (including *English*); asks for reports from listeners, including time of reception, strength, fading, interference, type of receiver used; address given as Roumanian Radio, 41 General Bethulow Street, Bucharest, Roumania; states all reports will be verified in writing. (Pearce)

Praia, Cape Verde Islands, 6.400, is scheduled 1530-1700 with .03 kw.; address, Radio Clube de Cabo Verde, Praia, Cape Verde Islands. (Frick)

Japanese stations on 7.258, 6.003, and 4.910 are heard at 0445 with *English* lesson. (Dilg)

Gerard V. de Freitas, long-time manager of ZFY, Georgetown, British Guiana, has resigned to take over program direction of the new *Radio Trinidad*; he was manager of the B.G. United Broadcasting Co., Ltd., from 1941 to 1947, and for a period during the war was in Washington, D.C., doing radio work concerning Latin America. He has been succeeded by A. E. Roberts who has been connected with ZFY since 1941 as secretary; Mr. Roberts has been associated with Guiana broadcasting since 1935 when he was one of the early announcers of VP3BG. (*ZFY Radio Guide*)

RADIO NEWS

Hargeisha, British Somaliland, 7.12, is on daily, 0800-1030. (Pearson)

By this time, YV7RB, Cumana, Venezuela, will probably have moved from 3.470 to 3.590, with the installation of a new transmitter; wants reports, but must be sent in Spanish; address, c/o Estacion de Onda Large YV7RA, "Radio Sucre," Apartado 26, Cumana, Sucre, Venezuela. (Kary)

Airmail tips just in from Ronald Gray, New Zealand, include: YI5KG, 7.085, Baghdad, Iraq, signs off at 1430; news in Arabic is at 1400; Bucharest, 9.25, heard testing at 2300-2315; Sofia, Bulgaria, on 7.660 has news at 1530, and signs off at 1540; XGOE, 9.82, Kweilin, appears to open at 0530, has news at 0600.

Finally, these late tips come airmail from Miss Dorothy Sanderson, Malvern, Australia, one of the leading DX-ers "Down Under": Western type music is heard in Australia at 0530 from XMTA, 12.215, Changsha. *Radio Kuala Lumpur*, 6.165, Malaya, has and music at 0800. AIR, Delhi, 4.96, has news at 0730. FK8AA, 6.16, *Radio Noumea*, New Caledonia, has news in French and music at 0445. *Radio Mascassar*, 12.32, has been heard at 0530 with musical program. WLKS, 6.105, Kure, Japan, outlet of BCOF, is heard with news at 0430. CR7BU, 4.92, Mozambique, has news at 1515, good signal. *Radio Rodina*, 9.33, Sofia, Bulgaria, has news at 1530, followed by program details. The Suva, Fiji Islands, weather station on about 6.45 is heard with weather reports at 0600.

Berne now beams three transmissions daily including Saturdays to North America; 1730-1815, 11.865 (100 kw.); 2030-2200, 9.535, 11.865 (100 kw.), 15.315; 2200-2230 (to West Coast), same frequencies as transmission two. Reports desired.

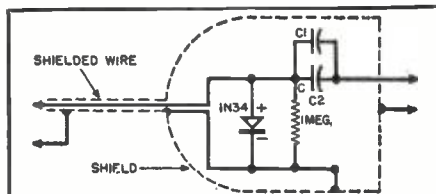
Acknowledgement

Sincere thanks go to all contributors to this month's ISW Department. Please keep up the FB!

CRYSTAL DIODE PROBE

WE HAVE received several inquiries for the circuit diagram of the crystal diode probe pictured on page 43 of the January, 1947, issue of RADIO NEWS. The author, Mr. J. C. Hoadley, has given us this information, and we felt that it would be of interest to many of our readers. Therefore, the diagram and values of component parts are reproduced below.

Circuit diagram of crystal probe. It can be used with either crystal phones or voltmeter. Note C₁ and C₂ should be as large as possible if audio frequencies are to be measured. The author used two 51 μfd. ceramicons for r.f. and two 1000 μfd. ceramicons for straight audio applications.



June, 1947

NEWARK VALUES LEAD THE FIELD

NEW EDWARDS 8-Tube FM TUNER



Easily attached to AM receiver or Phono Amplifier for complete High Fidelity for reception—87.5 to 109 FM reception—Extremely compact, mc. Uses 6AG7, 6J6, 3-6SH7, 6AL5, 6V5, 7Y4. Top quality. Wgt. 10 lbs. Complete with Tubes..... **\$52.50**



5-TUBE SUPERHET AC-DC KIT

Full-sized 5 Tube SuperHet Kit with Automatic Volume Control, Built-In Antenna, PM Dynamic Speaker, Brown Plastic Cabinet. Build it yourself and enjoy fine performance! Uses 12SA7, 12SK7, 12SQ7, 50L6, 35Z5. For 110 volt AC or DC. Complete, **\$12.75** less tubes..... Complete Kit of Tubes (as above)..... **\$4.08**

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2-Tube Model Compact, mts. any position. Tone, volume controls. 35Z5, 50L6. 110 V. AC-DC. Wired, ready to operate, less tubes..... **\$2.95** 2 tubes for above..... **\$1.62** 3-Tube Model—Similar, uses 35Z5, 12SK7, 50L6. Less tubes..... **\$4.45** 3 Tubes for above..... **\$2.54**



PHONO Oscillator

2-Tube Kit Compact, mts. anywhere. 110 V. AC-DC, Incl. 2 tubes..... **\$5.33**



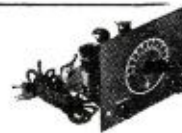
12-20 Watt PHONO AMPLIFIER

High Fidelity Phono Amplifier for quality reproduction. Matched components. Minimum distortion. Uses 2-7F7, 2-6V6GT, 5Y3GT. Separate tone equalizers. 12 x 6 x 8 1/2". Wgt. 18 lbs. Incl. cover, less tubes..... **\$36.75** Kit of matched tubes..... **\$4.95**



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Great fun to build and enjoy. Gets all stations from 550 to 1500 kc. 110 volts AC or DC. Uses 2-6J5 and 1-6SJ7 Tubes. Complete kit, less tubes, wire, solder, and phones, only **\$6.15** 3 Tubes..... **\$2.40** Phones, **\$1.95**



V M MIXER CHANGER

Sensational! Plays 10" and 12" records intermixed with no adjustment. Light, crystal pickup. One control knob for on, off, manual, automatic, press to reject. 110 Volt, 60 cycle, noiseless motor. 15 x 14 x 7 1/2" H. Wgt. 16 lbs. Only..... **\$17.95**



TRANSMITTING and SPECIAL PURPOSE TUBES

2AP1	\$2.25	10Y	1.50	800	2.25	815	2.25	843	.75	955	.75	1629	.27
3AP1	3.00	OC3/VR105	.75	802	1.58	816	.60	845W	3.75	956	.75	2051	.90
2C40	2.63	OD3/VR150	.75	803	9.00	826	2.25	872A	2.25	957	.75	8005	3.15
2C44	1.50	75T	2.25	805	3.75	829B	3.00	874	1.95	958A	.75	8016	.53
2X2/879	.90	211	1.13	807	.95	830B	5.25	884	.75	959	.75	8025A	3.90
5AP1	9.00	250TH	9.00	808	3.00	832A	2.25	922	.68	1616	3.00	9001	.90
5CP1	6.00	304TH	12.00	809	1.50	836	1.50	923	.45	1619	.75	9002	.90
6AK5	.90	304TL	3.75	811	1.95	837	3.38	927	.95	1624	.90	9003	.95
3E29	3.00	801A/801	1.73	813	6.75	838	3.75	931A	1.88	1625	.75	9004	.90
				814	4.50	841	1.20	954	.75	1626	.60	9006	.68



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New, Guaranteed! 8000 ohms imped. Bakelite caps and shells, rubber cushions, Adjustable headband.

Model HS-23, **\$1.95**

Sale Price.....

Model HS-33, Same, but Low Impedance. Sale Price..... **\$1.89**

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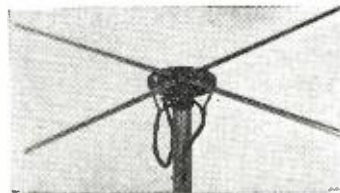
HALLICRAFTERS S-38 complete..... \$47.50 S-40A complete..... 89.50 SX-42..... 275.00

HAMMARLUND HQ-129X complete... 173.25 SP-400X complete... 342.00 RME-45 complete... 198.70 RME-84 complete... 98.70 Panadaptor..... 99.75 Meck Transmitter... 150.00 Jones Micromatch... 29.50

Standard Receivers Now Available!

NATIONAL NC-173 w/speaker.... 189.50 HRO-5Tol complete... 306.71 NC-240D w/speaker... 241.44 NC-46 with speaker... 107.40 1-10A with tubes, less speaker and power supply..... 67.50

IT'S NEW



THE HI-PAR Non-Directional FM Antenna

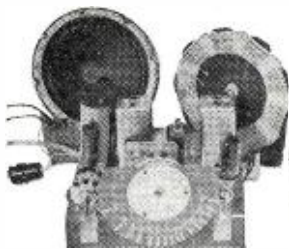
HI-PAR PRODUCTS CO. FITCHBURG MASSACHUSETTS

NON-DIRECTIONAL

Efficiently receives signals from any direction. Eliminates faults of dipoles. Easy to install. No guy wires. Exclusive Matching Section provides maximum gain. Modern styling. Permanent construction. The antenna that meets all present and future requirements.

SOME AREAS OPEN TO REPRESENTATIVES

FITCHBURG MASSACHUSETTS



WITH
THIS
COMPLETE
RADIO
KIT

Direct From Manufacturer
PLUS 2 HOURS OF YOUR TIME
you can complete the
assembly of an

EMPRESS RADIO

AT
JUST
HALF
THE
RETAIL
COST!



IT WORKS LIKE A CHARM!
IT LOOKS LIKE A DREAM!

A delightful new note in home decoration . . . the EMPRESS captivates young and old alike. A welcome addition to any room in the house. Life-like tone . . . dependable performance . . . hair-line selectivity.

HERE ARE THE SPECIFICATIONS:

- 5 quality, long-life tubes.
- Broadcast Band—545—1630 KC.
- 2 Band 545—1630 KC, 7-15 MC.
- Operates on AC or DC current.
- 5 inch Dynamic Speaker.
- Size 10½" high, 8½" wide, 6¼" deep.
- Cabinet (optional), as illustrated, finished in cream, red and brown trim.

AND PLEASE NOTE:

- ✓ Sub-assemblies wired at the factory.
- ✓ Intermediate frequency transformers are pre-tuned.
- ✓ Built-in loop antenna.
- ✓ ALL PARTS CARRY FULL 90 DAY GUARANTEE.

Generous discounts on quantity orders
Dealer and jobber inquiries invited

\$5

WITH ORDER

BRINGS IT ALL TO YOU!

Fill Out and Mail
Coupon Today!

EMPIRE DESIGNING CORP.

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Please send me your COMPLETE EMPRESS RADIO KIT.

Check items desired: 1 Band \$13.50.
 2 Bands \$14.50. Cabinet \$4.50.

I enclose Check; Money Order for \$5.00 and agree to pay the balance of \$..... to the postman.

Name

Street

City..... State

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Test Your
Sales Ability

One of a series of sales aptitude tests especially prepared for RADIO NEWS by Mr. George Speer, Director of Institute for Psychological Service, Illinois Institute of Technology.

1. Would you rather (a) read a story (b) listen to a story (c) tell a story
2. Which do you like best? (a) conservative people (b) people who have done you favors (c) absent-minded people
3. Assuming that you had equal ability for all three, which you rather study? (a) chemistry (b) music (c) public speaking
4. Have you on your own initiative organized clubs or other groups in the last five years (a) more than three (b) one to three (c) none
5. Which would you rather do (a) write a newspaper column of advice on personal problems (b) raise chickens (c) study the effectiveness of different types of sales letters
6. When you see someone in a public place who appears familiar, do you ask him whether you have met before (a) sometimes (b) rarely (c) never
7. Do you make up your mind for yourself (a) frequently (b) sometimes (c) very seldom
8. If you were asked to help out in a community chest drive, which job would you prefer (a) write daily reports of the progress of the drive (b) solicit money for the drive (c) make a record of the pledges as they come in
9. A written statement that goods or money have been received is (a) a receipt (b) an acceptance (c) a voucher
10. Which would you rather do (a) solve mechanical puzzles (b) play chess (c) go to a vaudeville show
11. If you received the same wages, which would you rather do (a) conduct an advertising campaign for a florist (b) develop a new variety of flower (c) take telephone orders in a florist shop
12. Which would you rather read (a) Atlantic Monthly (b) American Magazine (c) National Geographic Magazine
13. If you attend a lecture are you stimulated to develop new ideas and anxious to ask further questions (a) frequently (b) occasionally (c) seldom or never
14. If, in the case of Question No. 13, a discussion period follows the lecture, do you ask questions (a) frequently (b) occasionally (c) seldom or never
15. If you have just recently begun to sell a new product, and are trying to sell a prominent and wealthy individual who says "You will never succeed in this game unless you acquire more experience and confidence in yourself," what would you do? (a) realize that you couldn't sell him, and try another prospect (b) continue to try to sell him (c) agree that you need more experience, and ask him for further advice
16. If for some reason you had to change jobs, which of these would you try to find, assuming that you had equal ability for all, and would receive the same salary in each (a) statistician (b) social welfare work (c) office manager
17. Selling below cost in order to drive a competitor out of business means (a) dumping (b) bankruptcy sale (c) cutthroat competition
18. Who would you most like to have been (a) Frank Sinatra, singer (b) Marshall Field, merchant (c) Thomas Edison, inventor
19. If you have made a mistake which is discovered by your superior, do you make excuses (a) practically never (b) sometimes (c) usually
20. Currency which would always have the same exchange value in goods would be (a) managed (b) standard (c) stabilized

(Answers on page 167)

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Confidence in Amcon Capacitors has been earned on the simple basis of performance. They do the job they were designed to do—efficiently and over long periods.



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June, 1947

SCOOP



AMAZING NEW "MODEL B SERIES" MAGNETIC WIRE RECORDER

Everlasting free from annoying background noise—needle scratch-hiss-crackle of disc type records. The MODEL B SERIES MAGNETIC WIRE RECORDER offers entirely new principles of sound recording. An amazing improvement in voice and musical quality reproduction. Light—compact—simple to operate, the Model B recorder permits recording from RADIO, MICROPHONE or RADIO. Can be connected to most amplifiers. It can record up to one continuous full hour program.

SPECIFICATIONS

RECORD, One Hour
REWIND, 7½ minutes
Freq. Response, 30-8000
cps.
Automatic Erase, Re-
wind, Stop
Record or Playback
through Radio or
Amplifier
Plays Standard Records
Two Induction Motors
110 Volt, 60 Cycle AC
Line
40 K.C. Hi-Freq. Oscil-
lator
Size: 9"x13"x6" deep
Weight: 11 lbs.

Model B-1 (as illustrated, less cabinet) with Crystal Mike & Phono Arm, Wired & Tested, 40 K.C. Oscillator, One Spool Wire (1 hour), Schematic diagrams & Instruction Manual\$119.50

Model B-1-A (as illustrated) Automatic Switching Unit completely wired and mounted in attractive wooden cabinet, with Model B-1. Complete with plugs, tube and cables.....\$154.50

AUTOMATIC SWITCHING UNIT

For use with High Gain Amplifier. All switching for record and play thru one selector switch. Simply connect leads to high gain amplifier. Furnished complete with 40 K.C. Oscillator and selenium type AC-DC power supply, mounted compactly on one chassis. (In Model B-1-A only.)
Additional Spools of Wire.....\$5.50

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**Electronic
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A new instrument designed to meet the need for measuring voltages in higher frequency ranges, yet be low priced. Measures AC volts to 600 V with a constant input resistance of 11 megohms. With internal resistance built into a probe, any range can be raised a multiple of 4 to 2400 volts. On AC the input capacity is less than 9-MMF giving a frequency response less than 50 cycles to better than 100 megacycles.

METER RANGES
DC Volts 0-3; 0-30; 0-150; 0-300; 0-600
AC Volts 0-3; 0-30; 0-150; 0-300; 0-600
Ohms . . . 0-100,
0-10 M, 0-100 M,
0-1 Meg, 0-100 Meg.

59⁵⁰

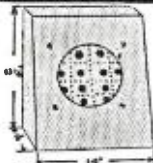


**Electronic
Volt-Ohm
Milliammeter**

A compact, low-priced V.O.M. which has all the features of higher priced units.
5 DC Voltage Ranges 0-3000 volts
4 AC Voltage Ranges 0-1200 volts
3 DC Current Ranges 0-600 milliamperes
4 Resistance Ranges 0-20 megohms
Counter Model (Illus.) Same Model With Case

20⁹⁵ 24⁹⁵

METAL SPEAKER HOUSING



- Heavy gauge metal
- For 12" Speakers
- Complete with 4 mounting brackets

A Resco Buy! **4⁹⁵**

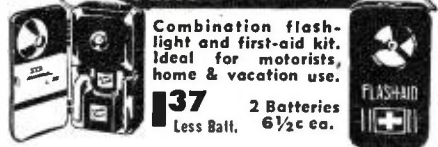
AUTOMATIC WIRE STRIPPER



Will strip 20 gauge (heavy insulation) and 18 through 12 gauge wire. Completely automatic.

Reg. 4.80 — Resco's Price **2²⁵**

LEWYT FLASH-AID KIT



Combination flashlight and first-aid kit. Ideal for motorists, home & vacation use.

1³⁷ 2 Batteries
Less Batt. 6^{1/2}c ea.

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Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

LAFAYETTE CATALOGUE

Radio Wire Television Inc. (Lafayette Radio) of New York is offering a new 144-page catalogue which lists over 10,000 items for the serviceman, amateur, experimenter and broadcaster.

Radio receivers, parts and test equipment, ham receivers and transmitters, custom-built cabinets, p.a. equipment, record changers and recording equipment, technical books, kits and replacement parts are all listed in this 25th anniversary catalogue.

Copies of the catalogue are free and may be secured by writing the company, Radio Wire Television Inc., 100 Sixth Avenue, New York, New York.

SOLDERLESS WIRING

Compiled to assist design and production engineers, Aircraft-Marine Products Inc. has announced a selection data book covering their entire line of solderless wiring devices.

Bound in plastic, this book covers various types of solderless terminals, their features and application in a series of concise, illustrated charts which are index-tabbed for quick reference.

A copy of this data book may be obtained by writing to Aircraft-Marine Products Inc., 1615 North 4th Street, Harrisburg, Pa.

COLOR CODE CHART

Designed to be of service to the radio serviceman, amateur and engineer, Cornell-Dubilier Electric Corporation is distributing free of charge an easy-to-read card listing Army-Navy and RMA color codes for mica capacitors.

This small pocket-sized chart provides data on capacitance, tolerance and drift of almost any mica capacitor.

Copies will be sent upon request to Department R, Cornell-Dubilier Electric Corporation, South Plainfield, N.J.

JFD BULLETIN

Covering items essential to the radio serviceman, JFD Manufacturing Co., of Brooklyn, has recently issued a four-page leaflet which is being distributed without charge.

Popular items among the company's line, including dial pointers and knobs, replacement phono-radio switches, phonograph pickup adapters, jacks and plugs, microphone connectors, stroboscope discs, connectors, lead cables, toggle, snap and rotary switches, fluorescent light noise suppressors, interference filters, antenna loops, etc.,

are listed along with prices and order data.

This bulletin may be secured free of charge by writing to Dept. L., JFD Manufacturing Co., 4117 Fort Hamilton Parkway, Brooklyn 19, New York.

SYLVANIA TUBE DATA

A new and comprehensive technical manual containing basic application data on 545 types of radio receiving tubes has been announced by the Radio Tube Division, Sylvania Electric Products Inc.

Designed for the radio set designer, radio serviceman and industrial electronic engineer, the book includes characteristic curves for tube types in common use, resistance coupled amplifier data, interchangeable tube charts, connections for standard RMA internal and external shields, typical receiver and amplifier circuits, dictionary of tube, circuit and FM terms, and instructions on how to use the characteristic curves.

The 378 page manual is bound with a ring type spine to permit the book to lay flat for easy reference. The book is available at a charge of \$.85 from Sylvania distributors or from the company, Sylvania Electric Products Inc., Emporium, Pa.

ALLIED CATALOGUE

Listing over 10,000 radio and electronics parts, test units, batteries, radios and phonographs, p.a. and intercom equipment, recorders and accessories, communications receivers, etc. Allied Radio Corporation of Chicago has announced the availability of their 164-page, 1947 catalogue.

EXPORT PRODUCTS WANTED

In the past month we have received several letters from foreign business houses expressing their desire to make contacts in this country with the purpose of marketing American products abroad. Manufacturers who desire such an outlet for their merchandise can write direct to the persons listed below.

Radha Kishan
Radha Kishan & Company (Bombay)
c/o Royal York Hotel
Toronto, Ontario, Canada

Interested in radios and radio parts

P. R. Malhotra
E & M Supervisor
Survey of India
Raisalpur (N.W.F.P.), India

Interested in radio parts, tubes, receivers and testing equipment

Acme Trading Corporation
Post Box 132, Madras, India

Interested in radio and "reproducing machine testers."

A large section of the new catalogue has been devoted to the requirements of the amateur, while builders and experimenters will find a variety of kits, accessories and parts listed for their convenience.

Free copies of the catalogue are available from *Allied Radio Corporation*, 833 West Jackson Boulevard, Chicago 7, Illinois.

CANNON PLUGS

Filled with ideas for assembly, servicing, maintenance and portability of electric equipment through the use of connectors, the new *Cannon Electric Development Company* book "Cannon Plugs for the Electric Circuits of Industry" has been released for distribution.

This 76-page illustrated book covers the communications, power, railroad, aviation, television, commercial radio, etc. industries and is designed to stimulate design thinking along the line of product improvement through the use of connectors.

Copies of the book will be sent free to those making their request on company letterhead. Address Catalogue Director, *Cannon Electrical Development Company*, 3209 Humboldt Street, Los Angeles 13, California.

ELECTRICAL STANDARD

A new standard, "Basic Graphical Symbols for Electric Apparatus," has just been issued by the *American Standards Association*.

Known as *American Standard Z32.12-1947*, this new publication was sponsored by the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

The standard consists of 152 basic symbols for electrical drawings which in combination can be used to describe a variety of circuits and other electrical devices. Some of the classes of symbols treated in the new standard include those covering the electronic, thermionic and cold cathode fields, and photo-emissive tubes, transformers, inductors and capacitors.

Copies of the standard are available from *American Standards Association*, 70 East 45th Street, New York 17, New York. The price is 40 cents per copy.

TECHNICAL MANUAL

The Tube Division of *General Electric Company's* Electronics Department has recently made available a new 700-page technical manual covering electronic receiving tubes.

Designed especially for manufacturers and designers of electronic equipment, this manual has been prepared with an expander type binder to permit the data to be kept up-to-date. Included in this manual are discussions of the application and performance of receiving tubes, performance curves, ratings, outline drawings, basing diagrams and other pertinent information.

The manual is available at \$5.00 per copy which includes revision service through 1948. Further service to keep

For Faster Soldering WELLER

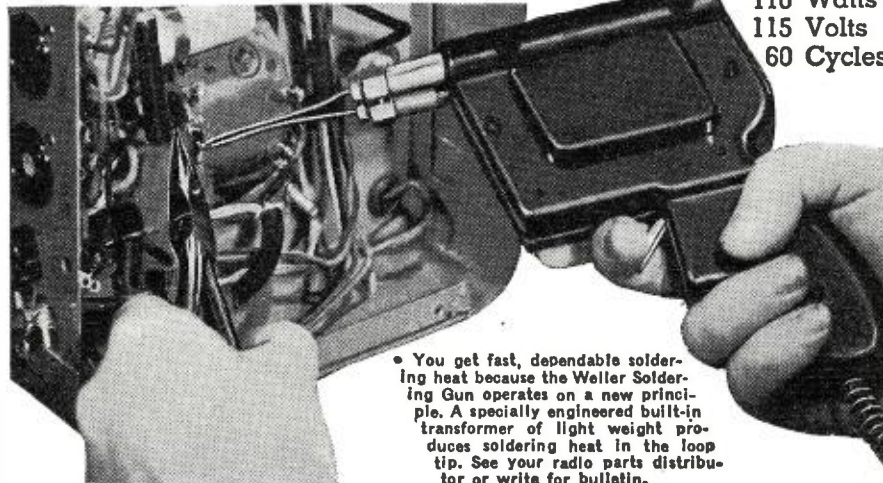
5-SECOND HEATING
Ready to solder in 5 seconds.

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110 Watts
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60 Cycles



• You get fast, dependable soldering heat because the Weller Soldering Gun operates on a new principle. A specially engineered built-in transformer of light weight produces soldering heat in the loop tip. See your radio parts distributor or write for bulletin.

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Export Dept.: 25 Warren St., New York 7, N. Y.

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Of course, the first requirement for profitable radio service is a good service man. The second necessity is good equipment. A good service man with poor equipment is a losing combination. Supreme test equipment has been proved accurate, dependable—"Supreme by Comparison" for nearly 20 years.

SUPREME MODEL 546-A OSCILLOSCOPE, above, is one of the more popular instruments in the complete new Supreme line. Ask your nearest Supreme jobber to show you and demonstrate this finer radio test equipment.

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full year Radio Course that is designed to qualify you for an important position in the Radio Industry. A limited number of both civilians and veterans can be accepted for the next class. For complete information fill out the attached Coupon and mail today.



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the manual up-to-date will be \$1.00 a year beginning in 1949.

Orders for the manual should be sent to the Electronics Department, Tube Division, Building 267, *General Electric Company*, Schenectady 5, New York.

BATTERY GUIDE

Radio Corporation of America is currently distributing copies of a new ready-reference booklet which is designed to enable dealers to select the proper *RCA* battery for any one of 120 brands of battery-operated radios.

This 8-page booklet lists radio brands alphabetically and model numbers in numerical sequence. Adjoining columns show the proper *RCA* battery type.

RCA distributors are handling the distribution of this booklet.

-30-

Universal Voltmeter

(Continued from page 64)

heater current and the forward resistance of such a tube would be so high as to limit the sensitivity of a voltmeter using a 0-1 milliammeter as its indicating instrument (1000 ohms per volt).

We now have another choice, i.e. the 1N34 crystal diode manufactured by *Sylvania Electric Products Inc.* These little diodes, no larger than a 1 watt resistor, need no sockets, as they may be soldered directly into the circuit by their axial leads. Their cost, about a dollar each, compares favorably with a tube diode.

These little diodes have several characteristics which make them ideal for our application. First, they have an extremely low forward resistance, in the order of 50 to 200 ohms, depending on current and applied voltage. Secondly, their current rating is high, being in the order of 20 milliamperes, which allows plenty of elbow room in selecting a meter. Finally, their frequency response is essentially flat to over 100 megacycles. Their back resistance is high enough to be considered negligible in this application, being in the order of 200,000 to 500,000. They are small enough to be squeezed into existing volt-ohm-milliammeters and are easily supported by their leads.

Note in the photograph the size of the 1N34 compared to a one watt resistor.

In Fig. 1 we find a circuit for a voltmeter which reads d.c. voltages, disregarding polarity, and a.c. voltages. It has a total of seven ranges. There will be a tendency toward non-linearity on the low a.c. and d.c. scales. This is usual on all rectifier type a.c. meters, and a meter with an a.c. scale may be used, or the scale may be hand calibrated.

Switch *S*₁ selects the voltage to be read. The resistors may be 1 watt 5% carbon. If a large number of these resistors are on hand, they may be culled

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ROTA-BASE

NEW HANDY LAB. DIAL actually gives a "prong" picture of radio tube connections. Simply turn the dial to the tube number desired on the ROTA-BASE and complete correct connections are instantly indicated on the "prong" diagram. No more valuable time lost thumbing pages or on lengthy readings. Filament, grid, plate, cathode, etc., to **MORE THAN 300** tube types are given. **PRICE NOW ONLY \$1.00** postpaid or sent C.O.D. plus postage. Order **NOW** money refunded if you are not delightfully pleased.

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SPECIAL!!

Kit of 25 Famous Brand Tubular Paper Condensers in assorted capacities only \$2.00 postpaid. Stock up now and save up to 50%! Watch for our other Specials appearing monthly in **RADIO NEWS.**

EATON'S, Box 471, Logan, Utah

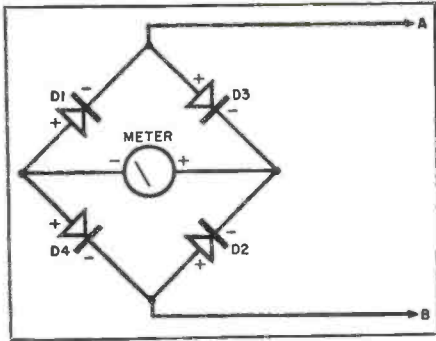


Fig. 2. Basic circuit of voltmeter is made up of four half-wave rectifiers.

and resistors accurate to 2% may be selected. If 1% precision resistors are used, it might be well to determine the meter's internal resistance and the actual forward resistance of your crystal diodes, as they vary somewhat from unit to unit.

The parts list (Fig. 1) indicates the multiplier resistor values for a 0-1 milliammeter and also those used with a zero to 50 microammeter. Of course, a meter of any intermediate sensitivity may be used. The higher the sensitivity of the meter, the less the series resistance of the diode will affect the accuracy. The unit may be mounted in a box or on a small panel as shown in the photograph. The meter shunts were the ones which came with the meter, which was a multirange microammeter, originally.

Existing multimeters may be modified by removing the leads from the meter itself and inserting the 1N34 bridge, together with a switch to open the bridge circuit. The installation will, of course, vary with your particular meter. When completed, you will own an unusual but useful addition to your service artillery.

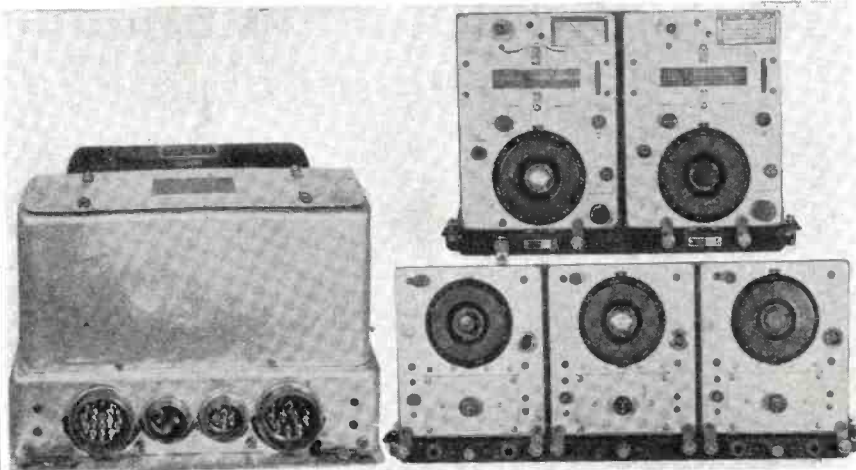
-30-

When Dr. Cleo Brunetti, chief of the ordnance development section of the National Bureau of Standards, appeared on CBS's "Adventures in Science" program recently he demonstrated a new radio transmitter which fits into a lipstick container. One of the special features of the broadcast was a pickup from the transmitter for which Dr. Brunetti has a special FCC license.

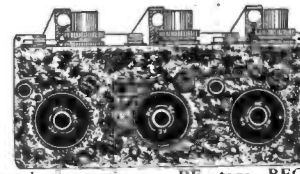


A. A. F. COMMAND SET

SCR-274-N
VALUE \$600.00
NOW AVAILABLE . . . ONLY \$34⁹⁵



This complete combination package consists of 3 receivers—the BC-453-A (190 to 550 kc.) the BC-454-A (3.0 to 6.0 mc.) and the BC-455-A (6.0 to 9.0 mc.). These receivers operate from a 24-28 volt source and each contains a separate dynamotor for plate power.



These receivers are very sensitive, incorporating an RF stage, BFO for c.w. reception and make excellent receivers up to approximately 10 mc.

The two transmitters, BC-457-A (4.5-5.3 mc.) and BC-458-A (5.3 to 7 mc.), consist of a master oscillator tube (16Z6 or 12J5) exciting a pair of beam tetrodes in the power amplifier stage (16Z5's or 12 007's). The tubes in the amplifier are connected in parallel. Included in each transmitter is a Piezo-electric crystal and an electronic resonance indicator for calibration. The transmitters are complete with dynamotors. The modulator (with dynamotor) contains all necessary circuits and components for plate and screen modulation of the transmitters. All mounting racks, remote control boxes, jack boxes, and antenna relay box are included in this superlative offer.

METERS

ANY TWO
\$6⁶⁴
each **\$3⁶⁹**

- 0-10-DC Milliamps.
- 0-50-DC Amps.
- 0-75-AC Amps.
- 0-30-DC Voltmeter
- 2.5-0 —2.5 Ma. Type Do-40
- 0-80-DC Milliamps.
- 0-30-DC Amps.
- 0-1-RF Amps.
- 0-120-DC Volt Ma.
- 0-300-DC Ma.
- .1-.8 Kilowatts
- 0-10-DC Milliamps.

SIGNAL GENERATOR I-198-A

U.S.A. Signal Corps
\$15⁹⁵

Calibration chart in cover. 1, 10, 100 and 200 Multipliers. Frequency 7½mc. to 15mc.

JACK BOX—FRONT COVERS

36c U.S. Signal Corps
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CRADLE TYPE HAND SET

Complete with 3 wire cord . . . **\$2.19** ea.
Less transmitter unit **\$1.59** ea.

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... it pays to BUY NOW
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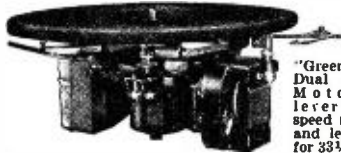
It's smart and THRIFTY to buy these acorn tubes NOW, at this sensationally low price—you'll need them later! Get YOUR share of this once-in-a-lifetime bargain offer!

954 955 Your Choice Ten for \$2.90

RA-20 Power Pack, complete with rectifier tube and plug..... \$9.95

Low-loss sockets for Acorn Tubes.....29c each

GENERAL INDUSTRIES MODEL "D" PHONO MOTOR



"Green Flyer" Dual Speed Motor, with lever-type speed regulator and lever shift for 33 1/3 and 78 RPM. 12" Turntable. For 115 volts 60 cycles AC. Shpg. wt. 12 lbs. Your Cost..... \$15.90

NEW ASTATIC PICKUP STUDIO MASTER "400"



Streamlined Crystal Pickup, designed primarily for broadcast and recording studio use—has all the advantages of lo-pressure design and operation. New adjustable-height swivel base. Model NYLON 400. Your Cost.....\$15.00 Model 400. Your Cost..... 15.00

FAMOUS BRUSH PL-20 Superb Pickup

A high quality instrument for use with all lateral cut records, including broadcast transcriptions. Permanent sapphire stylus. Crystal cartridge. Shpg. wt. 3 lbs. Your Cost..... \$30.00

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R. F. Power Supplies

(Continued from page 51)

windings are universal wound with 7 strand No. 38 Litz enameled wire. The coil is dipped in tropicalization dope and baked until dry, or "Q Max" coil dope can be used. The coil is mounted with the grid lead towards the 6V6GT socket to keep the leads short. In making solder connections to the 7 strand No. 38 enameled Litz wire, each strand must be carefully cleaned and tinned. Use a very fine emery cloth to clean off the enamel. Remember if one strand is lost it will affect the coil. The pickup loop, L_p , is made with No. 16 solid wire with spaghetti slipped over it. The size and placing of this loop is so designed that it will light the filament of the 8016 diode rectifier properly for the output of the unit. In mounting the coil do not run a metal bolt through the coil center. Use short screws in the tapped holes. The filament of the 8016 diode will show an even red glow when at proper potential. Do not measure the voltage with a low resistance voltmeter, as it will pull the output down.

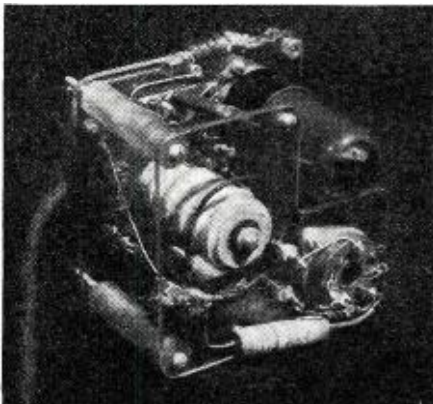
Layout of the Unit

Two pieces of plexiglas or phenolic are cut out and shaped as shown in Fig. 3. On one piece leave out the holes, A, B, C, as these are needed only on the grid end. The tube sockets are mounted face to face and all leads are kept short. The special tie posts are handy but not necessary. They rivet into the phenolic. The $2\frac{1}{16} \times \frac{1}{2}$ " spacers are made of wood or phenolic rod, and a bolt threaded through them, or they can be tapped.

Shielding

The shielding of a radio frequency power supply becomes somewhat of a problem. Because of the low frequencies the penetration is greater and an ordinary screen has little or no effect on the radiation. Shielding also causes a loss of efficiency. When figured out it will be found that for the most cases at 250 kc. an airtight $\frac{1}{4}$ " aluminum case is the answer. All leads entering or leaving the shield must be bypassed

Photograph of home-built, two-tube r.f. power supply shows compactness of construction.



WILCOX F3 RECEIVER

110V 60c AC operated



6-tube Super-fixed Frequency Receiver Crystal-controlled local oscillator. Excellent as hi-frequency converter. Fits standard 19" rack. Tube line-up—2-6K7, 1-6K8, 1-6F7, 1-6C8G, 1-80 rectifier. Complete with Instruction Books, plug-in coils—3.5-6.1 Mc. Set of spare tubes, less crystal.

\$13.95 F.O.B. New York

25% deposit required on C.O.D. shipments

★ Many other Surplus Items ★

Nu-Tone Electronics Co.

47 St. Marks Place Brooklyn, N. Y.

S.S.S.

"Servicing by Signal Substitution"

Learn about this modern dynamic approach to radio servicing with ONLY BASIC TEST EQUIPMENT.

... Fully described in a 120 page book available from your Precision Distributor or factory at 35¢.

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Manufacturers of Fine Test Equipment
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MODEL A-2 WITH ADDED SENSITIVITY
For numerous control applications such as burglar alarms, industrial safety controls, automatic counters, or in conjunction with a chime or bell to announce entrance of persons in stores and offices. For A.C. Complete with tubes and built-in SPDT relay..... \$11.95
LIGHT SOURCE—Will operate up to 25 feet with above unit..... \$5.95
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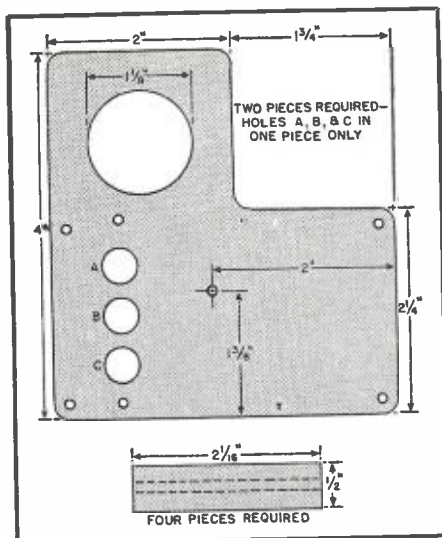


Fig. 3. Mechanical layout of the two plexiglas or phenolic panels. Four wood or phenolic separators are required.

and in some cases a double shield will be necessary. In the higher powered units a shielded high voltage cable is also used for the output; the shield being grounded at the case.

Band Switching Xm'tr.

(Continued from page 55)

their low-capacitance settings when L_1 and L_2 are in the circuits. They hit 20 meters at high capacitance and 10 meters at low capacitance with L_2 and L_3 .

The oscillator may be tuned to the crystal fundamental (or e.c.o. output frequency) or to double that frequency. The 807 stage will operate as a straight-through amplifier, doubler, tripler, or quadrupler. Several methods of operation thus are available and at the choice of the operator.

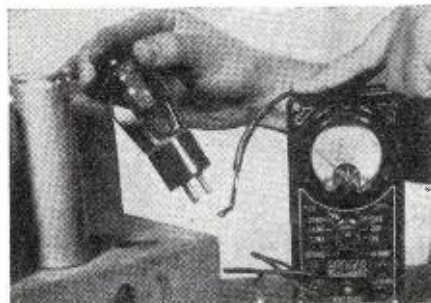
The 807 should not be loaded to

TEST LEAD WITH SPRING WIRES

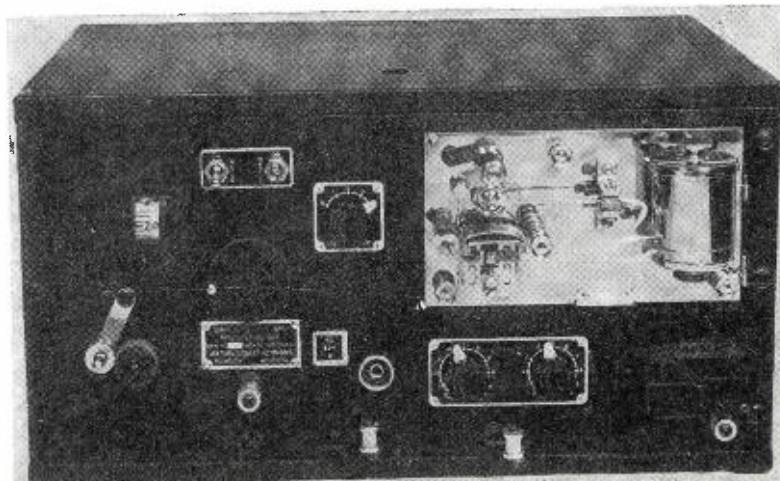
IT IS often desirable to contact a radio tube prong from the outside of the chassis or without removing the chassis from the cabinet.

With the type of tube illustrated this may be done by attaching to the test lead a piece of spring wire bent as shown—so that the two ends of the wire will spread apart and grip the tube prong when forced over it.

In use a short length of insulated sleeving is slipped down over the wire—leaving only the extreme end which contacts the tube exposed . . . H.L.



ACTUAL TAPE 50 WORDS A MINUTE CODE RECORDER BC-1016



GENERAL—Designed for ink recording of standard code signals at speeds up to 400 words per minute on a $\frac{3}{8}$ " paper tape. Made by Waters Conley Company Rochester, Minnesota.

APPLICATION—a) Designed primarily to be connected to the output circuit of a radio receiver. Operates on a signal from 0.15 to 50 volts, usually connected directly across the speaker voice coil so that signals may be heard as well as automatically recorded. Frequency response 500 to 5000 cycles per second.

b) Direct Keying recording from an automatic keyer or from a hand keyer to record messages or for code practice, etc.

c) Can be operated from a telephone line which carries the radio signals to the recorder from a remote location.

POWER SUPPLY—Operates on 117, 170, 210 or 240 volt 50-60 cycle alternating current or within 10% of those voltages.

POWER CONSUMPTION—Approximately 140 watts operating approximately 85 watts in standby.

COMPONENTS—Fully equipped and assembled. Just connect to voice coil of the speaker on your receiver (or to a key for code practice) and plug into your power line.

Contains the following:

- Bodine variable speed drive motor with fan
- Three pens (use Higgins "Eternal Black" ink)

Power Cord

Technical manual with instructions and wiring diagrams

5 Spools of tape (1000' spools). These spools can record up to 20,000 of messages if necessary (extra tape available from radio supply houses)

Amplification—bridge circuit with the following tubes: 1 6SJ-7—1 6SN-7—2 5U4-G—1 6H6—3 6L6

Complete in Steel Cabinet $10\frac{1}{4}$ " high, $19\frac{1}{4}$ " wide x $14\frac{5}{8}$ " deep; wt. 80 lbs. Designed to fit any standard 19" rack. Height is $8\frac{3}{4}$ " and wt. 65 lbs. when cabinet is removed for rack mounting.

SURPLUS NEW GUARANTEED

NET \$24⁹⁵ F.O.B., N.Y.

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BRAND NEW NAVY SURPLUS HI-FI PUSH-PULL AUDIO OUTPUT TRANSFORMER

Made for E. H. Scott's Navy Model REE entertainment receiver. \pm 2db 75-10,000 cps. Imp: Prim. 4400 \sim ct. Secondaries 4 \sim , 60 \sim ct, 200 \sim , 300 \sim , 600 \sim . Fully cased. Weighs 5 lbs. With each order will include schematic of the REE's audio section and power supply. Tell your friends about this ad. Quantity limited. Order immediately!

Only \$1.89 each!

HERE'S THE MISSING LINK FOR YOUR SCR-274-N RECEIVERS Local Control ADAPTER FT-260-A

You need one in the front panel of each receiver to replace the dummy or remote-control adapter now in it. Simply plug in the FT-260-A. No wiring necessary. Contains the CW-OFF-MCW switch and the gain control. With each order we furnish a schematic and explanation of the control circuits and receptacles and a schematic for an A.C. power supply with instructions for its connection into the set. BRAND NEW!

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Send \$1.00 deposit, balance and postage C.O.D.

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Condensers

.00035 MFD 25KV	\$8.95
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.005 MFD 3000V Mica	.40
.012 MFD 25KV (C-D type BT14)	7.15
.08 MFD 1000V Mica	.30
.5 MFD 2000V (C-D type TJH)	1.15
1 MFD 2000V (C-D type TJH)	1.75
4 MFD 600V (C-D type TJH)	1.20
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4 MFD 2500V (C-D type TJH)	4.15
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10 MFD 600V (C-D type TJH)	1.65
10 MFD 1000V (C-D type TJH)	2.15
.02 200V paper	.07
.05 200V paper	.07
.1 200V paper	.07
20/20 MFD 250V electrolytic	.65
30/50 MFD 150V electrolytic	.95

Tubes

6L6	\$0.98
6AC7, 6H6, 6SA7, 6SJ7, 6SG7, 6SL7, 2X2, 5U4	.84
715A	4.95
705A	2.75
836	1.75

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0-1 M.A. D.C. (G.E. 3" round)	\$4.95
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0-50 M.A. D.C. (G.E. or Weston 3" round)	4.25
0-150 V.A.C. (G.E. or Weston 3" round)	4.95
0-1 Amp R.F. (G.E. or Weston 3" round)	6.50
0-300 M.A. D.C. (2" round in aluminum case with plug)	3.15
0-30 M.A. D.C. (G.E. 3" round)	4.95
0-10 (tuning meter, aircraft type 0-2 M.A. mvt. with thermocouple)	3.25
0-20 KV (Westinghouse 3" round, 1 Mil mvt.)	4.75

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Dunco DPST 115 V.A.C. 30 Amp contacts	\$2.25
Dunco DPST 125 V.D.C. 30 Amp contacts	2.25
Dunco DPST (current) 3 Amp A.C. 30 Amp contacts	2.25
Cramer, Time Delay, variable 2 sec.-2 min.	6.50

Transformers, 115 V.A.C. Primary (cased)

6.4 V/7.5A	\$2.25
6.4 V/.06A, 2.6 V/1.75A (Hi. Volt)	3.15
5 V/16A (Hi. Volt)	3.65
2.5 V/10A (Hi. Volt)	2.95
6.3/2.1A, 5 V/3A, 580 V.C.T./250 M.A.	3.95
5 V/3A, 5 V/3A, 5 V/3A	2.95
1650 V/20 M.A., 680 V.C.T./225 M.A.	8.75
2.6 V/3.5A, 6.5 V/3A, 5.2 V/3A, 5.2 V/3A, 27.1 V/4.3A (Hi. Volt)	7.15

Resistors

1/2 Watt (100 same)	\$2.25
1 Watt (100 same)	2.75
1.5 Meg. 1.5 KV insulation, Precision	1.95
Full stock of high wattage resistors, send us your requirements.	

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500 ohms, 50 watts	\$0.95
1000 ohms, 100 watts	1.45

Wire: No. 22 double insulation, per 1000 feet	\$7.00
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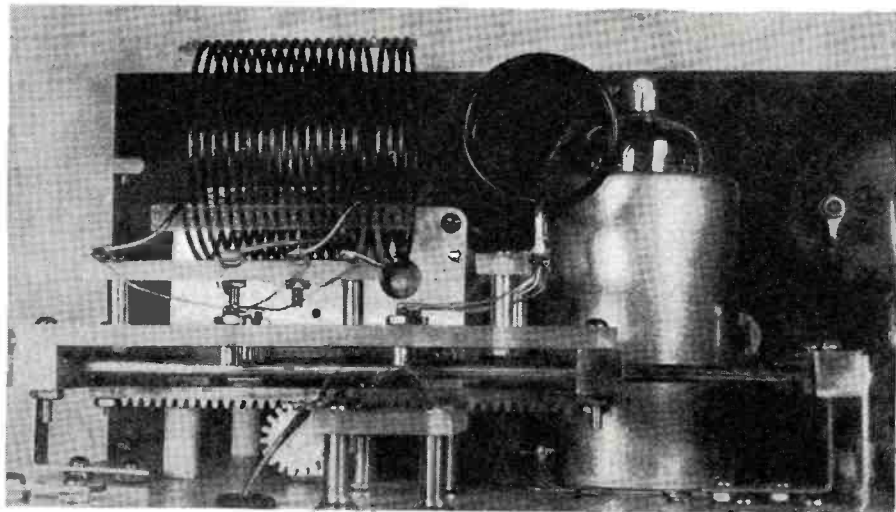


Fig. 6. Close-up of the amplifier band-changing mechanism.

more than 100 milliamperes plate current. With a plate voltage of 400, this amounts to 40 watts input. 600 volts will give 60 watts input, and 750 volts (c.w. telegraphy only), 75 watts.

Since the transmitter shown here was designed expressly for radiotelephony and for later use as an exciter for a pair of 812's, no provision was made for keying. However, a closed-circuit keying jack may be included easily in series with either the 7C5 or 807 cathode. Oscillator keying, if desired, may be employed with complete safety, since the self-bias resistor, R_6 , in the 807 cathode circuit will limit the amplifier plate and screen currents to safe values when the key is up.

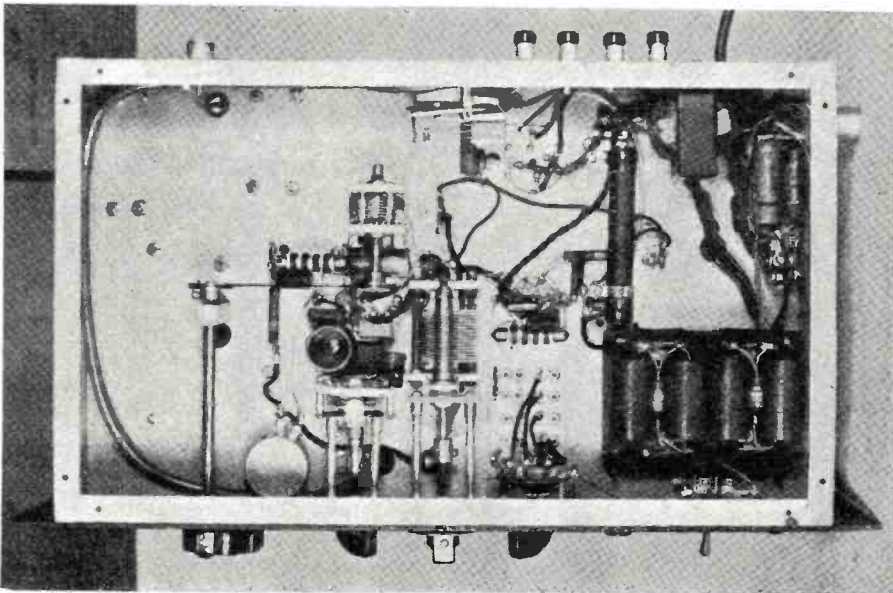
When changing bands, only one precaution is in order and that is to release the push-to-talk switch before switching the amplifier coils. If this is not done, the 807 screen will draw excessive current during the interval when no plate coil is in the circuit. This brings to mind that an additional refinement would be the inclusion of a switch in the amplifier band-changing mechanism to remove automatically

the 807 screen voltage when changing bands.

Modulator requirements are modest. For an 807 plate voltage of 400, the modulator should have an output of 21 watts and an output impedance of 4664 ohms for plate-screen modulation. For a plate voltage of 475, audio output should be 25 watts and impedance 4524 ohms. For a plate voltage of 600, audio output should be 31 watts and impedance 5635 ohms.

Narrow-band FM on 10 meters may be obtained by setting the transmitter for 10-meter output (as if coming down from an 80-meter oscillator) and feeding into the e.c.o. input jack, J_1 , the 3625-to-3712.5 kc. output of a crystal-type narrow-band FM exciter. FM operation with 50-kc. deviation on 10 meters may be obtained in a similar manner by feeding-in the output of a regular reactance-tube modulated exciter, operating between 3635 and 3702 kc. (safe center frequencies), and adjusting the deviation for 6.25 kilocycles at these frequencies. Both FM exciter units are small affairs, no more unwieldy than an external e.c.o. —50—

Fig. 7. Under chassis view shows placement of component parts.



Establishing a Business

(Continued from page 59)

banker and his advice is well worth heeding.

The legal structure of your business is another important aspect. There are certain advantages to be accrued from each type of organization and there are also legal obligations which must be met. It is important to know just what these are. Here again your banker can be of help, although the direct course would be to consult a lawyer to determine the legal requirements for a business of the type you wish to start. Briefly the forms of business are as follows:

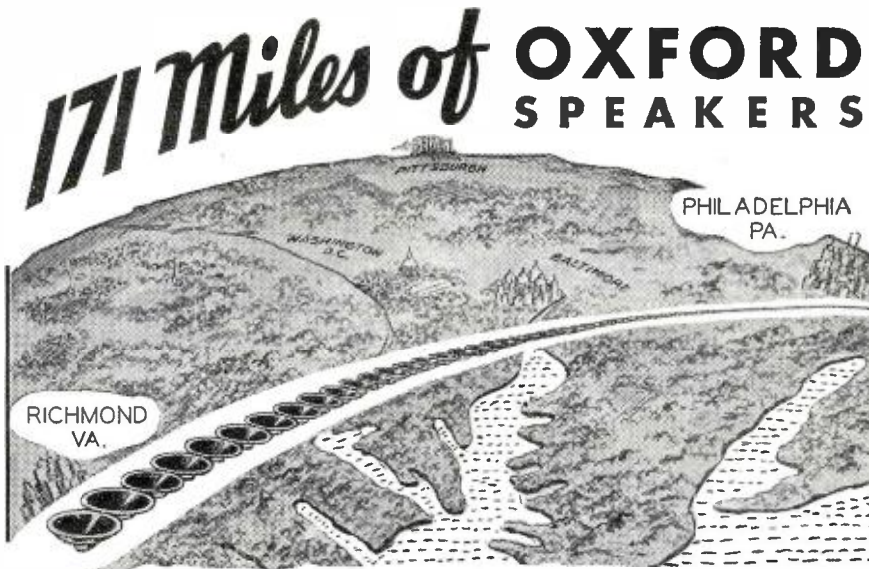
1. Individual ownership.
2. Corporation.
3. Partnership.

In the individual proprietorship, a form which predominates among American enterprise, the advantages are that you will be the sole owner and exercise complete control; all decisions will be yours. Furthermore, it has the advantage of simplicity. However, the disadvantages are that all your property, personal as well as business, may be seized to satisfy your business creditors; you are working only on your own capital which must, in itself, be sufficient to carry you through the first year; and it is often difficult to procure outside capital support for this sort of organizational setup.

On the other hand, the individual owners of a corporation are not responsible for the debts of the corporation over and above the amount invested. After a corporation charter is granted by the Secretary of State of one of the states, you turn over property or money capital to the corporation and in return get shares of stock. The stockholders receive remuneration in the form of dividends from the profits of the company. To a small corporation the high cost of incorporating, the increased taxes and the federal income tax against the dividends received by each shareholder often outweigh the advantages of a corporate structure.

The partnership is similar in structure to the individual ownership of a business except that two or more persons participate in the operation of the enterprise. A partnership has the advantage of combining the knowledge, capital, and skill of several persons, which sometimes is advantageous. A partnership, because of the legal responsibility requirements, may carry a better credit rating than an individual ownership. In a full partnership, any partner may act for the others and all of the partners are jointly liable for the debts of the business. This means that in case of bankruptcy the personal as well as business assets of all of the partners may be used to meet the liabilities.

Another form of partnership is that in which limited partners furnish capi-



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tal but are not liable for the debts of the business over and above the amount which they have in the business.

It is well to remember that in a business partnership your future and the future of your business is in another person's hands. Be sure that in picking a partner you select someone who is trustworthy and whose judgment in business matters is sound.

The problem of licenses, tax laws and other legal potpourri depends on the individual state and is a local affair to be settled by consulting responsible public officials.

Buying and Selling

Naturally one of the essentials in the successful operation of any retail store is the judgment used in buying merchandise. What to buy, how much, and at what particular time, are factors which make or break you in business.

If you buy too little you may lose many potential customers who want prompt delivery and will not wait while you order the merchandise they are seeking. On the other hand over buying will result in slow turnover of stock with its unpleasant corollary, the freezing of working capital. The safest method to follow when starting your own business is to make your first order a small one and expand gradually as you get to know the needs of your customers.

A perceptive businessman will make a statistical study of consumer demand in his community. Definite facts and figures on income, rent, occupation, etc. can be obtained from the Department of Commerce in Washington and information about your particular locality may be secured from Trade Associations or the local Chamber of Commerce. If the community is well known to you a fairly accurate survey can be obtained by interviewing the local banker, plumbing contractors, who usually have access to homes, electric utility companies, or real estate agents. These sources can usually provide a fairly accurate estimate of buying power.

In any case your success will depend on your ability to adjust to your community. There is no universal rule that can be followed here. An example of an appliance chain that tried to apply the same methods of operation in two different localities proves this. A store in Rochester was fabulously successful for three years and in consequence opened a branch store in Buffalo. Cursory arrangements were made, using the identical methods of the successful Rochester store. A year and a half later the Buffalo store was insolvent because care had not been taken to investigate the family income and buying habits of this community.

Before stocking any appliances it would be well to gather a list of every known appliance and study their individual sales possibilities in the com-

munity in which you expect to settle.

Of course, the type of shop contemplated will determine the specific appliance and service parts to be carried. There are usually four basic types of stores.

1. Electrical appliance and radio—sales and service.
2. Radio Stores—sales and service.
3. Electrical appliance and radio repair shop—service only.
4. Radio repair shop—service only.

For equipment needed in your service shop it would be a good idea to call on the service parts manager of your nearest wholesaler. This can save you an enormous amount of calculation as such a man will know exactly the material you will need because of his experience in handling orders for established concerns.

The amount of money you allow for this equipment should be carefully determined in advance to allow enough capital for other material such as store renovation, trucks and operating expenses. A good rule to follow is to allow 40% for merchandise. The distance away from your wholesaler must be considered. If he is located nearby it will not be necessary to stock up too greatly, merely enough for the floor display, as orders can be obtained within a few hours from him. This will lessen the capital requirement. If however, your orders have to be transported over a longer dis-

tance a larger supply of merchandise will have to be carried in stock. These are the minor points but the attention given to them can mean so much to business survival.

A prudent eye should be kept on the manufacturer's trend because new models will often appear, outmoding your stock on hand, a dangerous predicament for a newcomer in the field. This can be determined by scrutinizing the manufacturer's magazine advertising, and subscribing to trade journals which keep a tab on such developments.

Almost all appliances, according to a recent check up, have changed models during the months of January to March except table appliances such as toasters, irons, etc. and radios which appear in their new models from June to August.

As for the amount and proportion of items to be carried, this is another problem on which the community survey will give you a chance to make a fair estimate. The price range of the goods to be handled can also be judged from this survey.

In other words, you must gear your merchandise buying to the type of community in which you are doing business. It is obvious that if your shop is serving a community, or area of a city, where housing is of the "furnished" apartment type, it would be bad business to stock ranges, refrigerators and water heaters when such major appliances are furnished

with the apartment. Don't depend on being able to sell these appliances to the manager of such a building as this type of block selling is usually handled on a wholesale basis.

Shipping routes to your community should be investigated so that the cheaper, faster, and more efficient routes can be specified. It will be your responsibility to file damage claims and not the shipper's.

Where to purchase your merchandise is another factor. There are only two sources, the wholesaler and the manufacturer and since most manufacturers will sell only through their branch stores there is little alternative. In any case it is less troublesome to buy from a local wholesaler who being a community businessman can give valuable help and establish credit arrangements to suit your needs where a manufacturer might not. It will pay to patronize these men.

An excellent system of purchasing has been used in Buffalo where a group of appliance and radio stores have pooled their orders and have thus been able to benefit by the reduced price which is usually available to carload purchasers. Delivery to the individual stores is specified on the orders.

Next comes the choice of brands. Undoubtedly the most popular brands will be the easiest to handle, advertising being what it is. So it would be wise to visit the manufacturer's

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representative handling that brand and find out if they need representation in your locality, in fact the manufacturers of all brand merchandise should be visited until you find one with the best deal. Here is where personal initiative and investigation will do more than all the technical advice in the world. You must prove your sincerity and if you can they might be more eager than you to set you up especially with competitive "Brands."

Though it is a good thing to stick with one wholesaler so that he will give you a break from time to time for your loyalty, personal adjustment again prevails. Be constantly on the lookout for better propositions and there will shortly be many, due to competition.

Herein are the essentials, the fundamentals which, if followed, will leave your chances for success based upon other items besides those which statistics reveal as the prime cause of failure.

Spot Radio News

(Continued from page 22)

graph and approximately 146,000 straight FM sets. . . . Whatever the year-end total, all indications are that this will be FM's first big year, and production trends thereafter are expected to be upward for some years to come.

ALL THIS NEWS was hailed with enthusiasm by all but the most sanguine FM broadcasters. Speaking for the FM Association, J. N. (Bill) Bailey, its executive director, hailed the RMA estimates as good news and the manufacturers' attitude as "cooperative." Bailey pointed out that RMA figures showed a monthly FM production increase of 28 per-cent per month for the last four. If this per-cent increase is maintained, a 1450 per-cent jump in the number of 1947 sets will be registered over 1946. Going one year farther, if the present ratio is maintained, he predicted that annual output in 1948 will be 5,100,000 FM receivers.

ABROAD, U.S. SALES would seem to look steadily better as the year progresses. Latest note of optimism is struck by the office of international trade of the Department of Commerce, which estimates that Latin American countries will purchase approximately \$17,000,000 worth of U.S. radio receivers this year. Greatest demand is expected to be in Brazil, Mexico, Chile and Cuba, with Brazil buying some 200,000 sets costing about \$6,000,000, Mexico 160,000, Chile 94,000, and Cuba 60,000. Mexico was the largest pre-war buyer, with purchases of more than \$2,000,000 registered in 1941.

TELEVISION is still figuring in the news, latest with a rash of screens which have appeared in Chicago bars.

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1800 ohm Utah Speakers 5" with 300 ohm tap.....	2.30
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25 Assorted mica cond.....	2.20
25 Assorted W resistors, 5 & 10W.....	2.10
C.H. Toggle switch SPST, DPST.....	.24
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Pilot bulbs Mazda #44 & #47.....	10 for .45
Relay 24v. DC 130 ohm SPST N/O.....	1.10
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3Q5 6SK7 6K6 6F6 6G6 6P5 6SJ7 32L7

Send list of requirements of tubes not listed

LE-HI ELECTRICAL COMPANY
660 Broadway New York 4, N. J.
HUMBOLDT HUMBOLDT
5-3530 Dept. RN-100 5-3531

ELECTRICAL TRAINING

Intensive 82 weeks' residence course in fundamentals of industrial electrical engineering, including radio, electronics. Prepare for technician, engineering aides. Approved for veteran training. 54th year. Catalog.

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Send for Our Periodical Bulletins of Real Guaranteed Values

WHOLE-SALE RADIO SUPPLIES
RADIO & TELEVISION EQUIPMENT CO.
207 Oak St. Santa Ana, Calif. 709 Cherry St. Long Beach, Calif.

RADIO NEWS

They pickup telecasts from Chicago's WBKB, with audiences watching while they sip drinks. Favorite programs are sports—early spring leaders were hockey and fights. Even more interest was shown during the late spring in baseball, bringing a boom market in customer interest, accompanied by an equally pleasant boom in drinking, tavern keepers report.

FROM THE AIR comes the latest in lightweight sets, an air-marine portable originally designed by Bendix Aviation Corporation for use in light planes, but also ideal for portable use at home or afloat. Weighing only nine pounds, it covers three bands, indicated on a slide-rule dial. It's good for weather reports, air and marine communications, regular broadcast entertainment, and can also be used for navigating on aviation range stations, marine radio beacons and broadcast stations.

-30-

OK TELEPHONE RECORDERS

THE Federal Communications Commission recently adopted a report looking toward authorization of recording devices in connection with interstate and foreign message toll telephone service. Final orders have been postponed, however, pending a public engineering conference covering standards to cover these devices.

The Commission, in its report, found that there is a real and legitimate need for telephone recording devices; that their use does not impair the quality of telephone service; that parties to telephone conversations should have adequate notice that the same is being recorded; and that all such devices should be capable of being physically connected to and disconnected from the telephone line at the will of the user.

The report further states that adequate notice will be given by the use of an automatic tone warning device which would automatically produce a distinct signal that is repeated at regular intervals during the course of the telephone conversation when the recording device is in use. The report further directs that telephone companies and recorder manufacturers should undertake a publicity program designed to inform telephone users generally of the use of telephone recording devices and the import of the warning signal. The Commission further states that any publicity program should provide for the insertion of a full-page statement in telephone directories informing the telephone using public of the nature and use of recording devices and describing in detail the operation and significance of the tone warning signal. In addition, according to the Commission, the telephone companies should make available a special telephone number which when dialed or called would reproduce the warning sound.

The Commission further declared unlawful any tariff regulations now on file with it which bar the use of telephone recording devices, and the telephone companies are directed to file tariff regulations to cover their use.

-30-

June, 1947

INTRODUCTORY SALE

WELL KNOWN BRANDS—THE PRICES SPEAK FOR THEMSELVES

RADIO TUBES	50L6 \$.49	50B5 \$.49	PACKED IN BULK MINIMUM ORDER 25 OF EACH
	35Z542	35W442	
	12SK744	12BA644	
	12SQ747	12BE647	
	12SA749	12AT649	

- 5" DYNAMIC SPEAKER—450 ohms complete with output trans. (50L6) \$1.95
- 5" PM SPEAKER—Alnico No. 5 1.22
- OUTPUT TRANSFORMER (50L6)39
- VARIABLE CONDENSER—420/162 MMFD.78
- G.E. LINE CORD 6'—18 gauge—with new fingertip plug14
- PHONOGRAPH MOTORS 2.95
- CRYSTAL PHONO PICK-UPS 1.75
- VOLUME CONTROLS—1/2 Meg., 1 Meg., 50,000 ohms (with switch)39
- VOLUME CONTROLS—1 Meg. (without switch)19
- COAXIAL CABLE No. RG59U, 72-ohms (per thousand feet)64.20
- CAPACITORS .01-600-V. (per hundred) 3.95

BROOKS RADIO DIST. CORP.

80 VESEY STREET (Dept. B) NEW YORK 7, N. Y.

CUT HOLES

5/8" TO 3 1/2"



in radio chassis

Punch cuts through chassis, die supports metal to prevent distortion, cap screw is turned with wrench to cut clean, accurate holes for sockets, plugs, and other receptacles. Saves hours of work—no reaming, filing or drilling! 3/4" to 3 1/2" sizes. Get complete data now from Greenlee Tool Co. 1886 Columbia Ave., Rockford, Illinois.

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- Plate Transformers—Pri. 110 V. 60 cy. Sec. 1500 V. CT—250 ma. 6.95
- Klystron Osc. Tube 2K25/723AB operates on 3 cm. 5.75
- Parabolic Reflectors—15" spun alum. Alzak fin. for 1200 Mc. up 2.19
- Ea. 3.95
- Pr. 3.29
- Microammeter—Beede O-200 3.29
- Meter Rectifiers
- Full Wave95
- Half Wave65
- Vibrator—Syn. 2 Volt 7 prong for G.E. Portables, etc. 1.69
- Microphone—T-24 Carbon with Push Switch and Cable 1.39
- Mike Buttons—1" Carbon contact type T-30 3 for 1.19
- Filter Chokes—20 hy. 300 Ma. 2 for 3.95
- Plate Transformer—Pri. 110 V. 60 cy. Sec. 1500 V.C.T. 250 Ma. 6.95
- Air Trimmers—12 assorted 1.19
- Resistors—1/2 and 1 Watt 500 assorted. 7.95
- Mica Condensers—25 assorted95
- Knobs—25 assorted 1.95
- Capacitor Dry Electro. 40-40-150 volt 6 for 1.95

SPECIAL

Have a few \$9.95 Service Kits available as advertised in our April issue.

Write for Circular Featuring Radio Components at Bargain Prices

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SHOWS
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For Amateur or Commercial Radio

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Qualify at home, in spare time, by easy, simplified system. You can learn code or gain greater speed and skill in sending and receiving by the same system that has made code champions and radio telegraph experts. **FREE BOOK OF FACTS** explains Course. It's absolutely free. Rush your name for it today.

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COMPLETE SOUND SYSTEM
READY FOR INSTALLATION



Consists of

- 1 TS14 Amplifier
Voice Coil Output—14 Watts
Separate Mike-Phono
Hi-Z Inputs and Controls
- 1 Jensen 12" Concert PM Speaker
- 1 12" Wall-type Baffle
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25 ft. 2-conductor Speaker Cable

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ITEMS NOW IN STOCK

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VH-91	Projector	32.50*
BR-121	Cabinet	31.65*
A-81	Cabinet	24.55*
A-121	Cabinet	34.05*
D-121	Cabinet	75.00*
D-151	Cabinet	75.00*

*Subject to trade discount.

SIMPSON

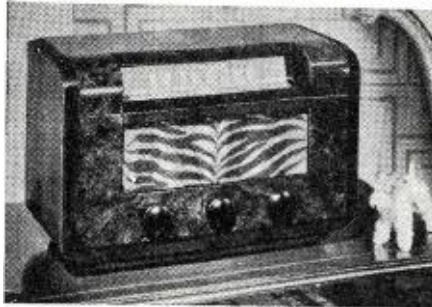
305	Tube Tester	.....	Net \$49.50
305RCP	Tube Tester	.....	59.50
305RCC	Tube Tester	.....	59.50
315	Sig. Generator	.....	67.35
260	Multitester	.....	39.95

20% Deposit with order.

RADIO PARTS OUTLET, INC.
4305 LINCOLN AVENUE, CHICAGO 18, ILL.

NEW RECEIVERS for Summer Market

MODERN DESIGN RECEIVER
In keeping with the trend for "modern" design radio receivers, *RCA Victor* has just released a new table radio,



Model 66X3, which features a black and gold-tone, tiger-striped grille cloth.

The receiver incorporates standard broadcast and international short-wave reception. Housed in a hardwood cabinet and finished to simulate burl walnut veneer, the set is 9 3/4" x 15 3/4" x 7 3/4".

Operation is on either a.c. or d.c. An electrodynamic speaker, *RCA Victor* "Golden Throat" tone system, a built-in phono-jack for a record player, six tubes including rectifier and a built-in loop antenna for standard broadcast are additional features of this set.

The *RCA Victor Division, Radio Corporation of America*, Camden, New Jersey will supply added details on the Model 66X3.

COMBINATION CONSOLE
Release of its new Model 673 console type combination radio-phonograph has been announced by *Packard-Bell Company* of Los Angeles.

Housed in a compact cabinet which is available in both period and modern



design, the receiver is equipped with a 10" PM dynamic speaker which is located in the lower portion of the cabinet. Ample record storage space is provided on either side of the speaker

compartment. The instrument is a.c. powered and features a built-in low impedance antenna, crystal type low pressure pickup, continuous treble tone control, a.v.c., and a new "stationized" dial. The automatic record changer will handle ten 12" records or twelve 10" records.

Details on the Model 673 may be secured from *Packard-Bell Company*, P.O. Box 3219, Terminal Annex, Los Angeles 54, California.

COIN RADIO

Telecoin Corporation has recently introduced a new coin radio for hotels, motor courts, and hospitals which incorporates several new features.

Engineered to protect owners from vandalism and tinkering, the *Telecoin* receiver has an 18 gauge steel case and chassis, set-back controls and



dial-face and baked enamel finish which will resist 180 proof alcohol and cigarette burns.

The chassis is rubber-cushioned and volume control is preset to prevent loud playing in hotels and hospitals. The five-tube set weighs 20 pounds and has over-all dimensions of 9" x 10" x 7 1/2". The receiver operates on 110 volts, a.c.

Additional information on this receiver will be furnished by *Telecoin Corporation*, 12 East 44th Street, New York, New York.

"AIRMARINE" PORTABLE

Designed for use in personal planes and on private boats, *Bendix Radio Division of Bendix Aviation Corporation* has recently announced the availability of its new "Airmarine" portable receiver.

This nine pound unit covers three bands which are clearly indicated on a slide-rule dial. It provides weather reports, air and marine communications reception and regular broadcast coverage and can also be used as an

aid when navigating on aviation range stations, marine radio beacons, and broadcast stations.

Covered with full grained "Tolex" Textileather, the case has a piano hinge door for complete protection of dial, speaker, jacks and controls. An on-off switch in the cover latch shuts the receiver off when the cover is



closed, even though the main switch is in contact position. The case measures 6½" x 11" x 12¾".

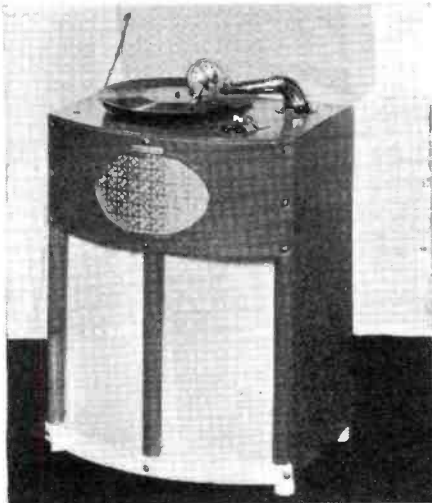
Two loop antennas are included inside the case for reception and direction finding while an external antenna connector is provided for reception of distance stations on all three bands.

Bendix Radio Division, Bendix Aviation Corporation, Baltimore 4, Maryland will supply additional information upon request.

CHILD'S PHONOGRAPH

A specially designed children's console phonograph has been released by Herold Manufacturing Co. to round out its line of phonographs for the "younger set."

Trade named the "Kiddie-Trola" this consolette is finished in maroon simu-



lated leatherette with painted ivory trim. It includes two spacious compartments for record album storage and the lid is rugged enough to seat an adult.

This consolette is a.c. operated and includes an on-off switch, needle cup and decorative metal grille. The cord set is Underwriters' approved. Any

June, 1947

Build your own...
TELEVISION RECEIVER
And
TEST EQUIPMENT

Design and Construction
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TELEVISION RECEIVER
2nd EDITION

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of a Visual Alignment
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"Design and Construction of a Modern 5 or 7" Television Receiver"

More Pages, Greater Detail, Drawings, Photographs, Designed for Good Performance, Simplicity, Economy. For Experimenters, Servicemen... any technicians that prefer to build their own.

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including 10 matched coils for Television receiver described in booklet... Only \$4.95

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Tele. Rec. Book.....	\$1.75
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GENUINE IMPORTED **SWISS WRIST WATCH**

\$7.95

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FREE GIFT With Every Order!

A beautiful metal Expansion Wrist Band. Valued over \$1.00

Here's real, solid value, backed by the ARJAC written guarantee. This is a Genuine Imported Swiss Wrist Watch—beautifully styled, with Radium Dial, Sweep Second Hand, Chrome Plated Case, Unbreakable Crystal, Leather Wrist Band.

OTHER GREAT ARJAC VALUES:

- Genuine Swiss Midget Alarm Clock (2¼" diam.) radium dial..... \$ 7.95
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- 7-Jewel Swiss Wrist Watch, waterproof, sweep second hand, radium dial..... \$12.95
- Imported Briar Pipe with leather pouch..... 2.95

All goods guaranteed; money refunded if goods are returned within 7 days after receipt.

ARJAC CO., Dept. R. N. - 117 W. 48 St., N. Y. 19, N. Y.

SEND NO MONEY: Send order, pay postman \$7.95 plus 10% tax and postage on delivery. If you include full remittance (\$8.75) we will pay postage.

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DETROLA AUTOMATIC RECORD CHANGER



\$14⁷⁹ Special

Smooth, fast change cycle—fool-proof—plays 10" & 12" records

2 TUBE PHONO OSCILLATOR



Complete with tubes 85Z5, 12SK7—Range up to 100 ft.—complete all wired—use with record player or carbon mike **\$5.95**

MODEL 100 P O C K E T M E T E R



D.C. Volts 0-15, 150, 300, 1500
A.C. Volts 0-15, 150, 1500
OHMS—0-3000, 300,000
MILS—0-1, 5, 15, 150
Comes complete with batteries. **\$13.95**

PORTABLE 7 TUBE RADIO

2 Band—3 way AC-DC Battery Foreign-American Reception Model 606-W

- 110/120 V.-50-60 Cy. or battery
- Full vision 2 band calibrated aeroplane dial
- Large 5" ALNICO V. P. M. speaker
- Built-in matched loop antenna
- Automatic vol. control
- Continuous tone control
- Beam power output system
- 2-45 V. "B" batteries & 2-4 1/2 V. "A" batteries
- 1 1/2" x 9 1/2" x 6"
- Red—Blue—Brown

\$39⁹⁵ Incl. Batteries

1/2 MEG. Volume controls with switch and long shaft **49c** Lots of 10

ALNICO SPEAKERS

4" or 5" Speaker with mounting for output transformers. Lots of 6 **\$1.25**

10% discount on lots of 24.

SEND US YOUR NEEDS AND WE WILL PROMPTLY SEND PRICES

25% with order, balance C.O.D.—include postage, excess returned.

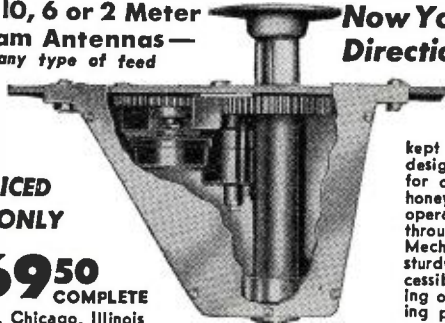
TEL-RAD ELECTRONICS CO.

New York City 169 Washington Street N. Y. C. 6

New! Munger ELECTRO-BEAM ROTATOR

For 10, 6 or 2 Meter Beam Antennas—any type of feed

Now You Can Have the Best Type of Directional Antenna at Low Cost!



PRICED AT ONLY

\$69⁵⁰ COMPLETE

F.O.B. Chicago, Illinois
ORDER ONE NOW!

- Price Includes Reversible Electro-Beam Rotator and Direction Indicator.
- Foolproof Potentiometer and Meter Circuit. Calibrations in Both Degrees and Directions.

A SENSATIONAL VALUE!



When you see the many fine features of my new Electro-Beam Rotator, you'll be as pleased as I am. And you'll feel good too, because it's such an honest value—priced low because we kept you in mind constantly through all the stages of design, engineering and testing. Now that it's ready for delivery, you can take my word that it's a real honey. About the specs: 1 R.P.M.—115 volts, 60 cycle operation. Powerful reversible motor drives main shaft through heavy steel gears. Lifetime Oilite bearings. Mechanism is completely weatherproofed—housed in sturdy non-rusting duraluminum case. All parts accessible for easy inspection. Rotator mechanism weighing only 10 1/2 lbs. makes it easy to mount. Top mounting plate 10" x 12".

10 Day Free Trial Offer—No Risk

Send your check for \$69.50 for one Electro-Beam Rotator complete with Direction Indicator. You pay small express charge upon arrival. Try it at my risk for 10 days. If you are not completely satisfied in every way, return the units undamaged in their original carton and your money will be immediately refunded in full. You take no chances. Order your Munger Electro-Beam Rotator today!

Illustrated Bulletin on Request
MANUFACTURED AND SOLD EXCLUSIVELY BY



W9LIP

Rex L. Munger Company
4701 Sheridan Road Chicago 40, Illinois

size record up to 12" can be played with the lid closed.

Trade inquiries on this unit are invited. Address requests for additional material to *Herold Manufacturing Co.*, 1 Romney Place, Scarsdale, New York.

PERSONAL RADIO

Electromatic Manufacturing Corporation has announced production of the "Rejuven-Air," their new portable radio. The new model is housed in a



smartly styled two-color leatherette carrying case. It weighs approximately eleven pounds and measures 10 1/2 x 12 1/2 x 4 1/2 inches.

Further information and prices may be obtained by writing to *Electromatic Manufacturing Corporation*, 88 University Place, New York 3, New York.

TABLE COMBINATION

In announcing several models to the trade, *Emerson Radio & Phonograph Corporation* listed a new a.c. super-heterodyne table radio-phonograph combination which incorporates all of the new *Emerson* features and includes a record changer capable of handling 10" and 12" records.

This table model is housed in a cab-



inet of mahogany veneers with a front panel slide-rule dial and control knobs. *Emerson Radio & Phonograph Corporation*, 111 Eighth Avenue, New York 11, New York will supply further information on this receiver and others in the company's line upon request.

THREE-WAY PORTABLE

A low-cost, compact three-way battery portable has been announced by *John Meck Industries, Incorporated*.

The new model, the 5D7/WL18, is only a little larger than a box camera, measuring 9 1/2" x 5 1/2" x 7" and weighs

UTICA TOOLS



PLIERS FOR EVERY NEED

Ask Your Dealer

UTICA DROP FORGE & TOOL CORP.
UTICA 4, NEW YORK

G&E CRAFTSMEN'S BARGAINS

HI-POWER ELECTRIC DRILL

- Heavy duty 3/4" drill. Light weight. Three jaw keyless chuck. Oil bronze bearings.
- 6 ft. flexible rubber cord with plug.
- 900 r.p.m. at full load. Operates at 110 V., AC or DC.
- No. 6202. Each **\$17.95**

A TREASURE CHEST OF RADIO PARTS

- Contains transformers, condensers, dial controls, insulators, terminal connectors, coils, practically all types of switches. Many more useful items.
- No. 6508. 15 lb. Kit for only **\$4.50**
- Send check or money order, including postage. No C.O.D.'s. Write for new free parts catalog.

G & E EQUIPMENT SUPPLY CO.
Dept. RN-5 400 N. SANGAMON ST., CHICAGO 22, ILL.

10 to 20 METER Remaco BEAM ANTENNA



OVER 1000 TO 1 FRONT TO BACK RATIO

GET THIS sturdy Lightweight 3 Element directional antenna with forward gain of 10 db. above $\frac{1}{2}$ wave dipole. Telescopic design of three elements permits continuous tuning from 14 mc. to 30 mc. Elements are spaced at .1 and .15 wave length on 20 meter band. Front-to-back ratio better than 1000 to 1. Our "T" Match Feed System provides convenient impedance match to any conventional feed line with maximum transfer efficiency and minimum line radiation. Elements are self-supporting in cross arm. Maximum strength, lightweight (36 lbs.) and streamlined design eliminates need for heavily guyed masts.

Remaco 3 Element 10 to 20 Meter Beam Antenna with cross arm and "T" Match arm and "T" Match \$92.40 Net

Remaco 2 Element 10 to 20 Meter Antenna with cross arm, "T" Match (with .15 wave length spacing on 20 meters. Parasitic element acts as director or reflector) \$63.00 Net

Easy to Erect Remaco Antenna Towers 12 ft. and 23 ft. . . . Prices 23 ft. . . . \$43.00 Net 12 ft. . . . \$19.00 Net

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The HOUSE OF A MILLION RADIO PARTS

FOR IMMEDIATE SHIPMENT

- No. 353 Crystal Pickups.....\$3.53
- No. 395 Crystal Pickups..... 3.82
- No. 289 Vibrator Transformer for 6 to 8 tube Radio 2.89
- No. 295 Power Transformer—650-V 90M 5V 2 amp. 6.3V amp. Giveaway price. 2.95

Thousands of radio and sound equipment parts and supplies in stock. Tubes, record changers, amplifiers, speakers, etc. Write for catalog No. 59.

Lifetime SOUND EQUIPMENT Co.
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4 NEW AUTOCRAT VALUES!

Model EPT-247 Table Top Electric Record Player, complete with amplifier, Alnico PM speaker, crystal pickup and tubes..... **\$14⁹⁵** Net.

Table Model Radio—4-tube T.R.F.—complete..... **\$13⁹⁵** Net.

Table Model Radio—5-tube Superhet, slide rule dial, Complete..... **\$16⁹⁵** Net.

3-Tube Amplifier with tubes and 5" PM speaker—only..... **\$7⁹⁵** Net.



Save by ordering direct from factory. Net. 20% deposit with C.O.D. orders.

AUTOCRAT RADIO CO.

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Offer thorough training courses in all technical phases of Radio and Television

WEEKLY RATES..... DAYS—EVENINGS
VETERANS: RCA Institutes is approved under G. I. Bill of Rights
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RCA INSTITUTES, Inc.
A Service of Radio Corporation of America
75 Varick St., New York 13, N. Y.

6½ pounds with batteries. The receiver uses a 1R5, 1S5, 1U4 and 3V4 with a selenium rectifier replacing the usual rectifier tube.

Price and additional details will be



supplied upon request to *John Meck Industries, Inc.*, Plymouth, Indiana.

-50-

Transformer Design

(Continued from page 61)

We won't go into mathematical determinations of flux density. It is only necessary to say that for practical work a flux density of 60,000 lines per square inch of core area is satisfactory. By using Fig. 4, one can determine the proper number of turns per volt for given core area which will provide operation at 60,000 lines flux density.

The size of wire to be used for each winding depends only on the magnitude of current flowing in the winding. It is necessary that the wire used be of sufficient cross section area to carry the current without overheating. Listed in the chart of Fig. 5 are the various commonly used wire sizes showing the maximum current-carrying capacity for each size. These values are suitable for good transformer design practice.

Voltage to be developed across each winding determines the number of turns of wire necessary in each winding. The number of turns will also depend on how much space is available in the core to accommodate the finished transformer coil. Because the flux density is determined by the number of turns in the primary in relation to the cross section core area, one could redesign a coil that was too large by reducing the number of turns and using the same size lamination but with more of them to make a larger core area. Thus, by using a larger core area, one could use fewer turns in the winding but still have a low flux density.

Let's go through the actual processes of designing a power transformer. We'll design a filament transformer with the following specifications.

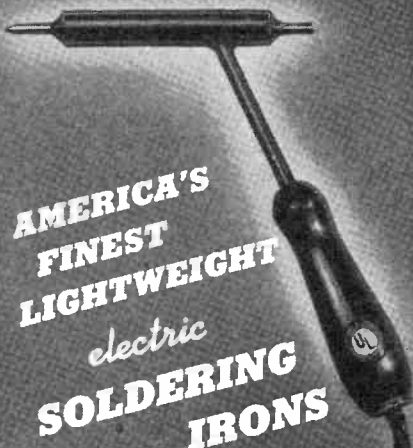
Primary for 115 volts 60 cycles.
Secondary No. 1 for 5.0 volts at 2 amperes.

Secondary No. 2 for 6.3 volts at 3 amperes.

The first step is to find the total v.a.

KELNOR

REG. U. S. PAT. OFF. * PATENTS GRANTED. APP. PDR



AMERICA'S
FINEST
LIGHTWEIGHT
electric
SOLDERING
IRONS

If you do MANUFACTURING or REPAIRING

in the fields of

Radio • Electronics
Radionics • Telephone
Aircraft • Transformers
Vending Machines
Instruments

you will be especially
interested in Kelnor Irons

KELNOR FEATURES:

1. **Weights Only 9 Ounces** complete with 6 feet of cord and plug.
2. **Solders in Hard-to-Reach Places** without burning insulation on adjacent wires.
3. **Kelnor Adjustable Tip.** Longer for less heat, shorter for more heat.
4. **Scientifically Balanced Angle Head** means less operator fatigue, more soldering operations per hour.
5. **Special Patented Kelnor Heating Unit.** Reaches soldering temperature amazingly fast. Outperforms irons of higher wattages.
6. **Reduces Cord Maintenance.** Kelnor irons are held in a "natural" position which prevents cord from twisting.
7. **All-Ceramic Sealed Insulation.** Heating element, lead wires hermetically sealed in ceramic.
8. **Rugged One-Piece Construction.** Tube is welded to barrel.

GUARANTEED FOR ONE YEAR

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or write for information to

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San Francisco, California

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Frazar & Hansen, 301 Clay Street

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Sigmon's - WEST VIRGINIA'S
LARGEST RADIO SUPPLY HOUSE!



A Sensational Value!
AMPLIFIER
GUITAR OR PHONO

You'll be amazed at the rich appearance of this excellently constructed amplifier which is designed specially for guitars or phonographs. CHECK THESE OUTSTANDING FEATURES: tubes, 6SJ7, 6J5, 6L6, 5V4G; 4 tubes—HI Gain; two microphone or instrument inputs; phone input; 6½ watts—beam power; solid wood cabinet; aeroplane cloth covered; tone control; heavy duty 8" speaker.

LIST PRICE \$59.50

NOW \$37.00

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ALL STANDARD LINES CARRIED

Sigmon's Inc.

CHARLESTON, W. VA.

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— LIMITED QUANTITY—SO HURRY! —

5" P.M.—alnico 5 magnet...\$1.45. 10 for...\$12.75
5" Dynamic—1000 ohm field.....each 1.65
10 for 15.00
8" P.M.—alnico 5 magnet—8 watts..... 5.25
10" P.M.—alnico 5 magnet—12 watts..... 7.25
12" P.M.—alnico 5 magnet—12 watts..... 8.95

RADIO LINE FILTERS

Complete with built-in chokes, condensers, ground lead, AC cord, receptacle. Standard famous make. SPECIAL\$4.70

3-tube phono amplifier, tone, vol. control....\$ 3.75
Kit of 3 tubes—12SQ7, 50L6, 35Z5..... 2.25
All-wave antenna kit, matched coupler..... 4.95
12 neon voltage testers on display board..... 3.53
Triplet 660-H volt—ohm—Milliammeter..... 19.60
Lightweight crystal pick-ups—boxed..... 2.45
8" walnut speaker baffles, wall mnt..... 2.70
12" walnut speaker baffles, wall mnt..... 4.45
Portable split-type carrying case for 2—12" speakers..... 18.95

Many other items in stock!!

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Wire Size Amperes Insulation

Wire Size	Amperes	Insulation
10	15	.010"
11	12	.010"
12	9.5	.010"
13	7.5	.010"
14	6.0	.007"
15	4.8	.007"
16	3.7	.007"
17	3.0	.007"
18	2.5	.005"
19	2.0	.005"
20	1.6	.004"
21	1.2	.004"
22	0.92	.004"
23	0.73	.004"
24	0.58	.004"
25	0.46	.003"
26	0.37	.003"
27	0.29	.003"
28	0.23	.002"
29	0.20	.002"
30	0.15	.002"
31	0.11	.0015"
32	.090	.0015"
33	.072	.0015"
34	.057	.001"
35	.045	.001"
36	.036	.001"
37	.028	.001"
38	.023	.0008"
39	.018	.0008"
40	.014	.0008"

Fig. 5. Current carrying capacity of various sizes of enameled wire.

output to be delivered by the two secondaries.

For secondary No. 1, v.a. = 5 x 2 = 10.

For secondary No. 2, v.a. = 6.3 x 3 = 18.9.

Then total secondary v.a. = 10 + 18.9 = 28.9.

The primary circuit v.a. is equal to about 1.4 times the total secondary v.a. or 1.4 x 28.9 = 40.5, approximately. If the primary v.a. is 40.5, then the primary current is equal to

$$\frac{\text{Primary v.a.}}{\text{Primary voltage}} = \frac{40.5}{115} = 0.35 \text{ amperes}$$

Now, since the current flowing in each winding is known, the proper wire sizes can be determined. Consulting Fig. 5 reveals that the primary wire size can be No. 26 to carry 0.35 ampere. It also shows that secondary No. 1 can be wound with No. 19 wire for 2 amperes and that secondary No. 2 can be wound with No. 17 wire for 3 amperes.

According to Fig. 2, the lamination size for a unit to deliver 28.9 v.a. is about 1" or 1½" iron so we'll try this design with 1½" square core. This means that we'll assume a 1½" thick stack of 1½" iron.

The next step is to determine the turns-per-volt required for our core area of 1½" x 1½" = 1.265 square inches. We find that the curve of Fig. 4 specifies that a core area of 1.265 square inches requires 5.5 turns-per-volt.

With 5.5 turns-per-volt, we must have 5.5 turns of wire for each volt appearing across each winding. Then the primary coil must have 5.5 x 115 =

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633 turns of wire. In a like manner, the turns in each of the secondary windings is equal to the voltage of that winding times 5.5. But the open circuit, no load, secondary voltages, must be slightly higher than the values required when the transformer is loaded. Therefore, multiply the load voltage by 1.08 to get the required no load voltage. Then:

For secondary No. 1, we have $5.0 \times 1.08 = 5.4$ volts, approx., no load.

For secondary No. 2, we have $6.3 \times 1.08 = 6.8$ volts, approx., no load.

The turns required for each secondary winding is then equal to the open circuit voltage times 5.5 turns-per-volt. Thus:

No. of turns for secondary No. 1 = $5.4 \times 5.5 = 29.8$ turns, approx.

No. of turns for secondary No. 2 = $6.8 \times 5.5 = 37.4$ turns, approx.

This means that secondary No. 1 will have 30 turns and secondary No. 2 will have 38 turns because you must use full numbers of turns. A fraction of a turn is not effective. Using 30 turns and 38 turns at 5.5 turns per volt, the actual open circuit voltage will be:

For secondary No. 1, $30/5.5 = 5.45$ volts.

For secondary No. 2, $38/5.5 = 6.9$ volts.

At this point let us tabulate our data.

Primary: 115 volts at 60 cycles.

Lamination size = $1\frac{1}{8}$ " iron.

Lamination stack = $1\frac{1}{8}$ ".

Core area = $1\frac{1}{8}$ " x $1\frac{1}{8}$ " = 1.265 sq. in.

Secondary No. 1: 5 volts at 2 amps. 30 turns of No. 19 wire.

Secondary No. 2: 6.3 volts at 3 amps. 38 turns of No. 17 wire.

A transformer coil is made up of enameled copper wire, paper insulation between the layers of wire, paper insulation between the separate wind-

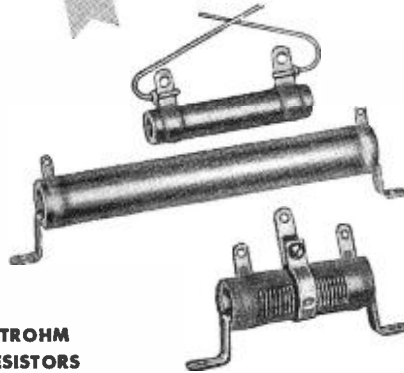
Fig. 6. Breakdown voltage of various between-layer insulating materials.

Paper Type	Thick-ness	Voltage
Cellulose Acetate	.020"	20,000
Cellulose Acetate	.010"	10,000
Cellulose Acetate	.007"	7000
Cellulose Acetate	.003"	3000
Cellulose Acetate	.001"	1000
Varnished Cambric*	.005"	2700
Varnished Cambric*	.007"	4000
Varnished Cambric*	.010"	7000
Fibre Paper	.007"	2000
Fibre Paper	.010"	3000
Red Rope Paper	.005"	800
Gummed Kraft Paper	.007"	1000
Gummed Kraft Paper	.003"	500
Kraft Paper**	.003"	300
Kraft Paper**	.004"	500
Kraft Paper**	.005"	650
Kraft Paper**	.010"	1000
Glassine Paper	.0004"	200
Glassine Paper	.0008"	250
Glassine Paper	.001"	350
Glassine Paper	.0015"	450
Glassine Paper	.002"	550
Gummed Glassine Paper	.002"	1000
Oiled Silk	.003"	2000

* (Empire cloth).
** (Not gummed).

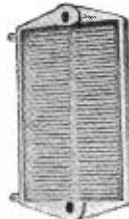
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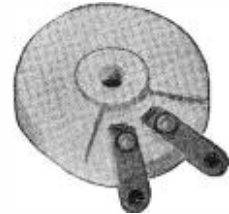
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Lamination Thickness Length

Lamination Thickness	Length
1/2"	.030" 3/4"
5/8"	.030" 7/8"
3/4"	.040" 1 1/16"
1"	.050" 1 1/8"
1 1/8"	.050" 1 1/4"
1 1/4"	.060" 1 3/4"
1 1/2"	.075" 2 3/16"
2"	.100") Depend On
2 1/4"	.125") Actual Dimension of Iron "D Dimension"
3"	.175")

These tubes upon which coils are wound are made by winding required number of layers of gummed kraft paper over a form of proper dimensions.

Fig. 7. Thickness and length of coil tube required for various lamination sizes.

ings, gummed tape, lead wire, and the tube upon which the coil is wound. To select the proper insulating paper consult Fig. 5. Here we see that No. 26 wire requires paper between each layer of wire which is about .003" thick and that .005" or .007" thick paper is proper between individual layers of No. 17 and No. 19 wire.

To determine the amount of paper insulation to use between the separate windings, figure that it must withstand voltage equal to twice the voltage across the winding which produces the highest voltage output in the transformer and add 1000 volts to that value. In this transformer, the primary winding has the highest voltage which is 115 volts and so $2 \times 115 = 230$, plus 1000 = 1230 volts. Data on paper insulation shown in Fig. 6 reveals that two layers of .007" fibre or "empire cloth" will be sufficient between the separate windings.

The coil must be wound on a rigid coil form which can easily be made. At almost any "ten cent" store you can obtain brown gummed "kraft paper" in rolls of various widths. Fig. 7 shows the required thickness for a coil form to be used with each lamination size. Now, this coil form, or tube, must be of proper length so that the coil will fit into the space in the core. Fig. 7 indicates correct coil length (coil form length) for each different sized lamination. Here we see that 1 1/8" iron will accommodate a coil form 1 1/16" long. The inside dimension of this tube must be slightly larger than the core and since the core is 1 1/8" x 1 1/8", we'll add 1/32" to each of these dimensions making the inside of our tube 1 5/32" x 1 5/32" x 1 1/16" long. The tube should be about .050" thick.

Strips of insulating paper to be used between the layers of wire and also to separate the various windings should be 1 1/16" wide and long enough to go around the coil and overlap about 3/4".

Before winding the coil, it is necessary to calculate the size of the coil to determine if it will fit into the core. Fig. 8 shows how many turns of wire can be wound in one layer for coils used in cores of the different sizes. We see here that on 1 1/8" iron we can wind 71 turns of No. 26 wire. Therefore, since our primary has 633 turns it will

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have to be wound in $633 \div 71 = 9$ layers. But it is possible with this iron size to wind 33 turns of No. 19 wire so only one layer is required for secondary No. 1. Two layers will be required for secondary No. 2.

Here let us add together all of the materials which, when they are wrapped one over the other, go together to make the total coil thickness. This data can be tabulated as follows:

Material	Thickness of Material in Inches
1. Winding tube	.050
2. Primary wire, 9 layers #26 wire (9 x .0168)	.151
3. Primary layer insulation (9 x .003)	.027
4. Primary wrapper (2 x .007)	.014
5. Secondary No. 1 wire, 1 layer #19 wire (.0375)	.0375
6. Secondary No. 1 wrapper (2 x .007)	.014
7. Secondary No. 2 wire, 2 layers #17 wire (2 x .0469)	.094
8. Secondary No. 2 layer insulation (1 x .007)	.007
9. Final coil wrapper (2 x .007)	.014
TOTAL	0.4085"

This figure, 0.4085", is the approximate thickness of the finished coil. Actually, the coil will be considerably larger. This is because when the wire and paper are being wound, they do not lie flat. Even with tight winding, the coil bows out slightly. For this reason, it is necessary to establish a maximum constant for coil size. The space into which this coil must fit in our $1\frac{1}{8}$ " iron is 0.562" according to Fig. 1, dimension F'. Our coil has theoretical thickness of 0.4085" which means that theoretically 73 per-cent of the available space is being used. This percentage is calculated thus:

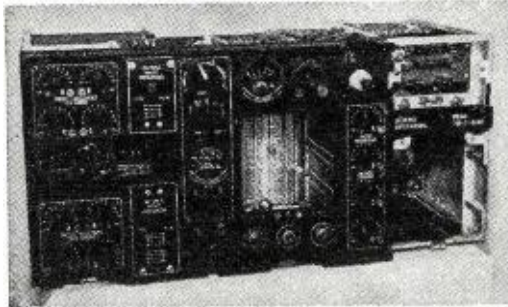
$$\frac{0.4085}{0.562} \times 100 = 73 \text{ per-cent}$$

If this figure had exceeded 82 per-cent, we would have to redesign our coil to make it small enough to fit. This coil with 73 per-cent build is satisfactory and will fit. We could even use less than a $1\frac{1}{8}$ " stack of laminations, which would give us smaller core area and therefore require more turns of wire. With a smaller core area, we would have to refer to Fig. 4 to find the "turns-per-volt" required and then redesign the coil.

In a transformer of this type the primary is wound first. When starting to wind, enough of the No. 26 wire is allowed to protrude to function as one lead connection. After the primary has been wound with .003" paper between each layer of wire the end of the wire is anchored, as was the start lead, to be used as the other connection to the coil. Insulating sleeving is used over the end wires to provide insulation for the leads. Next, the .007" paper layers are placed over the primary and the first secondary is wound in similar manner. When the second secondary has been wound, a final over-all paper wrapper is placed around the finished coil. This wrapper can be two or three layers of the brown gummed paper. Remember, when inserting the paper layer insulation, to make the overlap on a side of

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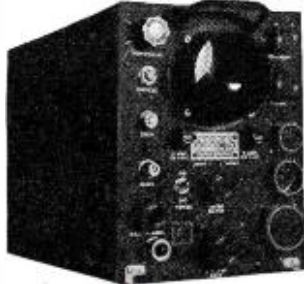


COMMERCIAL RADIO

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Department N

SURPLUS SPECIALS



Cathode Ray Scope, 3" radar indicator 1D-93/APG-13A, 115 volts 400 cps, 10 tubes plus 3" cathode ray tube. Power supply and sweep circuit need modification to make fine scope. New, made by G.E. \$25.00

METERS

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0-3 Milliammeter, 3" square, Triplett, white scale reads 0-3 ma., new	3.50
1-0-1 Milliammeter, 3 1/2" round, Marion sealed meter, white scale reads 100-0-100, new	3.50
0-200 Microammeter, 2 1/2" round Marion sealed meter, white scale reads 0-100, new	5.00
0-1 Milliammeter, 3" square, white scale reads 0-1, 0-2.5, 0-5 ma., 0-500 volts, and 0-2.75 megohms, new	4.00
0-8 amps R.F., Weston thermocouple meter, 2 1/2" round, white scale, new	3.00
0-10 amps, 3" square meter, Triplett, white scale reads 0-10 amps, new	3.50

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4 mfd 600 WVDC	60c
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.25 mfd 4000 WVDC	1.00 Sprague

MICAS

.005 mfd 2500 WVDC	.35c
.01 mfd 1250 WVDC	.15c
Silver Micas .01 mfd.	.5c
Western Electric dry disc rectifier, 150 volts 50 ma	50c

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P. O. Box 250 Red Bank, New Jersey

the coil which is not to be fitted between the legs of the core. This is necessary because if all of the overlaps were put on one of those sides, they would increase the coil size on that side so much as to prevent the coil from being inserted into the core.

Now, it is only necessary to assemble the coil and core together and the transformer is finished except for adding the required mounting brackets.

The design operations described above can be used to design any type of power transformer used in radio work.

In designing a plate transformer the size of wire to be used in the high voltage rectifier secondary is determined by the value of direct current which is to be drawn after rectification. (This applies to full-wave rectification. For half-wave rectification, use wire size twice as large.)

If a winding is to be put on in several layers and is to be center tapped, construction will be easier if you employ an even number of layers. This makes the center tap lead connection fall at one end of a layer.

Before winding a transformer you have designed, it would be a good idea to disassemble completely one or two power transformers to see more clearly the various details of construction. This is suggested because it is difficult to describe the various ways in which leads are brought out of a coil.

Remember to insulate well where all lead connections are made inside a coil. Also use insulation under end wires which are brought up along the sides of the coil to be soldered to leads at the top. Start- and finish-leads of the same winding must be insulated for each other, from other windings and from the turns in the same winding.

Defective transformers can be bought for a few cents each and they provide inexpensive core material and mounting shells. In building your own transformers your only real expense

Fig. 8. Number of turns of wire per layer that can be wound on various lamination sizes.

WIRE SIZE	LAMINATION SIZES							
	1/2"	3/8"	3/4"	1"	1 1/4"	1 3/4"	2"	2 1/2"
10				9	10	11	12	16
11				10	11	12	14	17
12		8	10	12	13	14	16	20
13	6	8	10	13	15	16	18	22
14	7	9	11	15	17	18	21	26
15	8	10	12	16	19	21	24	30
16	9	12	14	19	22	24	27	33
17	10	13	16	21	25	28	30	36
18	11	14	17	23	27	30	34	41
19	13	16	20	25	30	33	37	45
20	14	17	22	28	33	37	42	51
21	16	20	25	31	38	41	46	57
22	17	23	29	35	42	46	51	62
23	19	26	31	39	45	50	56	68
24	22	29	34	45	52	58	64	79
25	25	34	41	50	57	62	71	88
26	27	37	45	57	65	71	81	102
27	31	42	49	63	73	81	93	114
28	36	47	57	71	84	93	107	132
29	39	51	63	80	94	103	119	145
30	44	58	70	88	107	117	133	161
31	52	66	80	100	121	132	147	183
32	60	73	88	110	130	144	163	206
33	70	85	100	125	146	163	186	232
34	78	95	113	138	163	181	205	250
35	90	112	132	160	188	211	238	293
36	99	122	142	173	211	234	264	336
37	110	134	161	194	233	260	292	365
38	122	149	176	215	257	286	325	
39	138	165	203	252	281	316	362	
40	160	193	247	284	338	371	422	

The number of turns of wire per layer shown above allows proper margin at each end of the coil. To find number of turns per layer for any size iron, first decide on coil length, then, subtract about 1/4" to allow for margins. This gives space remaining for winding. Divide this space by the diameter of wire to get number of turns per layer.

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Phono Oscillator

(Continued from page 52)

operated at full power at all times for satisfactory results.

The output is low enough to be well on the safe side, even with an antenna attached. However, a receiver with a few feet of wire as an antenna will satisfactorily receive the signal over a considerable distance.

The unit is constructed on the simple chassis shown. The chassis may be easily made at home. The parts layout is not critical. The coil is mounted on the folded end of the chassis in order that its iron core may be adjusted by a screwdriver through a hole in the phonograph cabinet. Care should be taken that the plates of the selenium rectifier do not touch the chassis or any metal part, since they are at high potential.

Note that *no* connections whatsoever are made to the chassis. Using the chassis for "common ground" will cause the entire unit to be at high potential with respect to ground, a situation very dangerous when a metal phonograph or changer case is used. For the same reason the strap connecting one side of the crystal to the arm must be removed. This may be done at the same time the resistor is placed in the arm.

On the Webster model 55, and some other changers, the motor switch is placed between the two motor field coils. In order to use this switch for the oscillator too, it is necessary to change the connections so the switch will be between one side of the line and the motor. The oscillator is placed in parallel with the motor, and the same switch operates both.

After the unit is completed, the most important adjustment is the power supply voltage divider. The taps should be set to give resistance values slightly above those shown, a voltmeter should be connected across the 1R5 filament, and the power turned on. Tap #1 should be adjusted to give 1.45 volts at the filament. Then tap #2 and #3 are adjusted to give 90 volts plate and 67.5 volts screen grid voltage, maintaining the filament voltage at 1.45 volts by adjustment of #1. Be sure the taps are loosened before moving, or you will ruin the bleeder! Turn off the power before each adjustment. If values slightly higher than those given have been set up, these adjustments will require very little time. Now attach an antenna to the oscillator, if necessary add a few feet of wire to the antenna, and let 'er go. —30—

ANSWERS TO BIZ QUIZ

- | | | | |
|------|-------|-------|-------|
| 1. c | 6. a | 11. a | 16. c |
| 2. b | 7. c | 12. b | 17. c |
| 3. c | 8. b | 13. a | 18. b |
| 4. a | 9. a | 14. a | 19. a |
| 5. c | 10. c | 15. b | 20. c |

ARE YOU A SALESMAN? Give yourself 5 points for each answer you had checked correctly. A score of 45 is average, and 75 or better is very good indeed.



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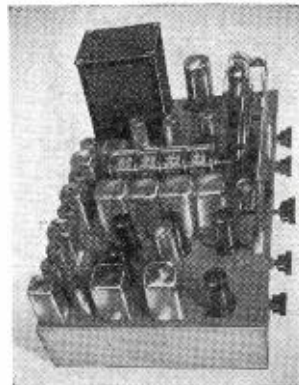
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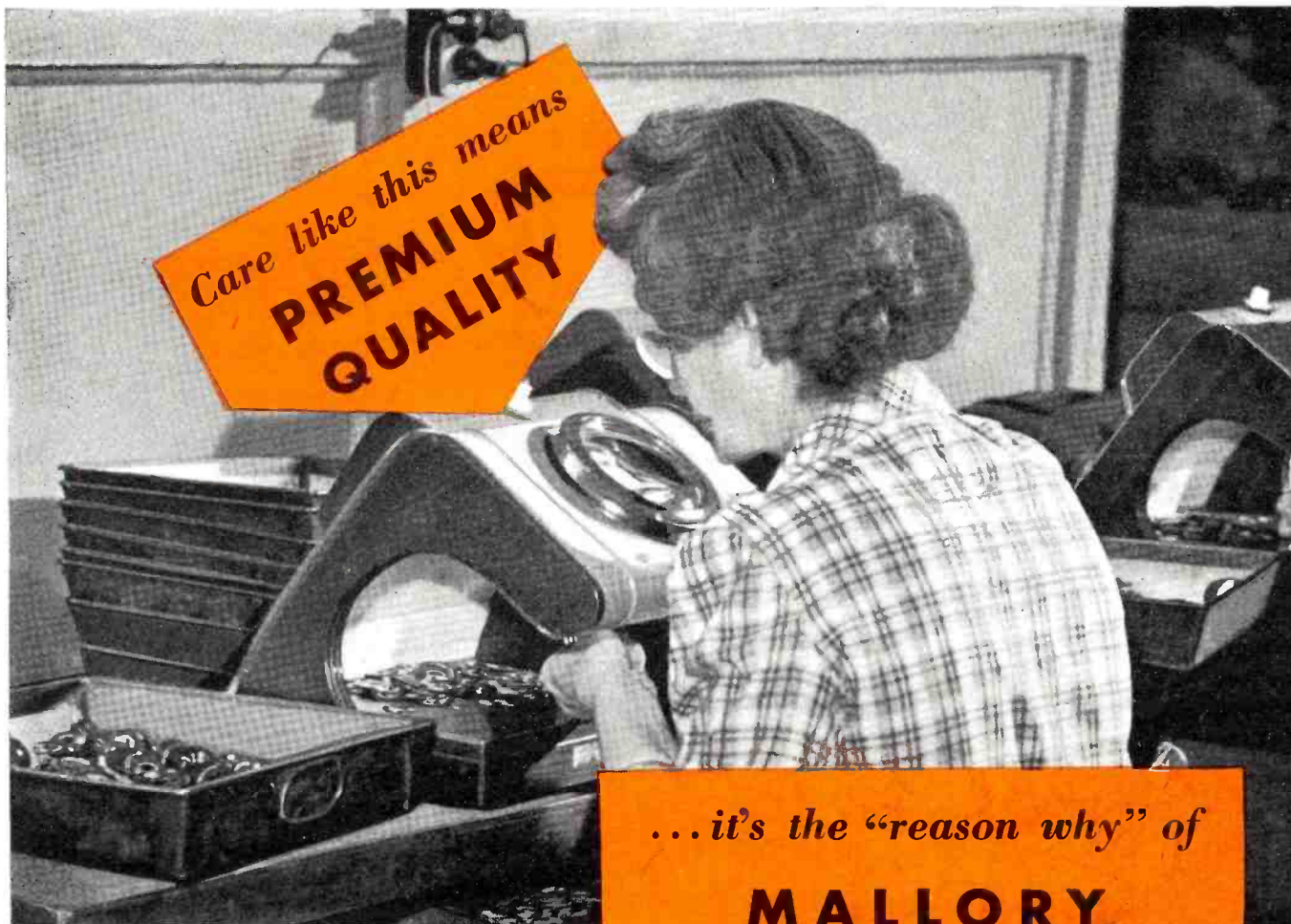
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