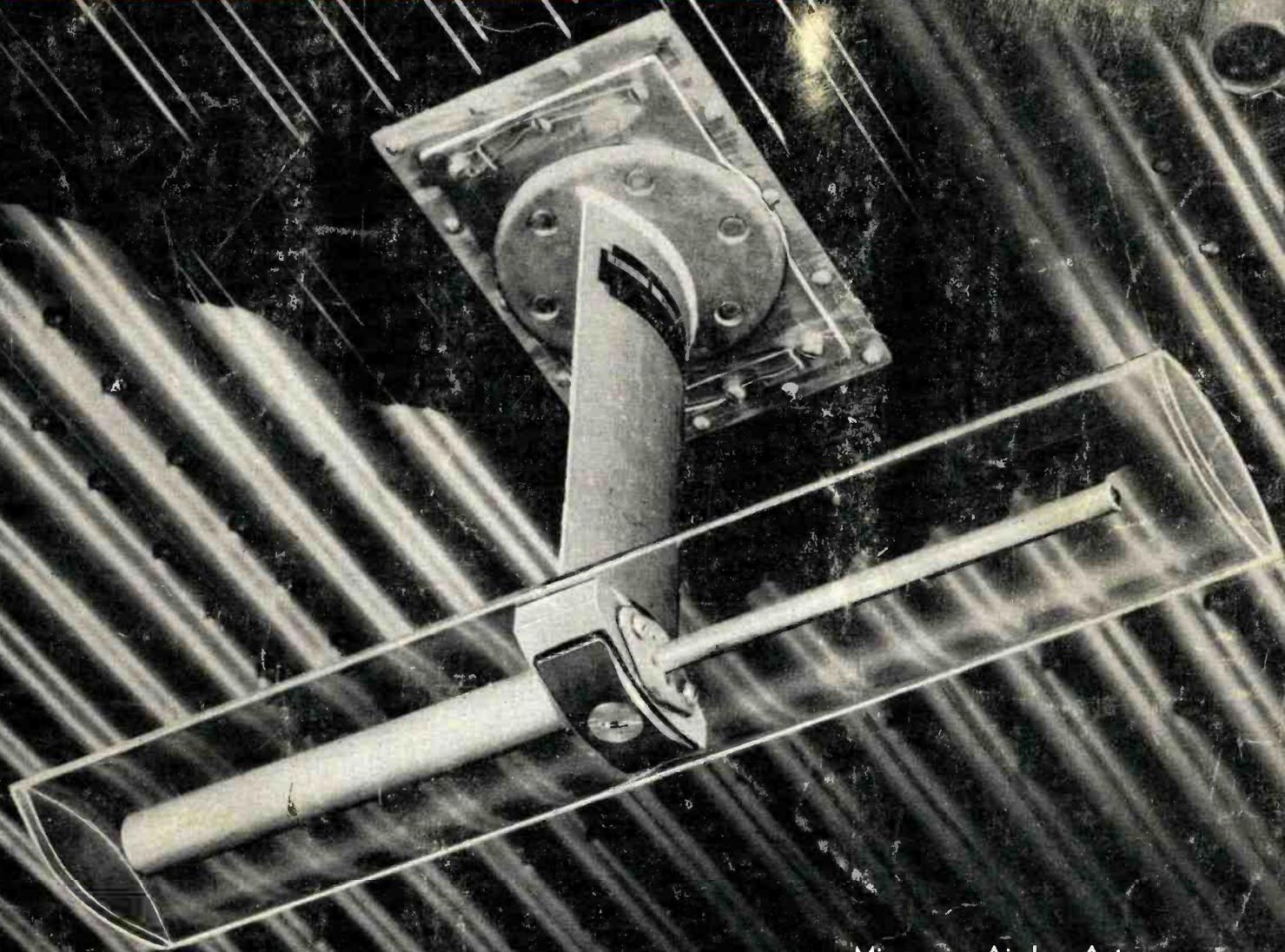


# RADIO NEWS

MAY  
1941  
25c  
In Canada 30c



Micro-wave Airplane Antenna

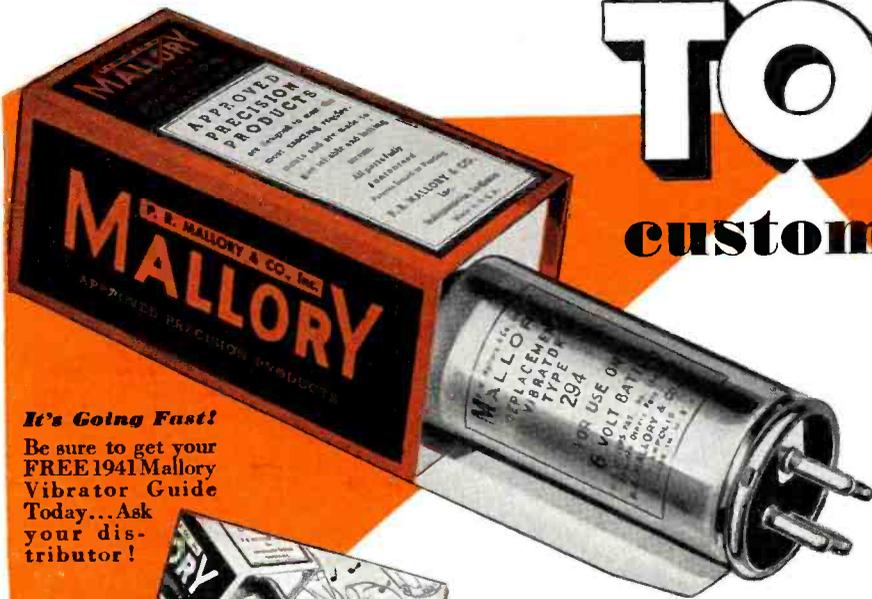
**DO YOU WANT A JOB AS RECEIVER TESTER?**

**IMPROVED FIELD DAY PORTABLE STATION**

**Serviceman's "Aligner-Upper" ★ Picking the Proper P. A. Speaker**

**RELATIVE FIELD STRENGTH METER**

# TOPS for customer-making!

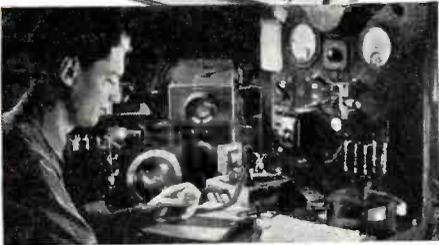


**It's Going Fast!**

Be sure to get your FREE 1941 Mallory Vibrator Guide Today... Ask your distributor!



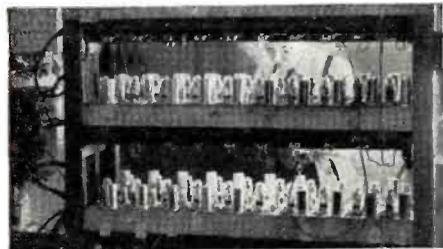
## P. R. MALLORY & CO., Inc. MALLORY VIBRATORS



Mallory Precision Vibrators result from constant engineering research and development.



Every performance factor of every Mallory Vibrator is proven perfect by these experts.



Sample cross sections from each production run receive rigorous life tests.

It's a hundred to one that the owner of every automobile radio you service, is also the owner of one or more home radio receivers. What a chance then... on auto radio service... to establish yourself and your reputation for superior service.

That's why we say... and that's why thousands of radio service engineers agree... that Mallory Vibrators are tops when it comes to making customers. With Mallory Vibrators you can depend upon exact replacements with the precise characteristics required by the circuit. You can depend upon the outstanding quality that has made Mallory Vibrators standard original equipment in the great majority of all auto radios.

Mallory Vibrators cost no more... and you can safely stake your reputation for service on every one you use.

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

Cable Address—PELMALLO

More than ever  
—INSIST ON

P. R. MALLORY & CO., Inc.  
**MALLORY**  
APPROVED  
PRECISION PRODUCTS

VIBRATORS • VIBRAPACKS • CONDENSERS •  
VOLUME CONTROLS • ROTARY SWITCHES •  
SINGLE AND MULTIPLE PUSH BUTTON SWITCHES  
• RESISTORS • RADIO HARDWARE

# DAVEGA

AMATEUR DIVISION, 63 Cortlandt St., N. Y., N. Y.  
World's Largest Radio Dealer

## A Really Wonderful Value!

- Ten independent ranges—six general, four amateur bandsread
- Full vision velvet vernier dial—ratio 30 to 1
- Sensitivity—better than one microvolt
- Signal to noise ratio better than 30 db. at ten meters
- Stability—3 parts in 100,000 with a 20 volt line fluctuation
- Wide range crystal filter with rejection ratios as high as 10,000 to 1
- Low drift temperature compensation
- Series valve noise limiter
- Crystal clear tone with 8 watts undistorted output
- Amateur net price with speaker in cabinet—\$147.50



# SCOOP! FAMOUS LEACH RECORDERS

Leach Recording Panels Can Be Used with Any Radio or Amplifier

### Model L

Wide range magnetic cutting head. Special G.E. split phase recording motor. Quadrant worm gear drive. 12 1/2" aluminum die cast turntable.

REGULAR PRICE ... \$59.50

OUR PRICE

**\$29.50**

### Model C.A. 12

Hi fidelity audio amplifier. Automatic idler type drive. Monitoring meter. G.E. special motor. 12 watt amplifier, uniform response.

REGULAR PRICE ... \$125.00

SPECIAL

**\$69.50**

### L.k6 Deluxe Recorder

Two microphone channels. 17" aluminum die cast turntable. 50-12000 cycle amplifier. Two Speeds, 33 1/3 and 78 R.P.M. Heavy duty special motor. Built in hiFi radio tuner

REGULAR PRICE .. \$350.00

SPECIAL

**\$159.50**



- Crystal filter (four-position variable selectivity).
- Calibrated bandsread.
- Automatic noise limiter.
- Preselection all bands.
- Two stage IF amplifier.
- Fly-wheel tuning
- Separate 6-inch PM speaker.
- CW Monitor.

**\$49.95**

## Never Before! ECHOPHONE

Commercial

- Preselection on all bands
  - Calibrated bandsread
  - Automatic noise limiter
- 8 Tubes, 3 bands, covers 545 to 2100 kc.—2.1 to 8.1 mc.—7.9 to 30.5 mc. 5" PM dynamic speaker mounted in cabinet. Calibrated bandsread scale on 80/40/20/10 meter amateur bands. Electrical bandsread at all frequencies in the tuning range. Operates on 115 volts alternate current or direct current. Available also for operation on higher voltages with resistance cord.

### HALLICRAFTER SX-28



15 tubes—two stages preselection—calibrated bandsread inertia controlled—micrometer scale tuning inertia controlled—tone and AC on-off—beat frequency oscillator — AF gain — RF gain—crystal phasing—adjustable noise limiter—send-receive switch—AVC—BFO switch—bass boost switch—phono jack—80, 40, 20 and 10 meter amateur bands.

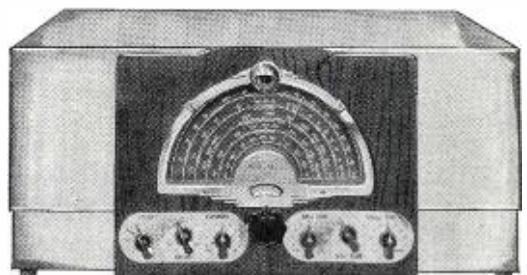
### FINEST McMURDO CHASSIS EVER BUILT!

Two R.F. Stages  
Variable Selectivity  
Giant Jensen 18" Speaker  
Finest Shielding  
34 Watts Undistorted

Built to sell for \$350.00

DEMON-STRATOR **\$149.50**

Complete including 18" Speaker made by Jensen



AMATEUR DIVISION  
63 CORTLANDT STREET  
NEW YORK, N. Y.

# DAVEGA



By THE EDITOR

THE responsibility of publishing a magazine is usually said to be twofold; to the reader and to the advertiser. Since we do bring out a magazine, we must assume these two duties. In discharging these obligations, we consistently attempt to give our readers that which they want, and that which is at the same time authoritative, timely, and accurate. To our advertisers we offer our columns for the exposition of their wares, as long as their products are honestly described, and are in keeping with good taste and common sense.

As a radio magazine, the National Defense Situation has imposed another responsibility on our shoulders. That is this. Since radio itself is a valuable adjunct to our national defense, it is incumbent on us that we not expose any "secrets" of military or semi-military nature. Not only that, but our accountability goes further, and in keeping with a statement recently made to us by a government official, we have closed our columns to the description of any type of apparatus which would make the policing of our airwaves more difficult, or which could be used easily for subversive radio activity.

We are familiar that trained men in the ranks of the enemies of our country are well able to design and build transmitting units of any type. We are also well acquainted with the fact that a great deal of the actual subversive radio activity is carried on by not-too-intelligent people. It is because of them that the readers have not been seeing midget transmitters featured in the columns of RADIO NEWS. We have been told that there is no sense in giving out information which would enable any Tom, Dick, or Harry to build a "one-tuber" which could easily be hidden in his clothes, or could just as simply be transported from place to place.

This will explain why we have refrained from featuring single, or two-tube portables. Knowing that the readers' patriotism rises above their own interests, we feel confident that they will understand and agree. . . .

FOR a different reason, we have omitted the construction of ultra-short wave therapy units. At a recent hearing before the FCC, the ARRL made the statement that it was opposed to giving out such information in "ham" magazines. We agree with the League, but say, "We have never shown such information."

Our reasons are not necessarily those of the FCC. We have heard of a authentic cases where short-wave therapy in the hands of the uninitiated has been the cause of death. We believe that ultra short wave ther-

(Continued on page 45)



Trade-Mark Registered

Including Articles on POPULAR TELEVISION

The Magazine for the radio amateur  
experimenter, serviceman & dealer

VOL. 25, NO. 5



## Contents for May, 1941

### FEATURES

- CQ—"PITC"** . . . . . Raymond A. Dillon, W3DWJ-WCFT 6  
An American ham investigates Pitcairn and reports what he found.
- Improved Field Day Portable Station** . . . . . Oliver Read, W9ETI 9  
The 1941 version of the annual QRR rig,—in Army dress.
- The "Aligner-Upper"** . . . . . Raymond B. Frank W9JU 13  
A gadget to test receivers, crystals, and for many other uses.
- How to Make Receiver Measurements** . . . . . Guy Dexter 14  
Fit yourself to a fine radio position by learning receiver alignment.
- Picking the Proper P. A. Speakers** . . . . . Clark E. Jackson 17  
Showing the serviceman how to pick the right speaker for a job.
- Relative Field Strength Meter** . . . . . Thornton Chew 19  
A unit to find interfering noise and locate the best u.h.f. antenna location.
- The RADIO NEWS 1941 Super Superheterodyne Receiver, Part 2** . . . . . Karl A. Kopetzky, W9QEA & Oliver Read, W9ETI 24  
Building the FM, Oscilloscope, Antenna, Squelch and AM tuner assemblies.
- Communication & Electronic Maintenance, Part 7** . . . . .  
. . . . . W. H. Bohlke 36  
Some practical, all-around uses for the service test bench.

Cover Picture: Close-up view of the Western Electric Sonic Altimeter microwave antenna attached to the belly of a plane. (Courtesy Western Electric)

### DEPARTMENTS

- |   |   |  |
|---|---|--|
| As I See It . . . . . 12                  | QRD? . . . . . 32                         | Police Radio . . . . . 28                  |
| What's New in Radio . . 33                | Bench Notes . . . . . 23                  | Serviceman's Cases . . . 53                |
| Book Review . . . . . 41                  | Manufacturer's Literature 40              | The Video Reporter . . . 28                |
| Hamchatter . . . . . 29                   | Aviation Radio . . . . . 38               | Ring the Bell . . . . . 21                 |
| Serviceman's Legal<br>Advice . . . . . 22 | Washington Communi-<br>cation . . . . . 8 | Serviceman's Experi-<br>ences . . . . . 18 |

Copyright 1941,  
ZIFF-DAVIS PUBLISHING COMPANY  
Member of the Audit Bureau of Circulations

RADIO NEWS is published monthly by the Ziff-Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill., William B. Ziff, Publisher; B. G. Davis, Editor; J. Fred Henry, Business Manager; Karl A. Kopetzky, W9QEA, Managing Editor; Oliver Read, W9ETI, Technical Editor; Raymond Frank, W9JU, Laboratory Technician; A. H. Erickson, W9TDT, Draftsman; Herman R. Bolin, Art Director; S. L. Cahn, Advertising Manager. New York Office, 381 Fourth Ave. Subscription \$2.50 per year; single copies, 25 cents; foreign postage \$1.00 per year additional, Canada 50c additional. Subscribers should allow at least 2 weeks for change of address. All communications about subscriptions should be addressed to: Director of Circulation, 608 S. Dearborn St., Chicago, Ill. Entered as second class matter March 9, 1938, at the Post Office, Chicago, Illinois, under the Act of March 3, 1879. Contributors should retain a copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for their safety. Accepted material is subject to whatever adaptations, and revisions, including "by-line" changes, necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by contributor, all photographs and drawings will be considered as constituting a part of the manuscript in making payment.

**Echophone EC-1** Real communications receiver performance at this amazingly low price. The EC-1 incorporates every necessary feature for the amateur or short wave listener. 6 tubes. 3 bands covering 5.45 kc. to 30.5 mc. (550 to 9.85 meters). Electrical bandspread on all bands. Beat frequency oscillator. Self-contained PM Dynamic Speaker. AC/DC operation from 115/125 volts.

Model EC-1 .....\$19.95

**YOU CAN GET ALL**



**Echophone EC-2**

will give you up to the minute communications receiver performance. 8 tubes. Three bands. Covers 545 to 2100 kc. Self contained 5" PM Dynamic Speaker. Preselection on all bands. Calibrated bandspread scale on 80, 40, 20 and 10 meter amateur bands. Automatic noise limiter. Electrical bandspread at all frequencies in the tuning range. Operates on 115 volts AC or DC. Here's your opportunity to have all these communications features at this remarkably low price. Model EC-2.....\$29.95

Terms: \$4.50 Down. \$4.50 per month for 6 months.

(All prices net F.O.B. Chicago)

**SEND FOR THIS NEW  
1941 SPRING RADIO  
CATALOG FREE**

**180 PAGES**



**ALLIED  
RADIO**



**FROM**

**ALLIED'S**

*New Spring  
Catalog!*



**Echophone EC-3** Never before have you been offered all these outstanding communications features at this extremely low price. 10 tubes. 3 bands, covers 545 to 2100 kc.—2.1 to 8.1 mc.—7.9 to 30.5 mc. Crystal filter (four position variable selectivity). Calibrated bandspread. Automatic noise limiter. Preselection on all bands. 2 stage IF amplifier. Fly-wheel tuning. Separate 6" PM Speaker. CW monitor. Electrical bandspread operated by fly-wheel tuning. AC or DC, 115 volts. Model EC-3.....\$49.95

Terms: \$5.00 Down. \$5.96 per month for 8 months.

**ALLIED RADIO CORPORATION**

Dept. 1-EE-1, 833 West Jackson Blvd., Chicago, Ill.

- Please send your New 1941 Spring Radio Catalog FREE
- Please ship EC-1. \$.....enclosed.
- Please ship EC-2. \$.....enclosed.
- Please ship EC-3. \$.....enclosed.

NAME.....

ADDRESS.....

CITY..... STATE.....



Landfall on Pitcairn Island by the Yankee bearing with it the radio.



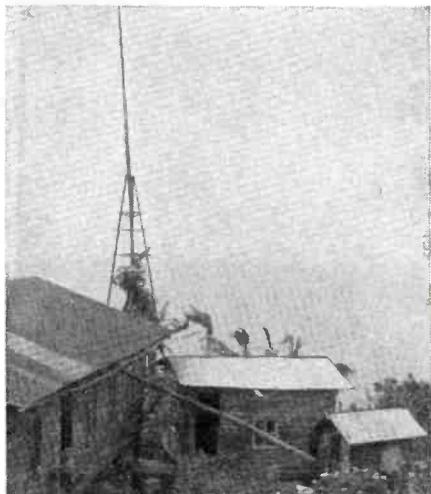
According to the movie, HMS Bounty, as seen from camera tug, approaches PITC.

## CQ-“PITC”

by **RAYMOND A. DILLON, W3DWJ-WCFT**

At sea aboard the Yacht Yankee.

**When the author reached Pitcairn, he found it quite different from the movie. However, he did meet Fletcher Christian's kin-folks.**



The simple antenna tower the author found when he visited VR6AY-PITC.

Charging of the batteries is done by this rather modern windcharger.



The story about Pitcairn was the subject of a large part of MGM's picture, "The Mutiny on the Bounty" which was showing the country-over a number of years ago. Herewith some additional facts about the radio set-up of the now famous island. The story was forwarded to us by the author's brother who lives in Brookline, Mass. The author is still away on the "Yankee," and was reached by radio when it became necessary to have him answer some questions. The article was sent from the "Yankee" by regular mail from one of its ports-of-call.  
—The Editors.

**I**N the last day of October 1939, the Yacht Yankee, bound around the world, set sail from the quaint old seaport town of Gloucester, with no schedule except to be back in eighteen months. On arriving at Panama there was much excitement at the post office when it was learned that Pitcairn was included in our itinerary. For at the post office, waiting delivery to Pitcairn, were numerous bags of mail, and a large box marked FRAGILE, RADIO APPARATUS, HANDLE WITH CARE.

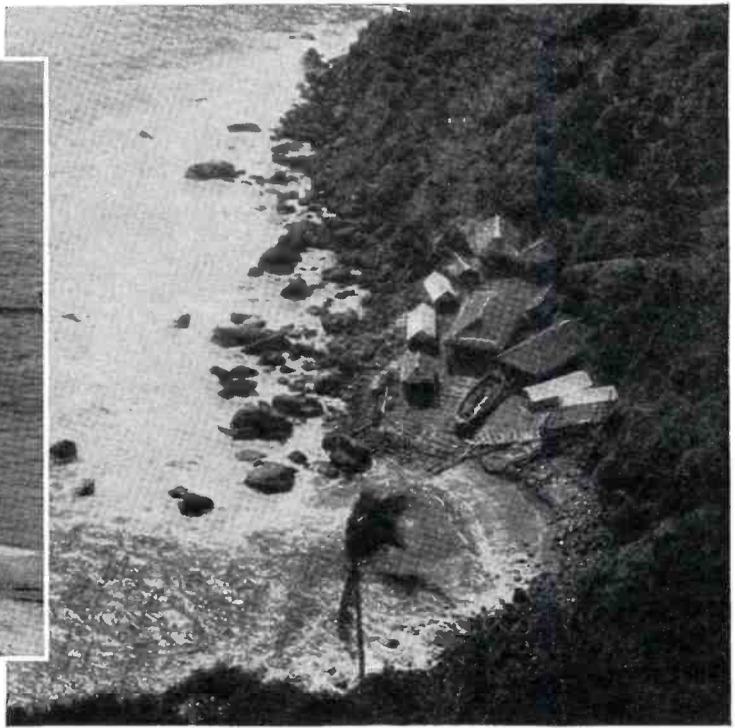
Further questioning brought out the fact that this large box contained Pitcairn's transmitter that had been sent to Panama for repairs more than a year ago. Carefully stowing it in our engine room, we set sail, and were soon carrying it swiftly across many desolate miles of the deep blue of the Pacific to PITC.

The history of Pitcairn is one of the most romantic stories of the sea. About the time of the American Revolution, Lieutenant Bligh set sail from England with a crew of forty-five in the H.M.S. Bounty, a vessel about the same length as the Yankee. Attracted by the beautiful women of the South Seas, the crew mutinied and set the captain adrift in a small open launch. Bligh made a heroic passage against terrific difficulties to Timor nearly 4,000 miles away, while the Bounty's crew, with their beautiful Tahitian wives, landed at the rocky uninhabited island of Pitcairn. After taking everything of value off the Bounty, she was sunk to prevent the ship from advertising their hiding place.

For two years all went well until the wife of one of the white men fell over a high cliff. He then stole a woman from one of the natives, who angered, killed every white man on the island,



The movie showed a large and spacious beach, no rocks, and many beautiful natives in a palm-tree setting.



Actually the beach is tiny, the coast forbidding. The *Bounty* was sunk here.

except one, who escaped to the woods. The women rebelled and murdered all the native men, leaving John Adams as the only male on the entire island.

The population has grown until now there are about two hundred inhabitants on this small island in the South Pacific, all descendants of the *Bounty's* mutineers.

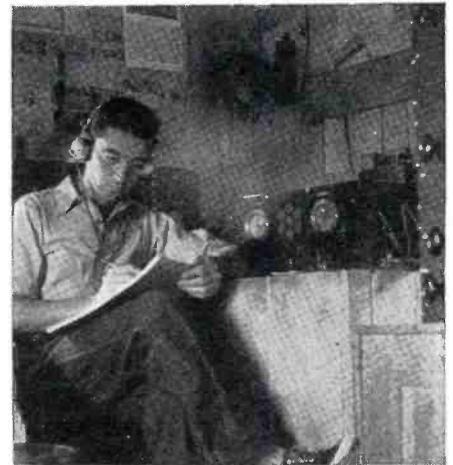
In 1922, the islanders became interested in radio when rumor reached them that an English radio company was about to send them a receiver. A buzzer was acquired from a passing ship and several of them set out to learn the code. Finally, the great day arrived and a simple crystal receiver was installed. Although the range was extremely small, it served to bring them news of passing ships. Frequently ships that planned to stop at Pitcairn would send a message "blind," thus giving the islanders time to meet it in their small boats.

About five years later a small spark transmitter was set up, consisting mostly of a spark coil and a twelve

volt storage battery. Because there is no power supply on the island, it was necessarily of low power. For a few years the storage battery, or *accumulator* as it is known on the island, was charged by a small engine driven generator. Fuel for this was obtained from an emergency supply left by an Italian airplane company, that was planning an air route from South America to Tahiti by way of Easter Island, Pitcairn, and Manga Reva.

When this supply of gasoline was exhausted, the islanders were unable to obtain more because of shipping regulations. Due to this queer legal set-up, their one storage battery had to be sent all the way to New Zealand for charging, leaving this lonely station off the air for months at a time.

Having no official call letters, Andrew Young, the native operator, early adopted the abbreviation *PITC* as an identification. Although the station has recently been granted the official call of *VR6AY*, it is still known the  
(Continued on page 46)



The author at the station on *PITC* worked some phenomenally fine dx.

Fletcher Christian's real descendant, Andrew Young, *PITC's* self-taught op.



The movie version. Here Capt. Bligh, left, talks to Fletcher Christian.



The transmitter was brought to *PITC* on deck all the way, and survived.





by **ALFRED TOOMBS**

Special Washington Correspondent for RADIO NEWS

### Defense Program in Critical Stage

**T**HE defense program is now in its most critical period. The slack has been taken up and the manufacturers are feeling the full weight of the load they must pull. There are shortages of vital materials and tools. There are labor shortages and stoppages. There is the shortage of time. A few months from now, the situation will have eased as materials come in from new sources and labor difficulties are overcome. But now, the Office of Production Management is working desperately to get industry through the crisis. There have been some industries which have fallen behind their delivery schedules. It is feared that some others will do likewise.

But there is one industry which has been putting its deliveries on the line and on the dot—and which, it appears at this point, will continue to do so. That is the radio manufacturing industry. From the OPM, we have obtained the first progress report made on the big work of radio rearmament.

Both the Army and the Navy report "all production on schedule, and there is still a reservoir of capacity un tapped." The production of radio for airplanes and tanks has been especially prompt. A strike in a plant which makes condensers hit the Navy, but only in a minor way. There have been a few other items which have fallen behind, but these difficulties were overcome.

There are two discernible clouds on the

activities may throw a monkey wrench in the works. Nobody has been told yet exactly how much radio equipment we are going to hand over to the British and there are some who fear the worst. For if we have to fill large British orders—on top of the \$20,000,000 worth of communication equipment the Navy is going to order and the \$50,000,000 worth the Army wants—the factories may be hard put.

Observers have noted that Major Van Voorhis, the Signal Corps intelligence officer, has been shifted to London as an observer. His mission may be linked to Lend-Lease activities.

The OPM says that at this time it can



Maj. E. F. Armstrong willingly gave FM. . . .

see no danger of a serious interference with production of radio and radio parts for civilian use. It is obvious, however, that there are going to be delays in deliveries and shortages of parts for repairs—particularly those which have aluminum—for some time. That's a word meant for the wise.

At the television hearing in March, Dr. Peter C. Goldmark testified that he did not believe that the manufacturers could turn out 20,000 video sets a year, because of the defense program. This statement was challenged and he admitted that the only article which necessarily should be made of aluminum is the electrolytic condenser. But he insisted that the shortage of engineers who could work in the television field was acute. "Trained television engineers are worth their weight in gold," he said.

Before long, more materials are going on the priorities list. Zinc will be rationed by July 1, we hear, and copper, lead, rubber and other materials are going to be scarcer as the weeks go by. It may be that the radio manufacturing industry, which is doing so well now, will have to sacrifice civilian work so as to conserve material and manpower for defense work.

### Radio Defense Orders Being Investigated

**I**NVESTIGATORS for the Truman Committee, which has been set up to probe the letting of defense contracts, have been looking into the radio manufacturing field

and before the investigation is over, the big companies may find themselves up to their ears in a new kind of trouble.

The Committee was appointed to get to the bottom of a number of stories which were floating around Washington, about the activities of lobbies, fixers, of favoritism, inefficiency, etc.

There are several things in connection with the letting of millions of dollars worth of radio contracts which will bear the committee's scrutiny. For instance, most of the money has gone to the three or four biggest manufacturers, who have farmed the work out to sub-contractors when they had to. Some committee members feel that orders of this kind should have been spread around the country more.

The fact that the Army is still giving "educational orders" in the radio manufacturing field and that many radio parts are being bought without open bids has attracted some comment. In justice to everyone, it should be pointed out that the Army has negotiated many secret contracts for radio equipment only because it had military secrets to guard.

### Radio Spies?

**G**OVERNMENT officials are at last showing some signs of waking up to the possibilities of the use of radio by espionage agents. For the first time, the FCC has organized a unit to listen to and keep records of foreign propaganda broadcasts. A picked force of 350 technicians, translators, code experts, etc., is being assembled to handle the job of recording and studying every propaganda broadcast directed at this country.

The unit was established on the recommendation of the Defense Communications Board, with the blessing of the Army and Navy, after discussions which showed how wide open the United States was in this field. Not only will listeners and analysts pay close attention to voice broadcasts, but they will also listen to musical programs. Experts have long been aware of the possibility of using music to transmit code messages. They aren't taking any chances.

The tightening of the control over foreign broadcasts follows an increase in suspicious



Admiral S. C. Hooper warned anew. . . .

horizon. These are shortages of materials—aluminum and quartz crystals. The strict rationing of aluminum will assure the radio manufacturers enough of this metal to handle their defense orders. The crystals are another problem altogether, however.

Crystals come from Brazil, from country deep in the heart of South America. The mineral is gathered by native labor, which is about as dependable as the March weather. These boys have no interest in anybody's war and it's just about impossible to get them to work fast enough to meet the increased U. S. needs.

There is a suspicion in the Army and Navy, however, that the Lend-Lease bill



Senator Truman viewed with alarm. . . .

air activities, such as the *insult-Hitler-at-his-own-expense* stunt of recent date, which is still under investigation. You may look for further steps in the near future to tighten our weak patrol of the air. It's about time.

### Red Radio Merchant Marine Ops.

**T**HE Navy has been handling the problem of the merchant marine radio rooms with kid gloves, but officers are preparing to move quickly to settle the question before long.

Admiral S. C. Hooper, testifying again before the House Merchant Marine Committee, renewed his warning that disloyal radio operators on merchant ships could cause na-

(Continued on page 42)

# Improved Field Day Portable Station

by **OLIVER READ, W9ETI**

Technical Editor, RADIO NEWS

***The 1941 version of the annual QRR rig, this time dressed up in Army style. A complete Field Day Station ready to operate on 5 bands.***

**F**OR the last three years, annually, RADIO NEWS has brought forth a new circuit, or an adaptation of an old one, which was featured as a "QRR Rig." This year is no exception, and the unit to be described is the 1941 version of the annual QRR rig.

There are a number of changes that are at once apparent in this year's model. For one, the unit is encased in a wooden carrying case which closely approximates, although it is not exactly like, the Army rigs. There are several reasons for this, not the least one being the fact that metal cabinets are at present rising in price and, since wood is still reasonably available, it was felt that the 1941 version should be so encased.

In addition to that, the wooden cabinet adapted itself much more readily to the use to which it was put. It will be noticed that space has been left not only for the transmitter and receiver proper, but for a speaker, a small compartment for wire, tools and paper, and another compartment for a key, microphone and any additional apparatus which would be carried into QRR locations. The wooden cabinet, therefore, made the QRR rig into a veritable portable station complete in every respect, even to a writing tablet and log book. The cover is used as a writing table!!

One of the distinct advantages of this model is the fact that it includes a receiver and a transmitter operating either from 110 volts a.c., or from a 6 volt supply source. While it is true that the "B" batteries will run the receiver only for 81 hours, approximately, nevertheless in intermittent service this represents quite a few days of operation, and since the B batteries are easily obtainable and easily replaceable (from the rear) we thought rather than to extend the amount of filtering which would be necessary in order to clear the vibrator hash out of the receiver, that it would be better to use ordinary *Mini-Max* batteries.

## **The Receiver**

Receivers are daily becoming more cheap to buy than to build. The *Echo-phone EC-1* unit, which was converted for use with this particular model, is a "hot" communications receiver for the size and for the number of tubes it employs. Some slight changes, which will be described later, were made before the commercial unit could be adapted for this QRR model. In view of the fact that the receiver costs but \$19.95 to the amateur, it was felt that the parts of a home-built receiver would easily total more than that and, hence, the commercial unit was used. The transmitter, however, is home-built, since transmitters of commercial design have not yet arrived at the same price level which home-built units have been enjoying for some time. Transmitter and receiver are interconnected by means of a readily removable plug and socket arrangement, which permits either unit to be removed from the cabinet for servicing. One antenna is employed both for



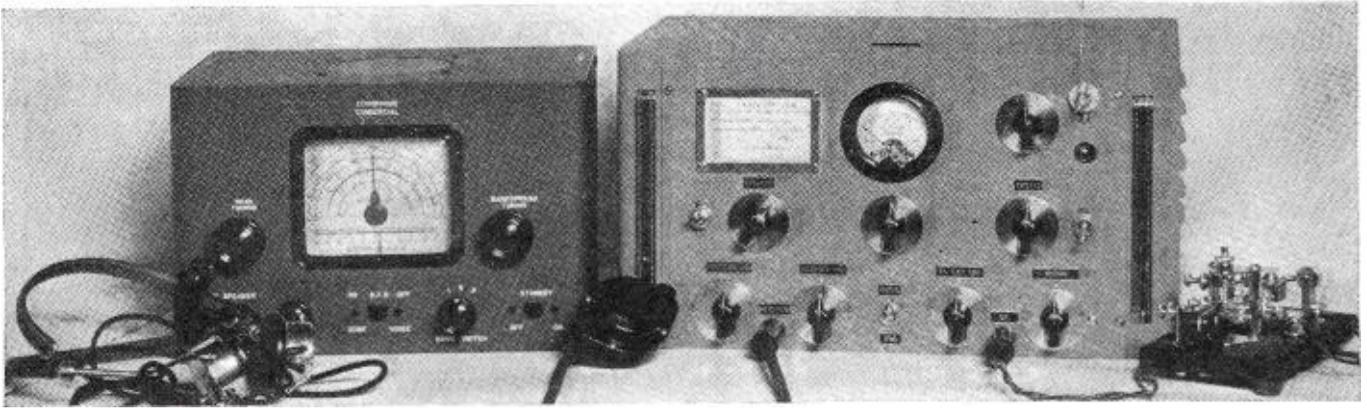
Note how closely the rig approximates the familiar Army pattern.

receiving and transmitting, and a relay throws the antenna from transmit to receive whenever the change takes place. When the receiver is being operated on battery, high voltage of the battery is disconnected in the transmit position.

The tube lineup for the transmitter is as follows: HY60 electron-coupled oscillator, HY60 r.f. amplifier, 6V6 class A modulator, a VR-150 voltage regulator, and a 6W5G rectifier. Considerable experience with all types of portable gear indicated that many features would have to be included and yet would not interfere with the flexibility of the complete assembly. Among the points considered and studied was the selection of frequency control. We have always felt that variable control was the correct thing to use in order to be able to combat the QRM from home stations that use many times the power available in a portable rig such as this.

Several circuits were tried. Some of these failed to give the desired coverage, others worked very well on the low frequencies but failed miserably on 10 and 20 meters. The two latter bands were included to make the unit available for any service—whether it be field-day, portable emergency, or as a complete exciter for the home station. A search was made for commercially available coil assemblies that were compact in design and would work with conventional tubes. The answer was found in the *Browning 5G* and *5P* coil assemblies. These are designed for full coverage on the 10, 20, 40, 80, and 160 meter bands.

Next was the actual circuit design considerations. These were taken in order and the details worked out after a decision was reached as to the features we wished to include. The transmitter must work from both conventional 60 cycle supply lines as well as from a 6 volt storage battery to be



When taken from the case, the Field Day Station makes a good "shack" rig.

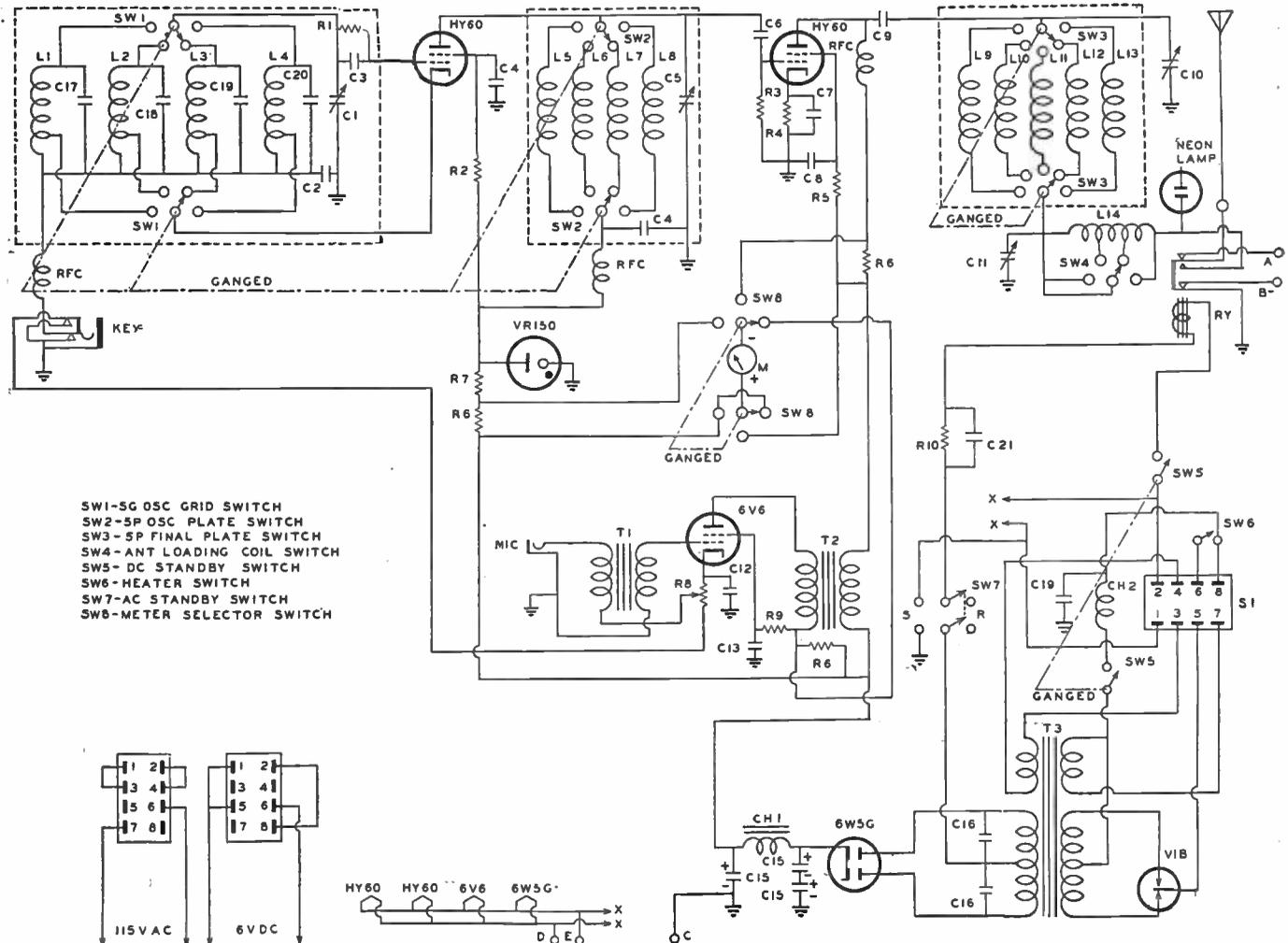
used universally. Some weight could have been saved by designing the rig to operate from a vibrator pack, but the unit would only be used on rare occasions and this would really spoil the flexibility of the unit.

Two plugs with cables are used for connection to the power source. One is for the battery and the other for the

a.c. line. Correct connections are made when the proper plug is inserted. The output of the power supply will be slightly higher when operation is had from the supply lines. In either case, the frequency stability of the ECO will be satisfactory. We found that plenty of drive was had when the oscillator tube voltage was reduced to as low as

125 volts. Consequently we included a voltage regulator tube to keep the plate voltage at a constant value of 150 volts. This is a real advantage in field day operation where more than one rig may be operated from the same power source.

The transmitter must operate efficiently on both c. w. and on phone.



- SW1-SG OSC GRID SWITCH
- SW2-SF OSC PLATE SWITCH
- SW3-SF FINAL PLATE SWITCH
- SW4-ANT LOADING COIL SWITCH
- SW5-DC STANDBY SWITCH
- SW6-HEATER SWITCH
- SW7-AC STANDBY SWITCH
- SW8-METER SELECTOR SWITCH

- R<sub>1</sub>-50,000 ohms, 1/2 w. IRC
- R<sub>2</sub>-15,000 ohms, 1 w. IRC
- R<sub>3</sub>-12,000 ohms, 1 w. IRC
- R<sub>4</sub>-200 ohms, 10 w. Ohmite
- R<sub>5</sub>-20,000 ohms, 10 w. Ohmite
- R<sub>6</sub>-50 ohms, 10 w. Ohmite
- R<sub>7</sub>-5,000 ohms, 10 w. Ohmite
- R<sub>8</sub>-200 ohms, 10 w. adj. Ohmite
- R<sub>9</sub>-15,000 ohms, 1 w. IRC
- R<sub>10</sub>-25,000 ohms, 75 w. Ohmite
- R<sub>11</sub>-1,000 ohms, 75 w. Ohmite
- C<sub>1</sub>-.0001 mfd. var. Hammarlund MC100S
- C<sub>2</sub>-.006 mfd. mica, Aerovox
- C<sub>3</sub>-.0001 mfd. mica, Aerovox
- C<sub>4</sub>-.005 mfd. mica, Aerovox
- C<sub>5</sub>-.00005 mfd. var. Hammarlund MC50S

- C<sub>6</sub>-.00005 mfd. mica, Aerovox
- C<sub>7</sub>-.01 mfd. 600 v. paper, Aerovox
- C<sub>8</sub>-.003 mfd. mica, Aerovox
- C<sub>9</sub>-.002 mfd. mica, Aerovox
- C<sub>10</sub>-.0002 mfd. var. Hammarlund MC200S
- C<sub>11</sub>-.000260 mfd. var. Hammarlund MC250S
- C<sub>12</sub>-20 mfd. 50 v. electro. Aerovox
- C<sub>13</sub>-.5 mfd. 200 v. paper, Aerovox
- C<sub>14</sub>-8 mfd. 600 v. electro. Mallory
- C<sub>15</sub>-16 mfd. 450 v. electro. Mallory
- C<sub>16</sub>-.05 mfd. 1,600 v. paper, Aerovox
- C<sub>17</sub>-200 mfd. silver-mica, Sprague
- C<sub>18</sub>-225 mfd. silver-mica, Sprague
- C<sub>19</sub>-210 mfd. silver-mica, Sprague
- C<sub>20</sub>-180 mfd. silver-mica, Sprague
- C<sub>21</sub>-.00005 mfd. var. Hammarlund MC50S
- RFC-2.5 mhy. R.F. Choke, Millen

- M-0-100 DCMA. Triplett, Model 223
- T<sub>1</sub>-Mike-to-grid. Thordarson T-86A02
- T<sub>2</sub>-Modulation trans. Thordarson T-19M13
- T<sub>3</sub>-Universal power trans. Thordarson T-14R40
- CH<sub>1</sub>-Filter Choke. Thordarson T-37C53
- S<sub>1</sub>-8 Contact socket. Jones
- P<sub>1</sub>, P<sub>2</sub>-8 Contact male plug. Jones
- V, B-Mallory 825 or equivalent
- SW<sub>1</sub>, SW<sub>2</sub>-2 gang, 5 position coil shorting switch
- SW<sub>3</sub>-2 gang, 5 position coil shorting switch
- SW<sub>4</sub>-Single gang, 4 position switch, Mallory
- SW<sub>5</sub>, SW<sub>6</sub>-DPST Heavy duty toggle, Arrow
- SW<sub>7</sub>-DPDT Toggle, Arrow
- SW<sub>8</sub>-DP-3 position meter switch, Mallory
- RY-Special relay. Guardian 115-2-CB3

We conserve on plate current when a key is plugged into the key jack. This opens the cathode return circuit of the modulator and renders the tube inoperative. It also removes the voltage from the carbon microphone giving further conservation of power. The plug is removed from the key jack when phone operation is to be used. Microphone current is taken from the cathode resistor of the 6V6 modulator. This is most convenient and provides a highly satisfactory voltage source.

A single meter is used in conjunction with a selector switch so that Osc. plate, Amplifier plate, and Modulator plate currents may be read. This is done by inserting 50 ohm resistors in series with the supply source as shown. The introduction of this low value will not affect the operation of the circuit in any way. It is necessary to observe the polarity of the meter when wiring these resistor connections.

Another feature found to be well worth its inclusion is the antenna changeover relay. This is a *Guardian* DPDT a.c.-d.c. unit, designed for operation from 6 volts. Note that a series resistor and electrolytic condenser are wired in series with one side of the relay coil. This is necessary for proper operation of the relay. One set of contacts is used to transfer the antenna from transmitter to receiver, and the other pair to open the B negative supply to the receiver when the relay is closed (transmitting position).

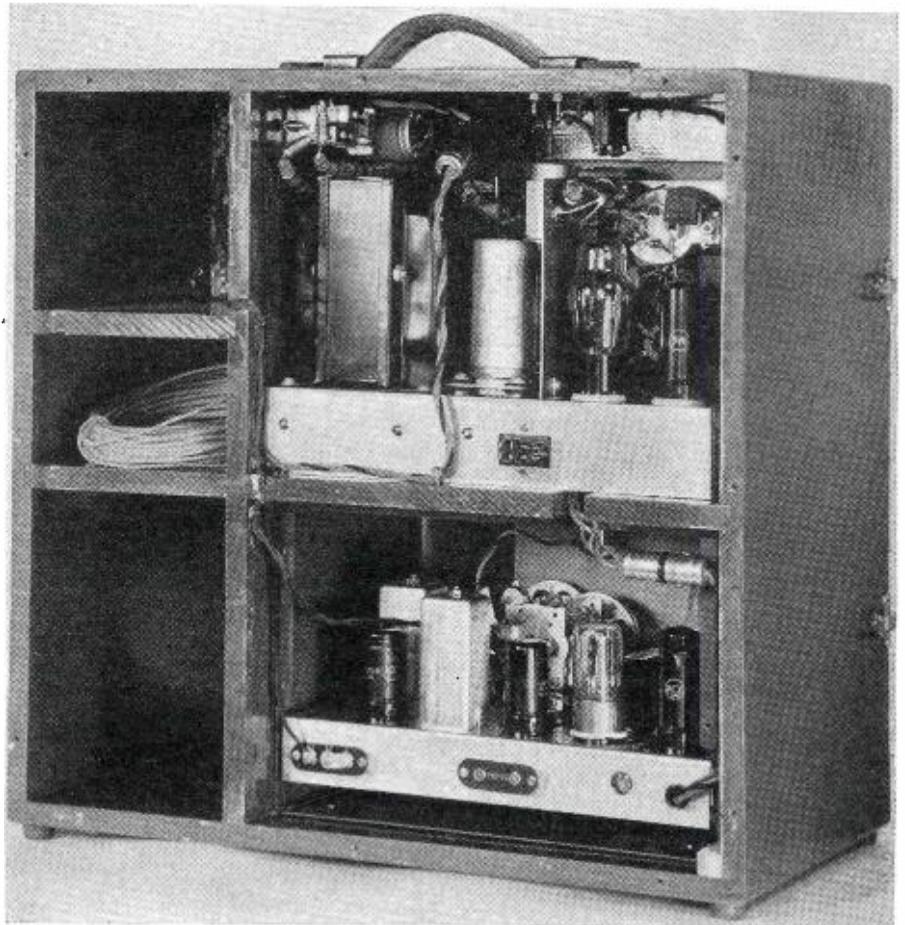
The transmitter was originally designed to be housed in the *Bud* steel cabinet illustrated. Actually the wasted space within the cabinet was intended to be used as a storage compartment for spare tubes, vibrator, phones, and key. The receiver had not been designed, but it was to be built and mounted in the same sized cabinet. The builder may follow the same idea if the rig is to be used as a fixed home station.

The transmitter must operate into almost any antenna system for emergency service. A suitable pi network plus a tapped loading coil will do the trick nicely. So much for the highlights of the transmitter.

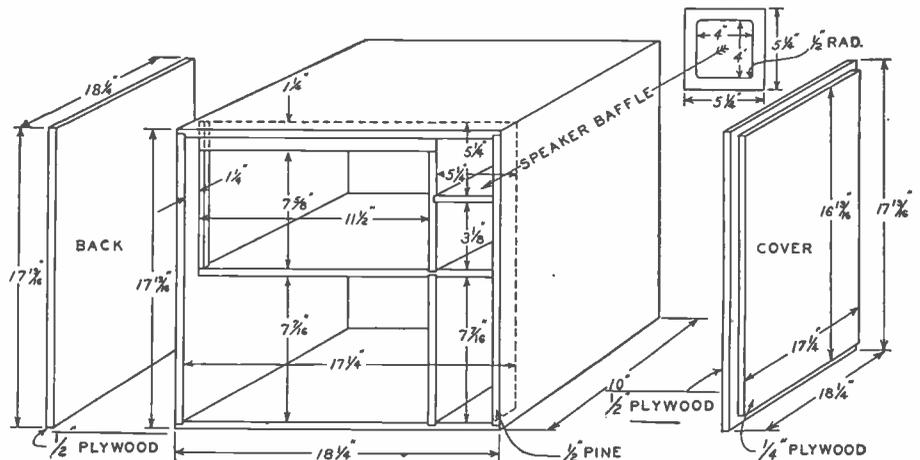
An important QRR touch is to be found with the inclusion of 2 lights which are needed for night work.

The receiver problem was solved after listening to the *Echophone Commercial*, a small 6 tube all-band receiver that really has a lot of sock for such a small unit. This little set was designed for 110 volt a.c.-d.c. operation. It was decided, after examining the schematic diagram, that the set could be converted easily for battery operation with no complications. The original tube lineup included a 12K8 converter, 12SK7 i.f. amplifier, 12SQ7 det. avc. audio amplifier, 35L6GT power amplifier, and a 35Z5GT rectifier. The rectifier tube is not required for battery operation and is dispensed with in our revised model. The set operates efficiently with from 90 to 135 volts B supply. Much time, not to mention headaches, may be saved by converting this receiver instead of constructing one from scratch. Many hams already own this set, and it may be used to additional advantage as a QRR rig. Details for the conversion will be given in later chapters.

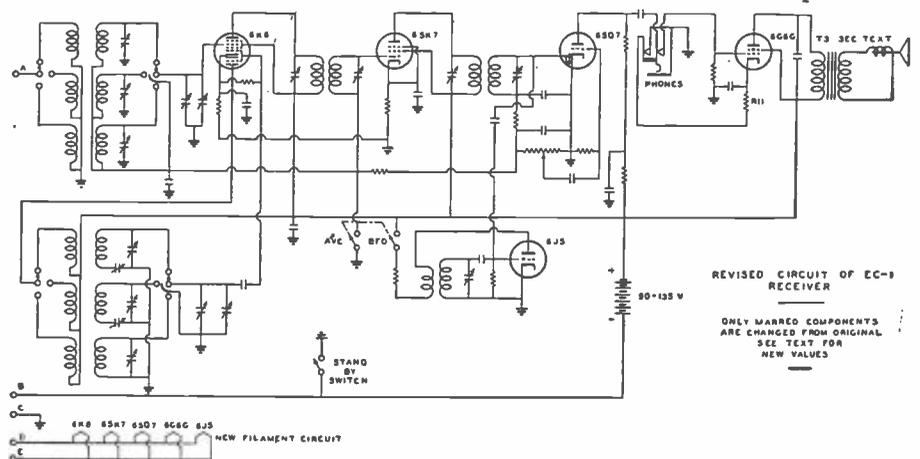
The complete transmitter is con-  
(*Pse QSY to page 48*)

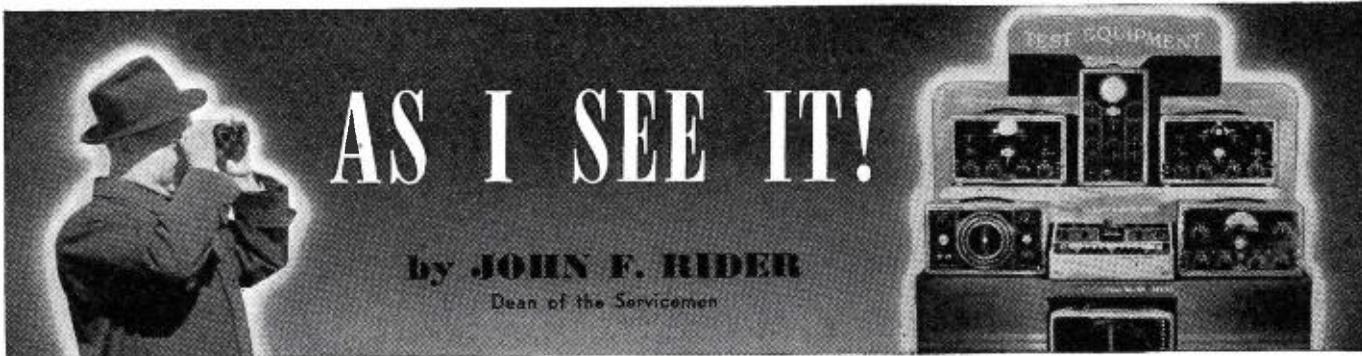


The Field Day Station from behind with back removed.



Field case construction details. Below: Converted receiver hookup.





### Record Changers

IT is seldom that we devote even a portion of this column to so called technical phases of radio servicing. As a rule we have tried to present subjects which we felt would be food for thought. However, during the past few weeks, it has been our good fortune to speak with the service managers of a number of representative set manufacturers and some very significant ideas were presented to us by these men and we pass them on to you for what they may be worth.

One of the problems of a set manufacturer as well as the servicemen, and something about which very little has been done, is that of record changers. A rough guess, and perhaps on the conservative side, is that there are more than a million automatic record changers in use today. In this group we do not include those turnover types which are employed in some of the very large installations and those used in coin machines. We are referring specifically to those which are a part of the radio receivers employed in the home.

From what information we can gather, and this comes from servicemen, responsible individuals at that—they do not care to work on record changer equipment. In fact we have a serviceman right in our own organization who can service any kind of receiver and do a good job, but he openly admits that if he is called in to work on a record changer unit, he "gives up the ghost."

To attempt to place the blame upon the manufacturer or the servicemen for a condition such as this is difficult.

We can appreciate the serviceman's point of view in that the record changer is strictly a mechanical device about which very little information, other than strictly service information which has appeared in service bulletins, has been disseminated amongst servicemen. So it is not surprising if a serviceman feels that he does not know enough about equipment of this type to do proper servicing. We don't know how many of you who read these lines have ever seen the underside of even the simplest automatic record changer. If you have not, take our word for the fact that it resembles one of the very complicated *Rube Goldberg Inventions*.

We have had the opportunity of examining radio literature contained in various magazines and while much space is devoted to many phases of radio servicing, very little, if any information concerning the record changer, has appeared in these publications. If anything has been given it was a close copy of the regular service notes released by some manufacturer.

This by no means is intended as indictment of radio magazines but it would be a very excellent act on the part of some magazine to make an effort to secure such information as will cultivate an acquaintanceship between the serviceman and the record changer.

After all, somebody must service these units. The manufacturers of the large turnover type record changers like, *Capehart* for example, suggest that only their experienced dealer men work on these units because of the complicated nature of the device and the abundance of knowledge which is required in order that proper service be rendered. Fortunately for the serviceman, these very complicated record changers are few in comparison with the very great number of simpler types. It is these simpler types that require most service if only because of their greater number. Granting that development of these record changers has reached that level where satisfactory operation prevails for a long period, it is nevertheless a mechanical device and consequently is subject to some failure. The customer who buys a record changer today, with respect to the possibility of

getting proper service, is leading with his chin. It is only the fact that defects are not commonplace which has enabled the successful continuance of sales to the public of such devices when such a hazardous servicing situation exists.

To the servicemen at large this should be an important problem. It is a problem associated with a device more easily comprehended by the customer than the operation of a radio receiver. Unlike a radio system, the performance of a record changer is good or bad. There is nothing in between and if a defect is of such character that it breaks records, John Q. Public would be more than happy to pay a fair price for service if only to safeguard his investment in records.

Looking at this subject from the viewpoint of the serviceman, it is an unfair act on his part to refuse to render service on such mechanical devices. Any attempt to justify his act by saying that not sufficient data is available is wrong. If the manufacturers develop certain apparatus for sale to the radio industry, which is within the operating scope of the serviceman, it behooves that individual to gather that data which he needs to enable him to do his work in proper fashion. It is his responsibility to see to it that such data is made available by bringing whatever pressure he can upon those who are in a position to secure such data for their readers. In other words, we are placing some of this blame upon the altar of the servicing industry if only because of the negligence of a number of the servicemen to communicate often enough with those who supply him with his reading material. We can say, without any fear of contradiction, that the editors of most of the radio publications welcome correspondence.

### Test Equipment & National Defense

THOSE who have no direct connection with radio apparatus, other than handling daily that which they already have in their possession do not appreciate the transition that is taking place in the radio manufacturing industry. As each day passes the industry is fast approaching the day when shortage of merchandise will become acute. In fact pressure is being felt by different organizations right today and it is because of this that deliveries cannot be made to jobbers and by the jobbers to the servicemen.

Now this is not being said with the intention of creating alarm or a helter-skelter rush to purchase apparatus. However it is true that if what we see around us is a barometer of things to come, *there may well be a shortage*

(Continued on page 50)

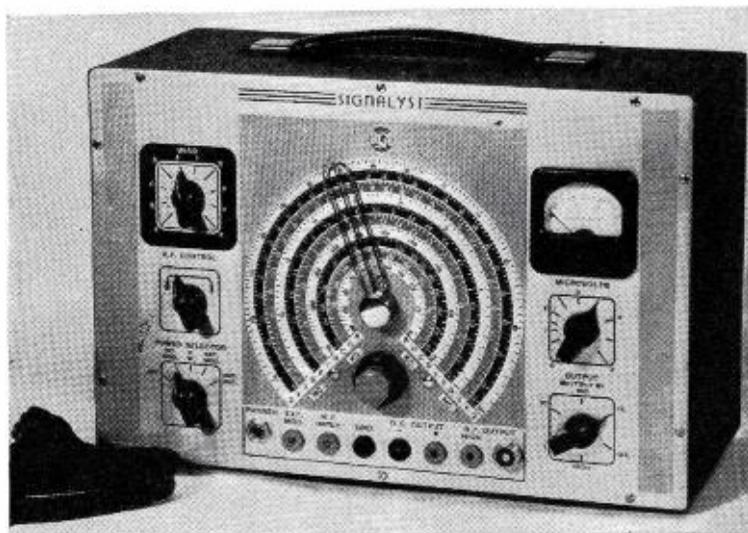




# How to Make Receiver Measurements . . .

by  
**GUY DEXTER**

Baltimore, Maryland.



Prime pre-requisite—A good signal generator!

*The nearest thing to a bottle-neck is in receiver aligners! Learn that profession, and you will find yourself in a 1st-class paying position.*

**I**T is hard to believe that among men actually engaged in radio receiver work, there is an appalling lack of knowledge regarding performance measurements. Nevertheless, this is the sad truth. It seldom occurs to the average serviceman that a real performance check would reveal whether he was getting to first base or not with his repairs and adjustments. Generally, it is lack of information on his own part—a defective part is replaced, or the stages are realigned, and so the set should be operating as the manufacturer intended. Just like that!

A radio man knows nothing about a receiver until he has checked its performance. The ear is not a measuring instrument, nor is the receiver dial. The mere fact that the dial calibration looks passable and that all extraneous noises have been eliminated does not positively indicate that a receiver is operating at peak efficiency. There may still be defective parts that could stand replacing. Tubes that give a reasonably good account of themselves in tube checkers might be discarded if the gain of the receiver stage in which they are employed, rather than the tube checker, is made the yardstick. A coupling transformer may pass all of the conventional service checks, yet show up as defective in a good fidelity test. Side-band cutting in a too-sharply peaked i.f. channel, uncovered quickly in an overall fidelity check, will render any receiver *sour* to a lover of well-rounded music. The writer might go on for an hour listing topics. There is a real art to the business of restoring a receiver to its original (or better) operating standard, and performance checking is the science behind that art. Indeed, brethren, there is more to receiver adjustment than the alignment alone.

Because complete information on re-

ceiver performance measurements is, for the most part, so scattered through a number of textbooks, it has not reached large percentages of the trade. Generally, it is something that is learned in a hand-to-mouth manner over a long period of practice. And when the last detail is finally mastered, the technician looks back down the corridors of time and opines that he might have done a much better job all along and perhaps made more money had he had the information from the very start. The men who earn their bread in receiver-factory test laboratories have to know performance measurements and be able to make them quickly and completely, otherwise their presence on the job becomes a matter of ancient history. New applicants for such jobs (and they pay well!) are questioned closely as to their knowledge of the subject.

The serviceman who would expand his scope of activity to include communications receivers must be equipped to make performance measurements as regular routine if he would cash in on this profitable business. Certainly, the technician who builds receivers of any circuit-type, for any field of application, must be similarly equipped if he would stay in business long.

## **Scope of Measurements**

In order completely to determine receiver performance, the following characteristics must be measured in *quantitative* terms:

**Sensitivity.** This is a measure of the ability of the receiver to respond fully to weak signals. The lower the signal voltage which will deliver maximum undistorted power output to the speaker, the more sensitive is the receiver. A practical point of view is that the insensitive receiver will not respond satisfactorily to any but

strong broadcast carriers. Sensitivity is an important receiver property, whether the equipment is of the communication, broadcast, or experimental class. The sensitivity test can, like other performance measurements, serve to show up defective circuit components and poor design.

**Selectivity.** The ability of a receiver to reject all unwanted signals when it is tuned to a desired signal is as important to the owner of a home broadcast receiver as to the professional radio operator. All operators of receivers desire that their sets be capable of operation within a few kilocycles of an undesired signal without interference. It is the ability of the tuned circuits to admit only the desired signal that is termed *selectivity*. Selectivity measurements will reveal a number of circuit troubles, as well as such poor-design features as over-coupling and high-resistance coils.

**Channel Gain.** This property is somewhat comparable to sensitivity. It is the purpose of a vacuum tube to provide amplification (step-up, or gain) and it is used for that purpose in conjunction with transformers or similar coupling media. Each stage of each channel (R. F., I. F., Converter, and A. F.) has as one of its jobs the function of gain, and the efficiency with which it does this job is a measure of the perfection of parts, tubes, and design. Gain measurements are made on separate stages and on an entire channel, embracing all of its stages. The measurement of gain is most important in receiver procedure. There are many advantages in so checking stages and channels in trouble diagnosis, as well as in receiver studies.

**Fidelity.** This term, lately loosely handled to a great extent by the general public, refers to the degree to which the receiver reproduces the sounds which were sent into the broad-

cast microphone. Fidelity, as the definition would assign, refers to *faithfulness* of reproduction. The radio listener expects a trumpet to sound like a trumpet, does not expect the bass drum to be cut out of the program by his own receiver, or the high notes of the violin to be obliterated. For checking this receiver characteristic, the radio man has the equivalent of a miniature broadcast station and all of the instruments and voices known to man. For indeed that analogy is fulfilled by his r.f. signal generator when it is modulated by his variable-frequency audio oscillator. Fidelity checks are made in the audio stages and speaker, i.f. channel, and entire receiver. Overemphasis of certain notes is checked in the course of this measurement and laid at the door of the speaker, chassis, cabinet, or any other part found to be resonating.

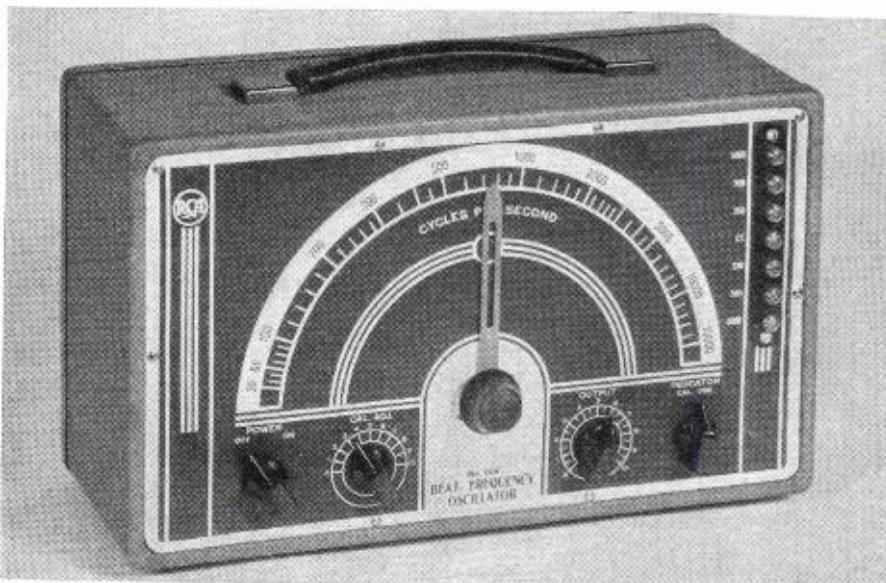
**Noise Ratio.** The actual level of the signal above the residual set noise is of paramount importance. To the communications operator, the signal-to-noise ratio is a quantitative indication of quiet operation. To the home set owner, who knows nothing about the ratio and cares less, the presence of a high noise level between station carriers is a distinct nuisance. Detection of an unreasonably high noise level can lead to direct spotting and remedying of the trouble.

**Image Ratio.** Image signals from the air, or repeat points produced by image settings of the high-frequency oscillator in a superheterodyne receiver run a close second in nuisance value to interference arising from poor selectivity. A complete receiver performance test includes an actual measurement of the ratio of signal to image. After spotting a high ratio, the serviceman is seldom able to rectify the difficulty, since it is most frequently a result of design; however, he can, when the customer approves, add sufficient r.f. amplifier stages (two are sufficient; one helpful) to attenuate the image response. In extreme cases, he might even be authorized to change the intermediate frequency to a higher value for the same purpose. But, of course, this latter procedure involves redesign of the coils of the r.f. section as well.

### Instruments

The instruments used in complete receiver measurements are those which are to be found in any up to date shop or lab. They are a signal generator with calibrated output voltage indicator and attenuator and with provision for external modulation; a variable-frequency audio oscillator, covering the range extending from 20 cycles to 15 kilocycles; a suitable a.c. voltmeter with good frequency response, preferably a vacuum-tube voltmeter (but a high-quality copper-oxide type instrument will suffice); and suitable power load resistors to match the receiver output if the speaker is not obtainable.

The signal generator must be an all-wave instrument to be useful for the measurements required in r.f. and i.f. channels, and must be provided with suitable impedance-matching devices for coupling into the receiver. Of many excellent instruments, now available to the serviceman, is the *RCA Signalyst*. This signal generator delivers a maximum of 0.2 volt r.m.s.



Second prime requisite—An excellent audio signal generator!

(or greater) of calibrated r.f. voltage between 100 kc. and 120 Mc. with very good accuracy. It was used by the writer, together with a variable-frequency audio oscillator in collecting data for this article. A built-in vacuum-tube voltmeter, in conjunction with a calibrated attenuator, gives an accurate indication of the r.f. voltage applied to the test points of the receiver circuit. The instrument is modulated internally at 400 cycles per second, or may be externally modulated by the variable-frequency audio oscillator in fidelity measurements, as will be explained later. The fact that the frequencies are delivered at an accuracy of plus or minus 1 per cent on *fundamentals* as high as 120 Mc. renders the instrument invaluable for i.f., broadcast-band, short-wave, and ultra-short-wave measurements.

The variable-frequency audio oscillator must be capable of covering the a.f. spectrum mentioned in the opening paragraph of this section, its output voltage (controllable by a suitable built-in attenuator) must be of good waveform, and its output circuit must afford a number of selectable impedances for matching to the r.f. signal generator and various points in the receiver audio circuits. Of many oscillators meeting these specifications, one is the *RCA Type 154 Beat Frequency Oscillator*.

The a.c. voltmeter is used to indicate receiver a.f. power output and to monitor the voltage output of the audio oscillator. Since fidelity measurements are made at various frequencies throughout the audio range, it is essential that the frequency error of this meter be very low. For this reason, a vacuum-tube voltmeter is most desirable. However, there are available a few copper-oxide rectifier meters with good frequency characteristics which will be suitable for this application. They are considerably more expensive than a simple, though adequate, V-T voltmeter which might be constructed by the radio man.

All output measurements are made with the receiver output-amplifier tube (or output transformer) properly terminated. Generally, the speaker will be found permanently connected-

in with the receiver circuit. But when this is not the case, the output circuit must be connected to a load resistor equivalent in d.c. ohmic value to the recommended load impedance of the amplifier tube (or to the secondary impedance, when an output transformer is included on the receiver chassis). The a.c. voltage developed across the speaker input terminals, or across the load resistor (which acts as a speaker substitute) by the input signal is then measured, and the power output wattage determined from the equation:  $P = E^2/R$ ; where  $P$  is the audio power output in watts,  $E$  the measured a.c. volts, and  $R$  the load resistance (or impedance) in ohms. If a load resistor is used in the measurement of power output, it must be capable of handling at least *twice* the maximum a.f. power output normally delivered by the audio amplifier stage.

### How to Make the Measurements

Before entering into the actual measurements of receiver performance, first align the receiver carefully throughout, peaking all trimmers and padders "on the nose" unless the alignment instructions prescribe staggered alignment in certain stages. Inspect the tuning dial calibration on all frequency ranges, correcting any irregularities that may appear. In short, make certain that the receiver is "doing its level best." It is assumed, of course, that all noises, intermittents, and the like have been completely "serviced out."

You are now ready to look into the receiver's actual performance, and after making the various tests might be acutely surprised to discover that your job of servicing has not been as complete as you might have at first guaranteed. You are going to learn one of these things:

- (1) that, fortunately, the receiver is in A-1 operating condition;
- (2) that stage gain is low, fidelity poor, or noise level high, and that by correcting these faults you can give the set that final "shot in the arm" that will completely revitalize it, to your customer's delight; or
- (3) that the set was poorly designed from the very start and that there is



One of the many types of receivers, the author describes testing.

little you can do to improve matters save revamping the circuit in many places. You will now be more of an engineer or skilled technician than you have ever been before.

### Sensitivity Tests

**Sensitivity.** You may make this measurement on any type of receiver, but the chances are that the bulk of your jobs are going to be done on tuned r.f. and superhet jobs, with the latter far out in front. Make the sensitivity test first.

1. With the receiver operating in the broadcast band (tuned to the extreme low-frequency—550-kc.—end of the dial), couple the signal generator to the antenna and ground terminals through a suitable dummy antenna, or other impedance-matching device. (The better signal generators include in their supplied accessories such matching devices,

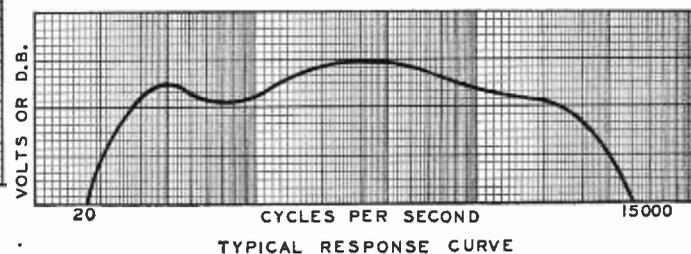
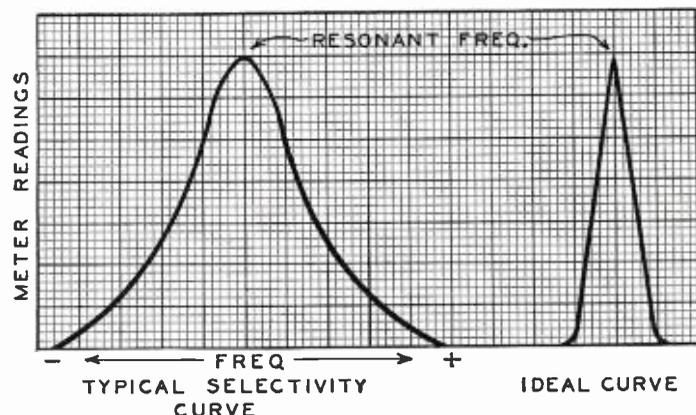
2. Connect the a.c. voltmeter, set to a voltage range sufficiently high to accommodate the expected power output, to the output terminals. If the speaker is left connected to the receiver, the meter may be connected directly across the primary or secondary winding of the output transformer. If the primary connection is used, a blocking condenser of 0.25 mfd. capacitance will have to be inserted in one voltmeter lead to block the d.c. plate-circuit voltage component. If the speaker is not used, the load resistor, chosen in ohmage to match the plate impedance of the output tube or the secondary impedance of the output transformer, must be connected in parallel with the meter, using the blocking condenser

directly referred to if connection is made directly to the plate terminal,

3. Switch on the signal generator, set its frequency dial to the frequency to which the receiver is tuned, and set its modulation switch for internal modulation. Carefully tune-in the generator signal with the receiver dial, watching for the peak reading of the output meter, preferably with the a.v.c. of the receiver switched off. Adjust the receiver gain control (s) to the proper setting to prevent overloading and "plugging,"

4. Slowly and carefully vary the output voltage delivered by the signal generator by adjusting its fine and coarse attenuators, stopping when the output meter indicates the rated full undistorted power output indicated by the set manufacturer. At this point, the actual r.f. voltage of the signal generator is noted by taking the attenuator and generator VTVM readings. This e.m.f. will be in microvolts and is the figure indicating the *sensitivity* of the receiver. Thus, if the receiver is guaranteed to deliver 2 watts of undistorted audio output power, and this amount of power is obtained when a signal of 10 microvolts is applied to the antenna and ground terminals, the sensitivity of the receiver is 10 microvolts. Good-grade receivers, such as high-priced communications sets, will generally be found to possess better than 1 microvolt sensitivity,

5. Repeat the sensitivity measurement at 800, 1200, and 1500 kc. and again at the high-, low-, and mid-scale points of each short-wave range, if the receiver is an all-wave receiver. By making these measurements every few kilocycles apart, a curve may be drawn, plotting microvolts against dial settings, to show the variation of sensitivity with frequency.



### Selectivity Tests

**Selectivity.** This characteristic is checked by tuning the receiver to a chosen signal-generator frequency with the aid of the output meter; and by setting the generator frequency in small corresponding steps on each side of resonance, noting the drop in output. The frequency settings are carried to the point of zero meter reading on each side of the center signal:

1. With the signal generator and output meter connected to the receiver in the same manner as outlined under SENSITIVITY, set the attenuator for maximum undistorted output as indicated by the meter,

2. First, vary the frequency in small steps to the *left* of resonance by small displacements of the generator dial. On many of the bands, it will be impractical to read variations as small as 1 kc. or so on the generator dial; however, a line may be drawn on the high-speed vernier knob and another on the panel, and each complete revolution of this knob (as indicated by successive arrivals of the lines opposite each other) may be taken as one frequency step,

3. Make enough separate frequency "steps," recording the output-meter reading at each step, to take the receiver output down to absolute zero. Then repeat the entire stepping process on the *right* side of resonance,

4. By noting the number of times the inscribed indicator lines on the vernier knob and generator panel come opposite each other between two known graduations on the generator dial, the approximate number of kilocycles covered by each knob revolution may be determined. Plot these frequency variations against the recorded output-meter readings to obtain a *selectivity curve*, such as is shown. Remember that the sharper the top of this curve and the shorter the distance between its "feet," the more selective is the receiver,

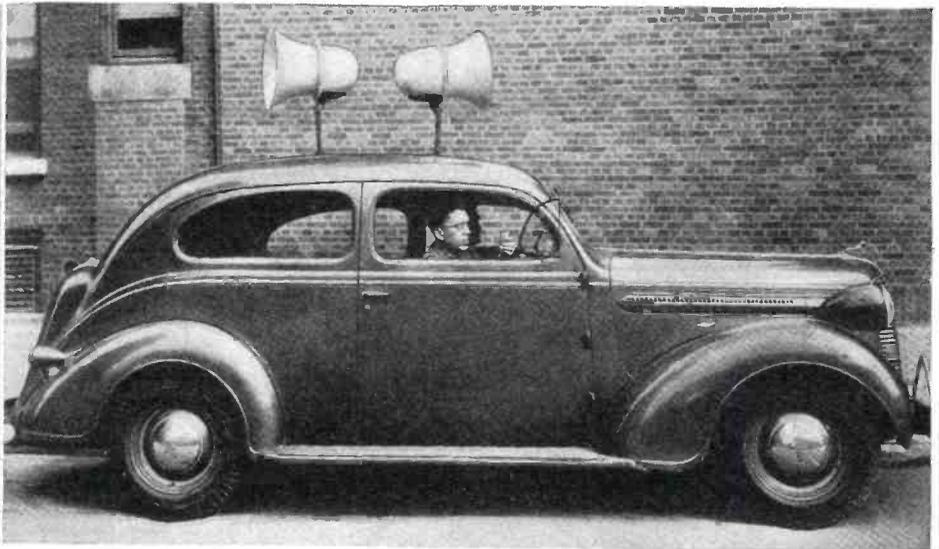
5. If the signal generator has provision for external frequency modulation, the curve may be obtained instantaneously. A suitable frequency modulator (*wobbulator*) is connected to the F-M terminals of the generator, and a calibrated and properly synchronized oscilloscope connected with its vertical amplifier input in the second-detector circuit of the receiver. When using this system, the receiver and signal generator may be left tuned to a single dial frequency and the operator will not be required to "step" the generator dial to secure the curve points. The frequency modulator automatically sweeps the generator frequency back and forth on each side of the indicated signal frequency, and the corresponding selectivity curve appears at once on the calibrated scope screen.

6. Using either the manual or oscil-

(Continued on page 52)



An excellent foot-ball game or track meet, or mass-meeting installation.



This type of installation has its uses not only for election time, but is being widely copied by Safety Departments. Note two horn directions.

# Pick the Proper P.A. Speaker

by CLARK E. JACKSON

New York City, N. Y.

*The selection of the proper P.A. speaker is rapidly becoming a specialty with which the serviceman must be familiar to make any money.*

IT seems that with each passing month that some new-fangled speaker makes its bow to the radio public and leaves the prospective purchaser completely in a daze when the occasion arises where he must decide on which will be the most efficient for his purpose. We will attempt to clarify some of these requirements and lift the fog that surrounds any serviceman after he reads what so-and-so has to claim for some particular version of what was commonly known as a loud-speaker in the old days.

Speakers fall into several classifications—and we might start with the most common types such as the home radio receiver speaker or “reproducer.” When cabinets were built to accommodate the first dynamics, we were actually given plenty of baffle as these were large in overall area and the bass response had a chance to really go to town. Then came the revolution. The mantel sets made their bow and the public actually believed that the transmitting stations were not capable of giving out their old quality.

Time passed, and the listener soon forgot “fidelity” and was satisfied as long as the set could be put out of the way in a spot such as the vegetable bin in the refrigerator. To make matters worse, the ultra-midget sets appeared and the manufacturers really went “hot” attempting to outdo each other in reducing size to a minimum—come hell or high water. A speaker which sold for more than \$1.00 was an extravagant gesture to make the competitive manufacturers believe that they had some real fidelity.

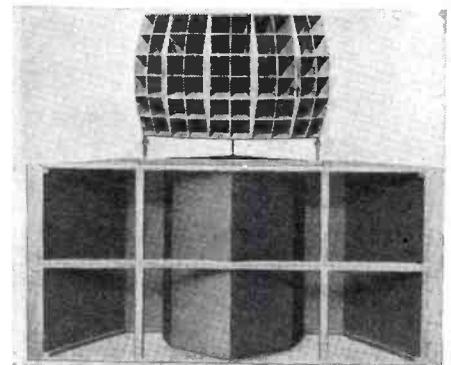
So much for this nonsense—we are simply attempting to illustrate what took place during the so-called “growing period” of radio receivers and to point out, with all the force at our command, that in order to attain respectable fidelity and efficiency from a speaker system, we must carefully consider the job at hand and go about the installation with more than the usual

viewpoint. We hope to see a return to the days when a speaker could find ample space in which to “do its stuff” without giving way to control shafts or power tube mountings.

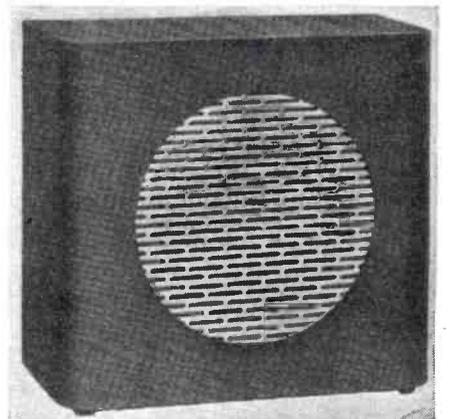
The PA man, on the other hand, is not restricted to such an extent, although we have seen many portable systems that include twelve-inch speakers mounted in cases that are not more than thirteen inches square. As a rule, there is a wider latitude for the soundman, and we shall illustrate just a few applications that can be improved by a careful analysis of the subject at hand.

Take for example the sound truck installation illustrated. Here we find the proper type of speaker for outdoor work where all kinds of weather is encountered. The horns are capable of satisfactory response, although they are especially designed for the reproduction of voice. The angle of sound distribution is sufficiently wide enough so that two speakers will cover a fairly wide area. One unit faces the front and the other projects the sound to the rear. Several versions of horns for mobile applications have been introduced and the one illustrated is representative of this group. These have also been used in factory and school installations with good success as they are of the so-called semi-directional type and therefore may be used wherever the sound is to be distributed over a wide area that will not reach any great distance from the speaker.

The units usually include the 12" PM  
(Continued on page 59)



Top: Theater installation speakers. Bottom: Home receiver metal speaker. Both have their individual places.





# SERVICEMAN'S EXPERIENCES

by LEE SHELDON

"SOMETIMES," Al remarked as we ate breakfast one morning last week, "it doesn't pay to be too smart!"

I shunted a hunk of doughnut into my cheek and turned to him in surprise.

"How can a repairman be too smart?" I gulped. "In servicing, 'smart' and 'successful' are synonyms!"

"I was thinking of friend Johnson, who owns the hardware store down the street," my partner replied. "When he learned he was eligible to pay income tax for the first time this year, he invested a dollar in an instruction book."

"What's wrong with that?" I asked, pushing my empty cup back on the counter. "He's still in business, isn't he?"

"After he bought this book, he studied it two or three hours every night. By the time his tax came due, he knew exactly what he could deduct."

"Gimme another cuppa coffee," I said to the counterman.

"Not that he wanted to be dishonest," Al continued. "You know how Johnson is—tight, but so honest he won't let his wife poach eggs. But as long as it was lawful, he wanted to get his final figure down as far as possible."

"I'll have a cup cake," I ordered, letting my eyelids hang loosely to show Al how interested I was.

"Johnson isn't unpatriotic," Al went on, "but in this case, he felt he would rather pay tribute to a publisher than give a cent for defense. Sure enough, he finally got his net income down to the place where he didn't owe anything."

"Are you sure that's a raisin?" I asked the waiter.

The waiter clapped his hands. Nothing moved.

"Yep!" he announced, "it's a raisin!"

"Pardon me, Al," I said. "You were saying—?"

"Last night, Johnson was bragging to me about how clever he was. I checked over his figures, and found them correct. If he hadn't bought the book, he would have had to pay tax—seventy-five cents' worth!"

"Well," I asked, "what about it?"

"Nothing," Al replied, "except that Johnson was such a wise guy he gyped himself out of two bits."

"What's that got to do with a store owner?" I challenged. "Every call a serviceman makes is a battle of wits: the repairman's experience against the customer's intelligence. Don't tell me—"

"The trouble with you," Al interrupted, "is that when you're smart, you're too smart, and when you're dumb, you're—"

"It's too early in the morning to argue," I countered. "Let's open up the store and see if we're still in business!"

I was thinking of our conversation that very afternoon as I answered a call on a *Majestic* 72. The set was turned on when I walked into the customer's living-room, and, with each step I took, a ringing sound came from the speaker. The detector tube, of course, was microphonic. A repairman doesn't have to answer many calls before he learns to recognize a noisy 27 in an old *Majestic*.

Right then I used my head. Why, I asked myself, should I let the customer get his set fixed by selling him a single tube? Isn't a repairman justified in taking advantage of such situations? Of course—that's how he stays in business!

I immediately snapped the power off,

stepped behind the console, and went through the motions of a complete examination. After I had wasted fifteen minutes, I announced:

"Filter block is shot. New one will cost you \$5.50!"

"That's cheap enough," he replied "but I just had one installed, and the set still makes that funny noise!"

I glanced at the power pack to make sure.

"That block isn't new," I pointed out "See—the paint is the same as the paint on the other parts. Shows it hasn't been touched."

After all, a person has to make a living, and if the fellow had been "taken" once, there was no reason he shouldn't do it the second time.

"Well," he said, "go ahead—if you're sure it will stop making that noise."

I gave him my assurances, and—to convince him he was getting his money's worth—took the chassis to the shop.

"Stick in a new detector," I told Al "and paint the filter block brown. . . just proved it pays to be smart. We get five-fifty for removing a bum 27. Not bad, eh?"

"Take the damn thing back," Al ordered, "and give that fellow exactly what he needs. If you don't, I refuse to have anything to do with your shyster methods!"

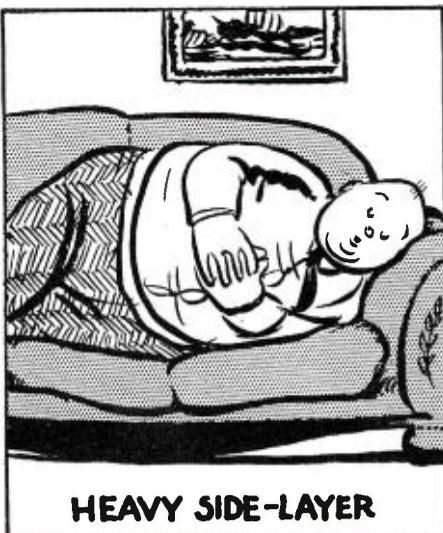
Imagine! He meant it, too.

"All right — all right, my high minded friend," I said. "I'll handle this little paint job. But I was under the impression you and I were supposed to be working together!"

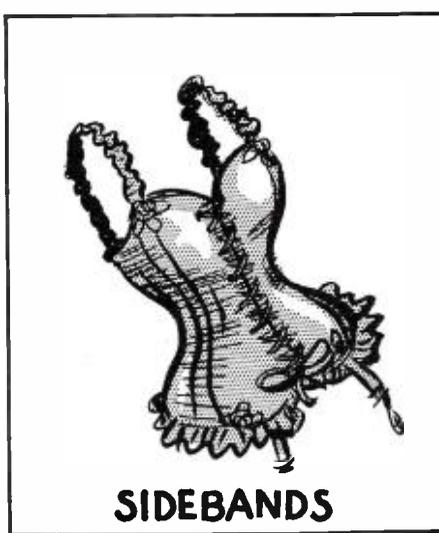
"There was plenty of stuff you could have sold that fellow for a total of \$5.50 without lying to him," Al pointed out, calming down a bit. "If you'd really used your head, you wouldn't"

(Continued on page 57)

## Technical Terms Made Easy



HEAVY SIDE-LAYER



SIDEBANDS



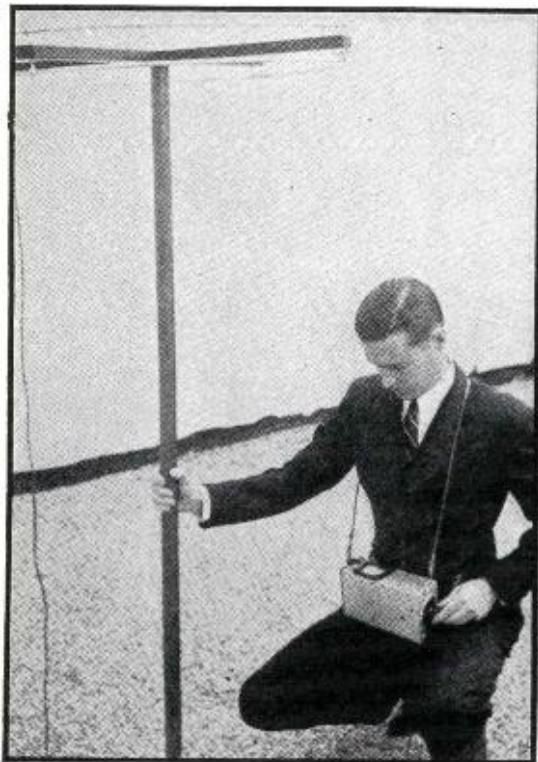
GROUND WAVE

# Relative Field Strength Meter

by **THORNTON CHEW**

Los Angeles, California

**An extremely valuable gadget, not only for locating noise interference, but also to discover the best u.h.f. antenna location.**



Setup to locate best roof-top antenna location.

**I**NVESTIGATION of many phases of radio and television carrier propagation requires some means of field-strength measurement. Usually relative indications are sufficient and the absolute quantitative measurement in volts-per-meter is not required. Such is the case with respect to determination of carrier polarization, signal-to-noise ratios, and topographic shadow effects.

Too, the most advantageous installation of a television antenna calls for the use of a relative field-strength meter to obtain the greatest signal input as well as the most favorable signal-to-noise ratio. The problem of locat-

ing interferences is also simplified by the use of a field-strength meter. It was for these reasons that the following described relative field-strength meter was designed.

Since thorough investigation sometimes necessitates quite acrobatic performances upon the part of the investigator, advantage was taken of recent advances in radio midget design to make this instrument extremely portable. The cabinet dimensions are 3" x 4 3/4" x 9". The total operating weight is 3 3/4 pounds.

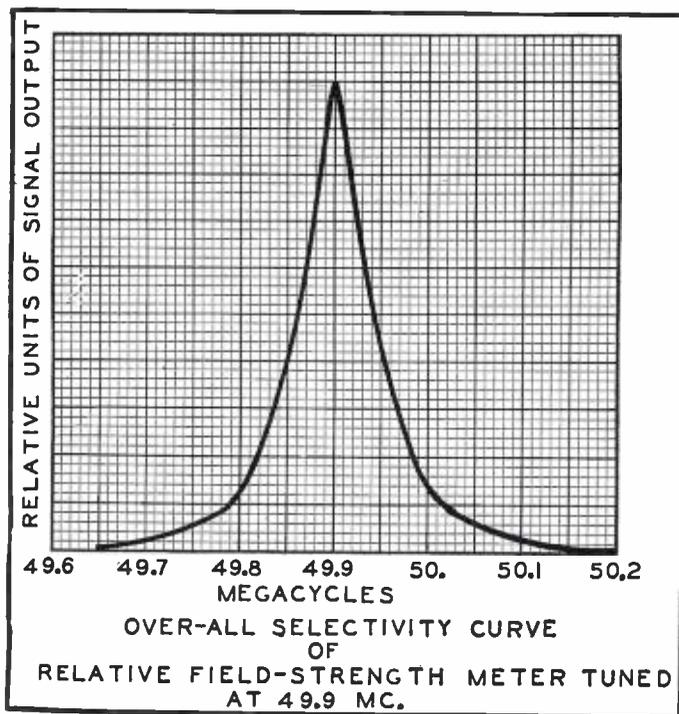
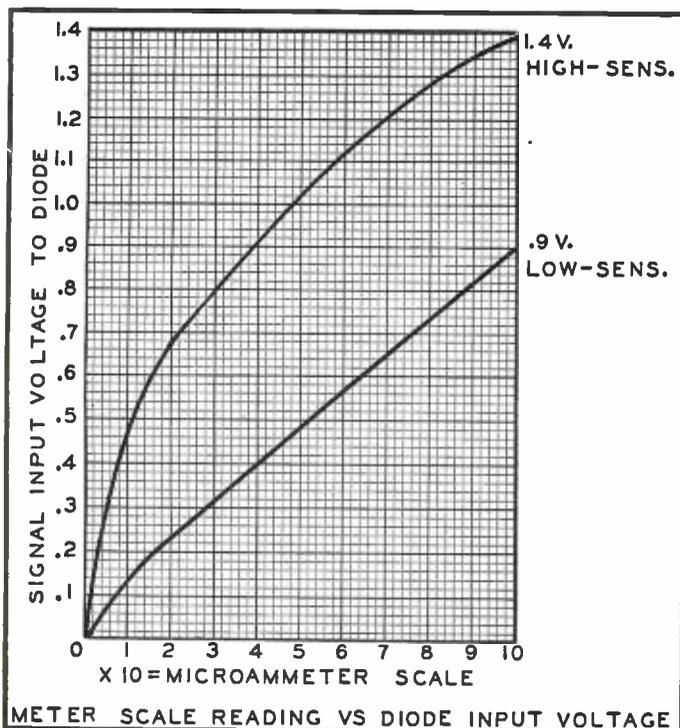
It is intended to be strapped to the operator's chest while tests are being made, which accounts for the some-

what unorthodox parts layout. Symmetry gave way to convenience.

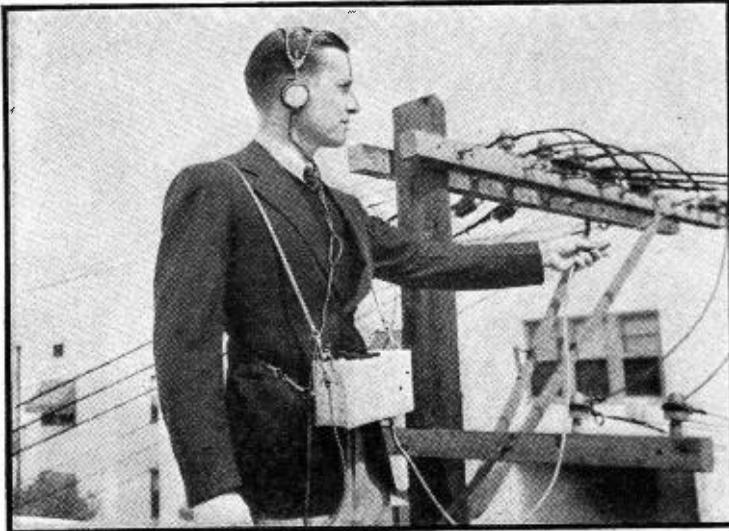
The plate supply is an *Eveready MiniMax* type 467, 67 1/2 volt battery. The filament supply is the common type 950 flashlight cell which lasts for three or four hours of operation.

The instrument is so constructed that by removal of one side of the cabinet batteries may be changed, tubes replaced, and I.F. transformers retuned. By removal of two sides, every part becomes readily accessible.

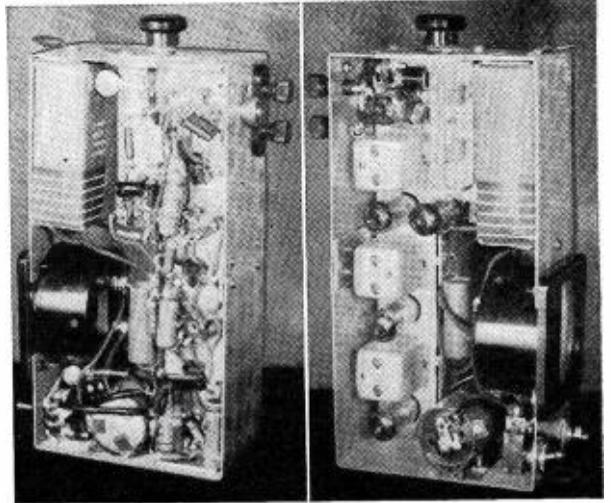
With the exception of the meter circuit and the I.F. transformers, the audio and intermediate frequency systems are conventional. The meter has



Two plotted meter curves



When testing for interference, the unit is hung around the neck and a long rod antenna is held near the noise source.



Top and bottom views of the completed unit. Note compactness of layout, and the comparative size of the meter to the rest of the set.

a 50 microampere movement of 2150 ohms resistance, with a 100 microampere scale. Since absolute values of current in the meter will have no significance, the simple interpretation of the decimal scale may be enjoyed.

The meter measures the rectified diode current. This current is sufficiently linear with respect to the signal voltage to provide useful ratios of signal strength as expressed on the decimal scale. Only at very low signal levels where the current component resulting from the initial emission velocity is relatively large does the departure from linearity become considerable.

Switched to the most sensitive position, a 100 microvolt signal input gives full scale deflection. The low sensitivity position has a meter deflection sensitivity ratio to the high position of 1 to 10.

### The Circuit

To avoid the critical tuning adjustments which attend extreme selectivity, a broad single peak I.F. response

is desirable. With this in mind, a comparatively high intermediate frequency, slightly above 4 megacycles, was chosen, and the I.F. transformer windings were coupled as closely as possible while maintaining single peak response. These as well as mechanical precautions were taken to make sure that any variation of meter reading is the result of signal input change rather than tuning change. The I.F. transformers are double capacity tuned with powdered iron cores.

The second detector and audio amplification are obtained through one of the new Lilliputian-sized tubes, the 1S5, a diode-pentode. Of this same series, two type 1T4 are used as intermediate amplifiers, one type 1T4 as first detector-mixer, and one type 1R5 as an oscillator only.

The 1R5 tube is a pentagrid converter. It was not used as such in this instrument because the internal tube capacities provided enough coupling between the detector and oscillator circuits to cause excessive "pulling" which no amount of isolation of the ex-

ternal circuits seemed to prevent. The use of separate oscillator section of the 1R5 and the 1T4 as detector-mixer eliminated this trouble and also gave increased gain.

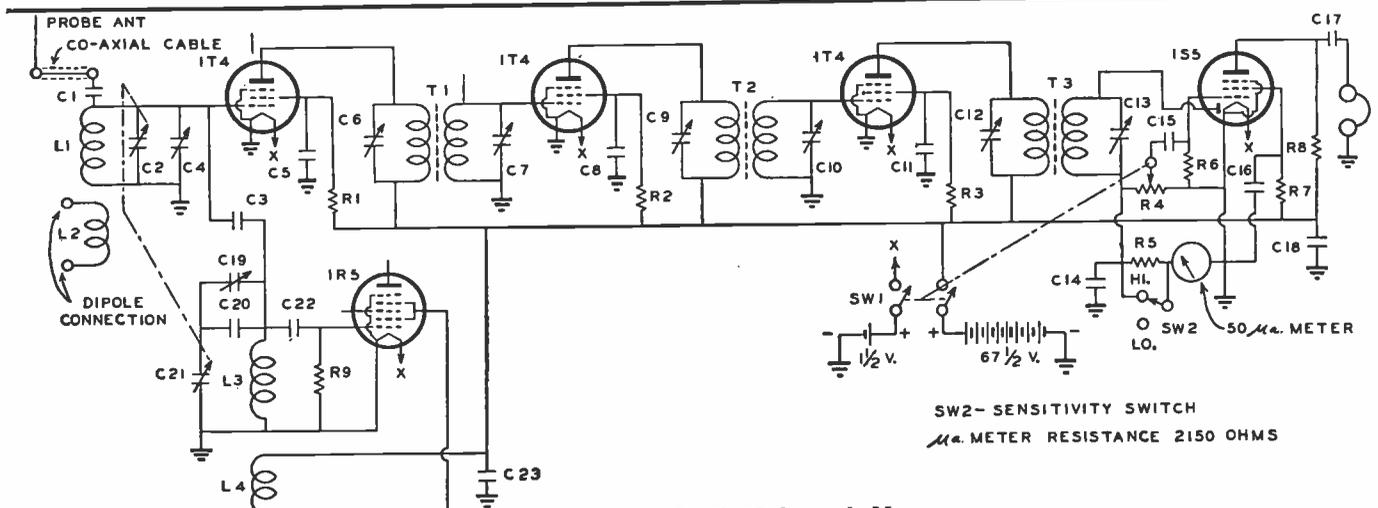
The R.F. tuning section is designed to cover all frequencies between 42 mc. and 72 mc. This includes the frequency-modulation broadcast band, television channels 1, 2, and 3, and the 5 meter amateur band. This portion of the ultra-high frequency spectrum will probably be the most used for some time to come.

### Alignment and Tuning

Alignment and oscillator tracking are accomplished by means of two variable capacities; a trimmer condenser shunting the detector tuning condenser, and a padding condenser in series with the oscillator tuning condenser. The procedure is simple.

A signal near the 72 mc. end of the tuning range is tuned in and the trimmer condenser is set to give maximum output. With the guidance of a tuning

(Continued on page 57)



Circuit diagram of the Field Strength Meter

- C<sub>1</sub>—5 mmfd. mica. Sprague
- C<sub>2</sub>, C<sub>3</sub>—50 mmfd. var. Millen
- C<sub>4</sub>—(See text)
- C<sub>5</sub>—12 mmfd. trimmer. Millen
- C<sub>6</sub>—0.0005 mfd. mica. Sprague
- C<sub>7</sub>, C<sub>8</sub>, C<sub>9</sub>, C<sub>10</sub>, C<sub>11</sub>, C<sub>12</sub>, C<sub>13</sub>—Trimmers on i.f.'s.
- C<sub>14</sub>, C<sub>15</sub>, C<sub>16</sub>, C<sub>17</sub>—0.05 mfd. paper. Sprague
- C<sub>18</sub>—0.0025 mfd. mica. Sprague
- C<sub>19</sub>—0.01 mfd. paper. Sprague

- C<sub>18</sub>—10 mfd. 150 v. electro. Sprague
- C<sub>19</sub>—5-100 mmfd. padder. Millen
- C<sub>20</sub>—0.0003 mfd. mica. Sprague
- C<sub>21</sub>—50 mmfd. mica. Sprague
- C<sub>22</sub>—0.0005 mfd. mica. Sprague
- R<sub>1</sub>—10,000 ohms, 1/2 w. IRC
- R<sub>2</sub>, R<sub>3</sub>—15,000 ohms, 1/2 w. IRC
- R<sub>4</sub>—500,000 ohm pot. Centralab
- R<sub>5</sub>—400,000 ohms, 1/2 w. IRC

- R<sub>6</sub>—10 megohms, 1/2 w. IRC
- R<sub>7</sub>—4 megohms, 1/2 w. IRC
- R<sub>8</sub>—1 megohm, 1/2 w. IRC
- R<sub>9</sub>—100,000 ohms, 1/2 w. IRC
- L<sub>1</sub>—4 i. No. 18, spaced 1 dia. 1/2" dia.
- L<sub>2</sub>—1 1/2 i. No. 18, 1/2" dia.
- L<sub>3</sub>—6 i. No. 18, 5/16" dia.
- L<sub>4</sub>—4 i. No. 18, 5/16" dia.
- M—0-50 dc microammeter. Triplett.



# RINGING THE BELL

by  
SAMUEL C. MILBOURNE

## Habit, Habit, Who Has a Habit?

**M**ANY servicemen have told us that business with them came in spurts. When they were "slack," they had plenty of time, but when a spurt of business came along they felt swamped. This is, of course, true in all businesses and the problem is to "Make Hay, Hay While the Sun Shines," i.e., to adjust their methods of doing business so that they can accomplish the utmost in a normal work day.

Do you want to know how to make your workday pay you bigger profits during the "lush" season? Do you feel at times as if the day just wasn't long enough to make all the calls, the pickups, the deliveries, the estimates, the repairs, the collections, etc., that you must accomplish during a normally busy day?

Here's how! It's nothing new, it's nothing untried, but *it works*.

First, *plan your day*. Second, *work your plan*.

Before you turn to another article in mild disgust, may we ask you a simple question? Have you ever tried this?

If you haven't, may we urge that before you pass judgment that you give it a *two-week trial*? You can't expect solid, lasting results in less time and it is doubtful if a month is too long a trial period.

If you have tried this plan and have failed, why did you fail? Probably the most likely reason is that you didn't give it a fair trial period. Or, you may have planned your time incorrectly. Or, having made your plan, you didn't follow through.

You, the same as every other human being, are a creature of habit. Why do you eat three meals a day rather than two, or four? Habit! Why do you smoke cigarettes, or cigars, or a pipe? Habit! Why do you start shaving on the right side of your face if you are right-handed, and on the left side of your face if you are left-handed? Habit! Why do you comb your hair a certain way? Habit!

We could ask dozens of similar questions which could all be answered by the one word, *habit*! It's something which is so strongly a part of each of us that we instinctively rebel at a momentary change in habit. Sometimes we get angry and temporarily "lose our religion" because we can't follow through on some habit. Did you ever look for a tool which you knew was *right there*, but found that it *wasn't right there*? Have you ever answered your home phone by giving your business phone number by mistake?

So, the first method to use in making your work-day pay you more in profits is to become "*habit-conscious*." Watch yourself carefully throughout a whole day or series of days. You must

be observant or you will miss many of both your good and bad habits. If you care to, make a list of all bad habits which you have recognized. Let us think of them as *loss-habits*. Start now to eliminate them, or change them into good, or *profit-habits*.

Make habit work for you instead of against you.

One of the worst *loss-habits* a serviceman can have is the pleasant, if aimless, habit of frittering away his time in non-profit activities. In the South, we call it "piddling," which may be defined as being concerned with trifles or dawdling. The serviceman who "piddles" is one who listens to part of a radio program after the set is repaired, not because he wants to make sure that the radio sounds right, but because he is interested in hearing some wise-cracking comedian, or a "hot" band. Such a man plays with his soldering iron to see how much molten solder he can pick up from his bench with it. He digs holes in the wooden top of his work bench with his test leads apparently with the mistaken idea that he is a woodpecker in human form. He finds all kinds of excuses *not* to work on customers' radios, preferring to day-dream about the workbench he would have if he had enough money to build it.

Stop "*piddling*"! Make it a habit, when you catch yourself dawdling away, to *get back to work*—profitable work.

Another *loss-habit* indulged in by entirely too many servicemen is the bad habit of wasting time in aimless conversation. The serviceman with this *loss-habit* "visits" too much. Given an audience of one—or a dozen—he can waste valuable minutes exercising the inalienable right to waggle his jaw. He spends too much time drinking coffee or soft drinks and just plain "*loafing*." Don't misunderstand us, we don't mean to imply that a certain amount of mixing with people and talking with customers is not an absolute necessity. It is, but be sure that the time is spent wisely. If so, it can be a *profit-habit*.

There are many other *loss-habits*, and we will write of several throughout this article. The main point to get now is to analyze your habits and, in so far as you are capable of doing, change *loss-habits* into *profit-habits*.

## Plan Your Work

**N**OW, about planning your work. Many servicemen feel that this is impossible in their line of work. People call them at inopportune (to them) times, a rush job must be taken care of, a part which they haven't got ties up a set on which they are working, etc.

To plan your work, sit down in the evening and make a list of the things

you *know* must be done the next day. You'll be surprised how many there are. If you get in parts late in the day and these parts are for waiting radios, schedule work on these radios for the next day. If it is collection time, or inventory time, schedule this work. If you have to run down to the local jobber for parts, try to schedule this errand at a time when the jobber is least busy. Allow one period in the morning and one in the afternoon for pickups and deliveries. Route your calls for minimum travel between each. If possible, sell customers who own midget receivers on the idea of doing their own pickup and delivery. Tell them it will be cheaper that way. Include some study time to keep up with things. *Don't forget to sweep and dust your shop daily*.

Yes, there are plenty of things to do in a service day which *can* be scheduled the night before.

## Work Your Plan

**N**OW, to work your plan, you must avoid the *loss-habits* and cultivate the *profit-habits*.

One instance of this was given previously under "*piddling*." Another was given under *aimless conversation* and *loafing*. We might say that in working your plan you should *keep the "pla"* out of plan.

Another important thing to watch out for is the all too frequent *interruption* which soon becomes the death of any planned day. The phone rings. It's Tom, who wants to know if you have a type 37Q2 tube in stock. Maybe you have and maybe you haven't, but if you don't cut the conversation short, you will have wasted fifty cents or a

## Technical Terms Made Easy



VOLUME EXPANSION

dollar's worth of profitable time talking with Tom about six totally unrelated things. Or, you get a brainstorm about some new gadget and spend another dollar's worth of profitable service time trying to do some "constructive thinking." Save "constructive thinking" until the evening hours.

Minimize the loss-habit of getting side-tracked onto a spur track. *Stay on the main line.* Think of yourself as a streamlined limited. No side-tracks. No flag-stops.

### No Procrastinations

**N**EXT, *don't procrastinate.* For the benefit of the brethren who deal exclusively in one and possibly two-syllable words, *don't repair to-morrow what you can repair to-day!* We have always wondered why servicemen who have so many odd jobs to do complain that they haven't anything to do. Often as not, there are several receivers sitting on the shop shelf which could be worked on if the serviceman would get down to work.

Cultivate the habit of walking into the shop in the morning and tackling the *hardest* repair first. Plan it that way. There are abundant reasons for doing this. The best work is done in the morning hours. It is a time when your mind is most alert and most likely to analyze the trouble quickly and accurately. It is a sure way to keep your shop clean of "tough" receivers. Do the *hard* jobs first. The more you hate the idea of working on a particular receiver, the more valid the reason for working on it—NOW!

Another loss-habit which is indulged in by so many servicemen is sleeping late in the morning and, as a consequence, working until all hours of the night. Now, before any readers who know us indulge in too hearty a laugh at our expense, may we humbly admit that there isn't anything we hate worse than getting up in the morning. We have always felt very strongly on the subject, but we must admit, as must you gentle reader, that it is a loss-habit. Our lack of intestinal fortitude in regard to the matter does not make a wrong habit correct.

If you need ten hours sleep, get to bed early enough so that you can get your full beauty rest and still be down at the shop early enough in the morning to put those "peak-activity" hours to good use.

### Don't Wiggle-Waggle!

**D**O you spend too much time worrying about conditions over which you have no control? Do you hesitate and "wobble-waggle" back and forth, pro and con, over some small matter which really is of no great consequence? If so, learn to stop that loss-habit right now.

If you worry about the war, the state of the nation, the weather, local political conditions, the general "cuss-ness" of customers, whether you should order six power transformers or two power transformers at a time, etc., stop it. Make it a rule to analyze your worries. Ask yourself the question, "Can I do anything about it?" If you can't, forget it. If you can, start doing it *at once.* Develop the profit-habit of making decisions quickly when they are about small, immaterial things.

Next, develop the profit-habit of knowing what your time is worth and

(Continued on page 54)



by TIMOTHY J. HEALY  
Counselor-at-law, New York, N. Y.

**I**N this month's issue we conclude our discussions of leases.

Last month, we pointed out that the serviceman might be inclined to believe he was free from liability on a lease as soon as he rented his store to a sub-tenant, where as a matter of law, he actually remained fully liable to his landlord for all the terms and covenants contained in the original lease. The danger of this mistaken conception was demonstrated.

There are, however, in sub-letting, other dangers which the radio serviceman must guard himself against which will be discussed in this month's issue. It is hoped that the effect of this month's discussion will be to convince the serviceman of the necessity of careful investigation of his sub-tenant, and in preparing beforehand for the dangers ahead.

First, let us assume a state of facts under which L, a landlord, leases a store to RS, a radio serviceman. The lease contains covenants by RS in which he agrees that he will not engage in businesses other than his own; that he will not sell certain mentioned products which would conflict with lines carried by other tenants in L's building. While RS remains in occupancy, he obeys these restrictions. At a later date, however, the radio serviceman wishes to move, and sub-leases his store to D, a druggist. In his sub-lease, RS makes no mention of the restrictions, so D, the druggist, sells what he pleases, in the well known manner of drug-stores, actually running a restaurant, dry-goods store, radio store, newsstand, music shop and possibly a dozen more stores in one. According to D's lease from RS, he has a perfect right to do so. Other tenants complain, however, to L, and rightfully, that concessions given to them in their leases are being violated by D.

L is necessarily enforced to institute an action against both the serviceman and the druggist, for recovery of the possession of the premises. Even though D is not in default of the payment of his rent, he is obliged to move, since he could not secure greater rights in his sublease from RS, than RS had obtained under his lease from L.

D's natural step, therefore, is a damage suit against RS for his probable losses in being forced out of his business. If successful, RS may be obliged to pay thousands of dollars after he thought he had the matter of his lease completely disposed of.

What are the chances of success in RS's action? The courts have held that it is just a question of "how much." This point was decided long ago in the case of *Stewart vs. the Long Island Railroad Company*, 102 *New York Reports* 601. In the *New York Law of Landlord and Tenant*, (1937) Volume 2, Section 539, the general rule is stated as follows:

"An assignee of a term is liable, on account of privity of estate, to the lessor on all covenants the burden of which run with the leasehold estate."

In addition to the damages RS is obliged to pay D, he finds himself obliged to pay either rent or damages for breach of the contract of letting, to the landlord for the balance of the term.

Our poor radio serviceman may still find himself subjected to a third liability. The landlord may sue RS for damages suffered by him as a result of complaints made, or benefits withheld by the other tenants in his building!

The other tenants may refuse to pay rent, or otherwise prove damages, because of the injury sustained by their businesses as a re-

sult of the druggist infringing on their lines! *Importers and Traders Insurance Company vs. Christie*, 28 *N. Y. Superior Court Reports*, 169.

"A lessor may undoubtedly maintain an action for damages for a breach by the lessee of his covenant not to subject, and in such an action, nominal damages would be recoverable at all events, although it is not easy, it is said, to lay down a rule for compensatory damages for such a breach." *New York Law of Landlord and Tenant*, Volume 2, Section 570.

There is even law to the effect that the landlord's counsel fees may, in some cases, be recovered from the unfortunate radio serviceman, because of his innocent violation of the covenants restricting the terms on which he is allowed to sublet. *Cuyler Realty Co. vs. Teneo Co.* 196 *Appellate Division Reports*, 440, affirmed without opinion 233 *N. Y.* 647.

As another danger encountered in subletting, let us assume that RS agreed with D that D was to pay the monthly rent installments directly to L, the landlord. For six months, D faithfully pays his rent to the landlord as agreed. RS then goes away for a well-earned vacation for, let us say, 6 months, to recuperate from the cares and worries of the radio repair business. He never worries about his sub-lease, however, as he feels that is now a matter between D and L alone. On his return, he is presented with a bill by L for 6 months rent. It seems that D stopped paying when RS left. RS complains that he is not liable—that the landlord had been getting his money right along from D directly, and that he should look to D now for the arrears. L replies that he does not care and that he is not interested in D; he simply wants his money and he wants it from poor RS. Who is right? The courts have held that L is perfectly within his rights, and that RS again must shell-out. The Court so held in the case of *Rosenwasser vs. Amusement Enterprises*, 150 *New York Supplement Reports*, 567, where it stated as follows:

"Concerning the second defense, the defendants have failed to establish it by a fair preponderance of evidence. They have not shown sufficient consideration to support the promise, which they allege was made by Kraushaar, to release them from all liability on the lease. The only consideration attempted to be shown was that the defendants, in subletting the premises, should require the rent to be paid directly to the plaintiffs, and that there should be a slight change in the times of payment. This sub-lease, which presumably was in the possession of the defendants was not put in evidence, and its absence was unaccounted for. At most, the promise to give a release was executory and conditional, and according to defendants' witness' own story one of the conditions was the payment of the rent directly to the plaintiffs. Defendants' witness' testimony shows that the rent was to be paid to July 1, 1914, in order to get the release, whereas, as matter of fact, the rent has not been paid at all for either June or July, 1914, so that, according to defendants' own testimony, the consideration has failed."

Subtenants may commit many more wrongs, the burden of which may fall eventually on the shoulders of RS. He may be fined for the nuisance committed by his sub-tenant; he may have to answer for his sub-tenant's violation of municipal ordinances, even though he had no knowledge of the

(Continued on page 54)

# BENCH NOTES

by **ROBERT KENDALL**  
Service Manager, Indianapolis, Indiana

## Laws—Natural and Otherwise

**T**HE local legislature has just adjourned, amid the curses and groans of those naive souls, the voters, who as usual, had childishly looked forward to the promised 100% increase in services and hand-outs by the State, with a 50% decrease in expenditures and taxes. The mental processes of many of our noble electorate must be curious to say the least; and the utility of our public school system seems rather doubtful, when such obvious errors in elementary arithmetic can be so readily ignored. The usual number of crack-pot bills were introduced, but none quite so laughable as one of some years ago when a helpful but misguided Solon proposed that  $\pi$  be made legally equal to 3.0 instead of the familiar indeterminate quantity. In order to prevent the rise of false hopes in the budding radio man, we hasten to add that the proposal was promptly squelched, and for the present at least there is little prospect that  $\pi$  will ever be changed to a more pleasing and convenient figure.

Our philanthropic Solon is not the only man who has been harassed by this exasperating term, but the student of radio and electricity must accept with resignation the fact that  $\pi$  will be evident in practically all calculations involving alternating currents. A sine-wave current has direction as well as magnitude, and a rotating vector representing the maximum value of a sine wave will describe a circle as one cycle is completed. Since the

ratio between the circumference of a circle and its radius is equal to  $2\pi$ , the rotating vector will travel, on paper, a distance equal to  $6.28 (2\pi)$  times its length. Thus in every revolution a rotating quantity completes  $2\pi$  radians, and the angular velocity is generally expressed in radians per second, the customary symbol being  $\omega$  (omega). From this the familiar equation is obtained  $\omega = 2\pi F$ .

So, until the inflexible relationship between the radius of a circle and its circumference can be altered, the ubiquitous  $\pi$  must remain an inconvenient term of radio physics; but after close consideration of a quantity that is constantly changing in magnitude, the radio man may be thankful that the sine wave equation has been reduced to such comparative simplicity.

## Spring Is Here—Practically

**I**N spite of the fact that at this writing the local temperature has just taken a nose-dive of  $36^\circ$  in less than 12 hours, there are signs that spring is at hand, even disregarding the miserable robin that arrived prematurely a week ago. Each bright Sunday the sound of crashing automobile fenders grows in volume, and the shriek of the sirens is heard with increasing frequency as the police and ambulances speed to scrape up the victims strewn about the streets and highways.

This increase in Sunday touring causes more attention to the auto radio, and the service man should have a minor boom in this type of business, which will be welcome after the dol-

drums that follow the holiday season.

While personally we regard the auto radio as a dangerous distraction for the morons that constitute too large a percentage of the nation's auto drivers, this does not alter the fact that auto radio service is often more profitable than service on home radios. It is rather peculiar that bills from \$6.00 to \$10.00 for auto radio service are usually paid with little or no complaint, whereas similar bills for home radio service may precipitate a minor riot, with loud cracks about *Jesse James* and horses. Why this should be the case we can only guess—it may be due to the fact that the average American will usually spend money more liberally on his automobile and associated accessories than any of his other possessions.

In any event, whatever the idiosyncracies of the customers, auto radio service can be made a profitable business by those with facilities for taking care of it.

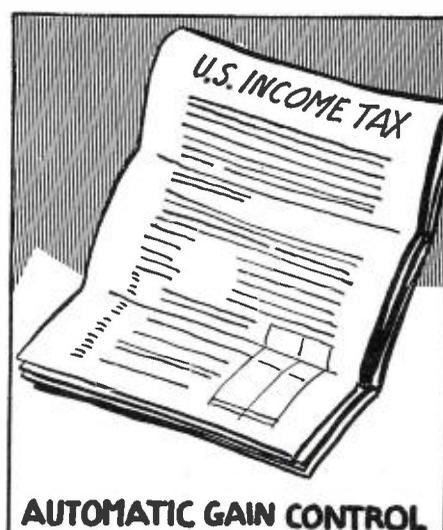
By the way, are you charging a fixed minimum price for taking the set out of the car? If not you should—it is noticeable that those shops that look prosperous have a flat fee for this service, usually about \$1.00.

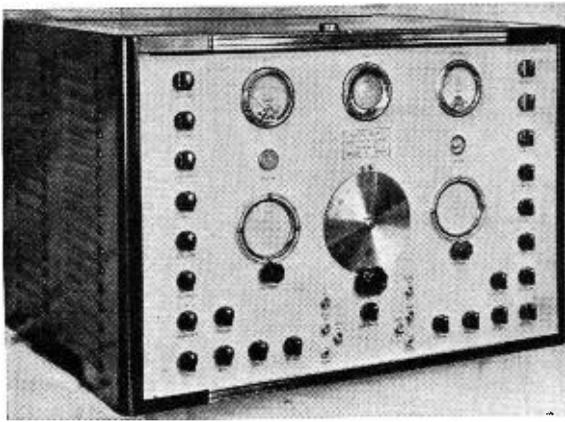
## Dilemma in Dixie

**N**OT long ago we received a letter from a young man in the Sunny South, detailing some perplexing problems that arose in connection with a service job. Ordinarily, most young service men are more interested in the

(Continued on page 60)

## Technical Terms Made Easy





# The Radio News 1941 Super Superheterodyne Receiver

by **KARL A. KOPETZKY, W9QEA**  
Managing Editor

and **OLIVER READ, W9ETI**  
Technical Editor

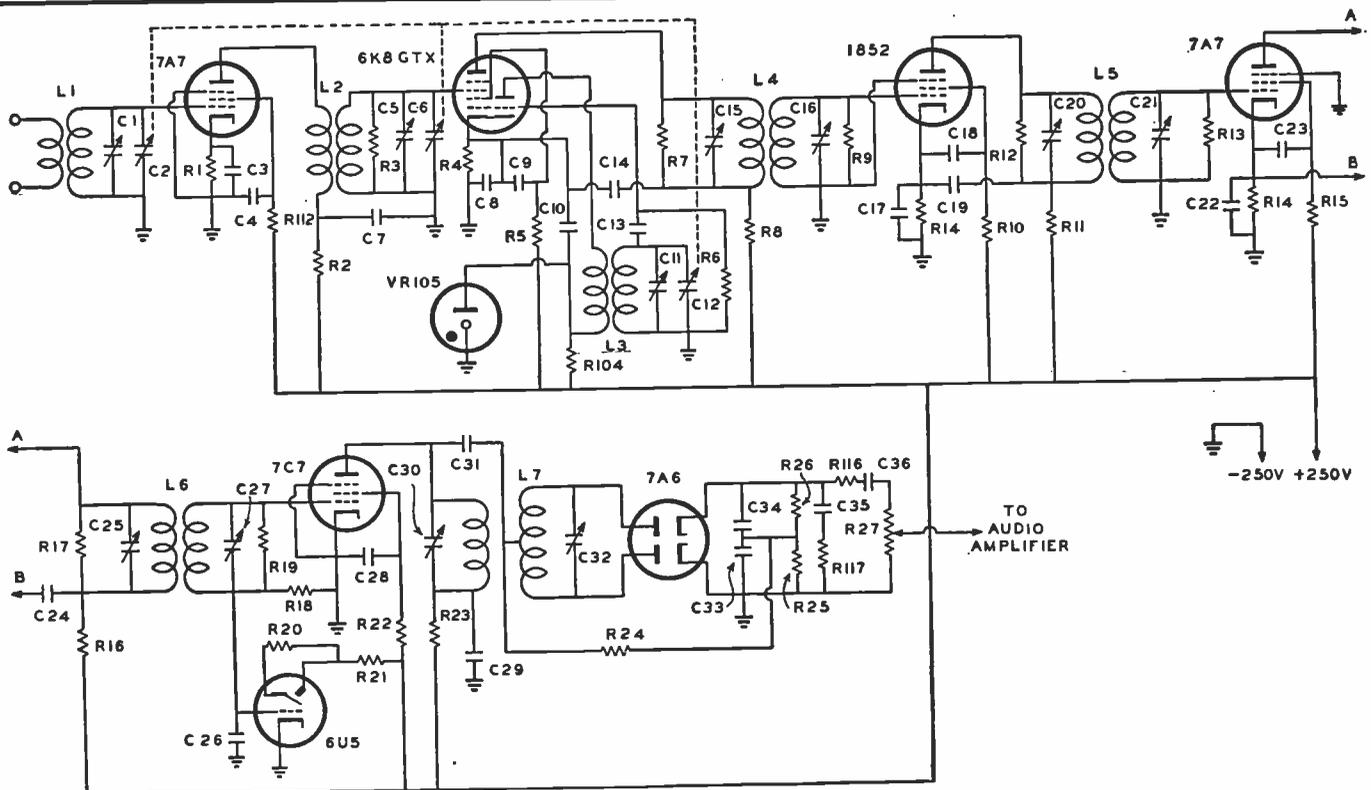
*The builder can pick any part of this whole receiver to construct, and find that it will fit right into his own home set.*

## Part 2

**L**AST month we described the various features of the "Super Superheterodyne Receiver" and ended up with the construction of the power supply and the audio systems, including the recording and phonograph parts. This month, having mounted all of the components on the chassis and under the chassis, we will concern ourselves with the wiring of the r.f. stages, the i.f. stages, and the BFO oscillator, the oscilloscope, in fact, the entire receiver.

There is nothing difficult about wiring a receiver as one might expect due to its size. The usual conditions prevail, and grid and plate circuits must be isolated, if not by a shield, then by sufficient space to prevent inter-coupling. Wiring throughout the chassis is entirely straightforward in every manner, and wires are run first with a regard to neatness and, second, in the most direct manner wherever grid and plate leads are concerned. Soldering must be carefully done

and one must be absolutely positive that the wire is actually "soldered" and not "rosin cored." It will be most difficult at the end of the wiring job to locate which of many hundred connections was not adequately soldered. Perhaps it will be best to take up one unit at a time and explain the wiring of that unit since the entire receiver is nothing but an assembly of many different units to accomplish a single function—that of a receiver. Special care must be taken in wiring



A typical F.M. Tuner circuit. It is shown by courtesy of *Browning* of Winchester, Mass.

- C<sub>36</sub>—.001 mfd. mica. Aerovox
- C<sub>36</sub>—.05 mfd. paper. Mallory
- R<sub>1</sub>, R<sub>4</sub>, R<sub>14</sub>—400 ohms, 1 w. Aerovox
- R<sub>2</sub>, R<sub>9</sub>, R<sub>11</sub>, R<sub>16</sub>—1000 ohms, 1 w. Aerovox
- R<sub>3</sub>—Included in Browning tuner assembly
- R<sub>5</sub>—20,000 ohms, 1 w. Aerovox
- R<sub>6</sub>, R<sub>15</sub>, R<sub>23</sub>, R<sub>24</sub>—50,000 ohms, 1 w. Aerovox
- R<sub>7</sub>—40,000 ohms, 1 w. Aerovox
- R<sub>9</sub>, R<sub>13</sub>—15,000 ohms, 1/2 w. Aerovox
- R<sub>10</sub>—50,000 ohms, 1/2 w. Aerovox
- R<sub>12</sub>, R<sub>17</sub>, R<sub>19</sub>—40,000 ohms, 1/2 w. Aerovox
- R<sub>15</sub>—10,000 ohms, 1/2 w. Aerovox

- C<sub>1</sub>, C<sub>2</sub>, C<sub>5</sub>, C<sub>6</sub>, C<sub>11</sub>, C<sub>12</sub>—Included in the Browning BL40TB tuner
- C<sub>3</sub>, C<sub>7</sub>, C<sub>8</sub>, C<sub>9</sub>, C<sub>10</sub>, C<sub>14</sub>, C<sub>17</sub>, C<sub>18</sub>, C<sub>19</sub>, C<sub>22</sub>, C<sub>23</sub>, C<sub>24</sub>, C<sub>25</sub>—.01 mfd. 400 v. paper. Mallory
- C<sub>4</sub>—.1 mfd. 600 v. Mallory
- C<sub>13</sub>—.0001 mfd. midget mica Aerovox
- C<sub>15</sub>, C<sub>16</sub>—Included in i.f.t. Browning (L<sub>4</sub>)
- C<sub>20</sub>, C<sub>21</sub>—Included in i.f.t. Browning (L<sub>5</sub>)
- C<sub>26</sub>, C<sub>27</sub>—Included in i.f.t. Browning (L<sub>6</sub>)
- C<sub>28</sub>, C<sub>33</sub>, C<sub>34</sub>—.0001 mfd. midget mica. Aerovox
- C<sub>29</sub>—.01 mfd. 600 v. Mallory
- C<sub>30</sub>, C<sub>31</sub>, C<sub>32</sub>—Included in L<sub>7</sub> discriminator

- R<sub>20</sub>, R<sub>21</sub>—1 megohm, 1/2 w. Aerovox
- R<sub>22</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>25</sub>, R<sub>26</sub>, R<sub>116</sub>, R<sub>117</sub>—100,000 ohms, 1/2 w. Aerovox
- R<sub>27</sub>—500,000 ohm pot. Mallory
- R<sub>30</sub>—20,000 ohms, 10 w. Ohmite
- R<sub>34</sub>—300 ohms, 1 w. Aerovox
- R<sub>115</sub>—.0001 mfd. midget mica Aerovox
- Note: L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub>, C<sub>1</sub>, C<sub>2</sub>, C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub>, C<sub>10</sub>, C<sub>11</sub>, C<sub>12</sub>, C<sub>19</sub>, R<sub>3</sub>, R<sub>6</sub> are included in the Browning tuning unit
- L<sub>4</sub>—i.f. transformer. 3 mc. Browning BL3M
- L<sub>5</sub>—i.f. transformer. 3 mc. Browning BL3M
- L<sub>7</sub>—discriminator trans. 3 mc. Browning BL3D

that section of the i.f. which pertains to regeneration, and will be explained later.

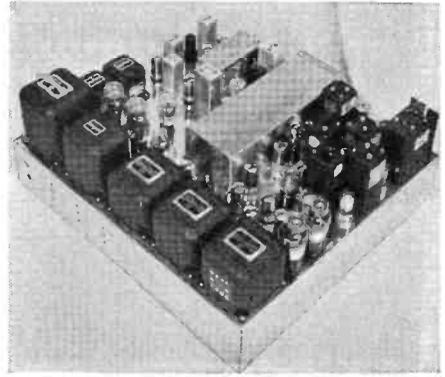
Before going into the actual construction, it might be best to consider some of the circuits and their functions. By understanding this, the wiring is made clearer, and the construction is better comprehended.

Considering first the FM section. FM reception is done between 42 and 50 megacycles where losses are high, and signal strength is low. This combination, while by no means insurmountable, requires extra care in wiring and construction. What will "hold" a broadcast signal, will allow an FM signal of the ultra high variety to "leak away." Isolantite insulation is the order of the day; and leads must be made with wire of at least No. 16 gauge so as to keep losses down. In-

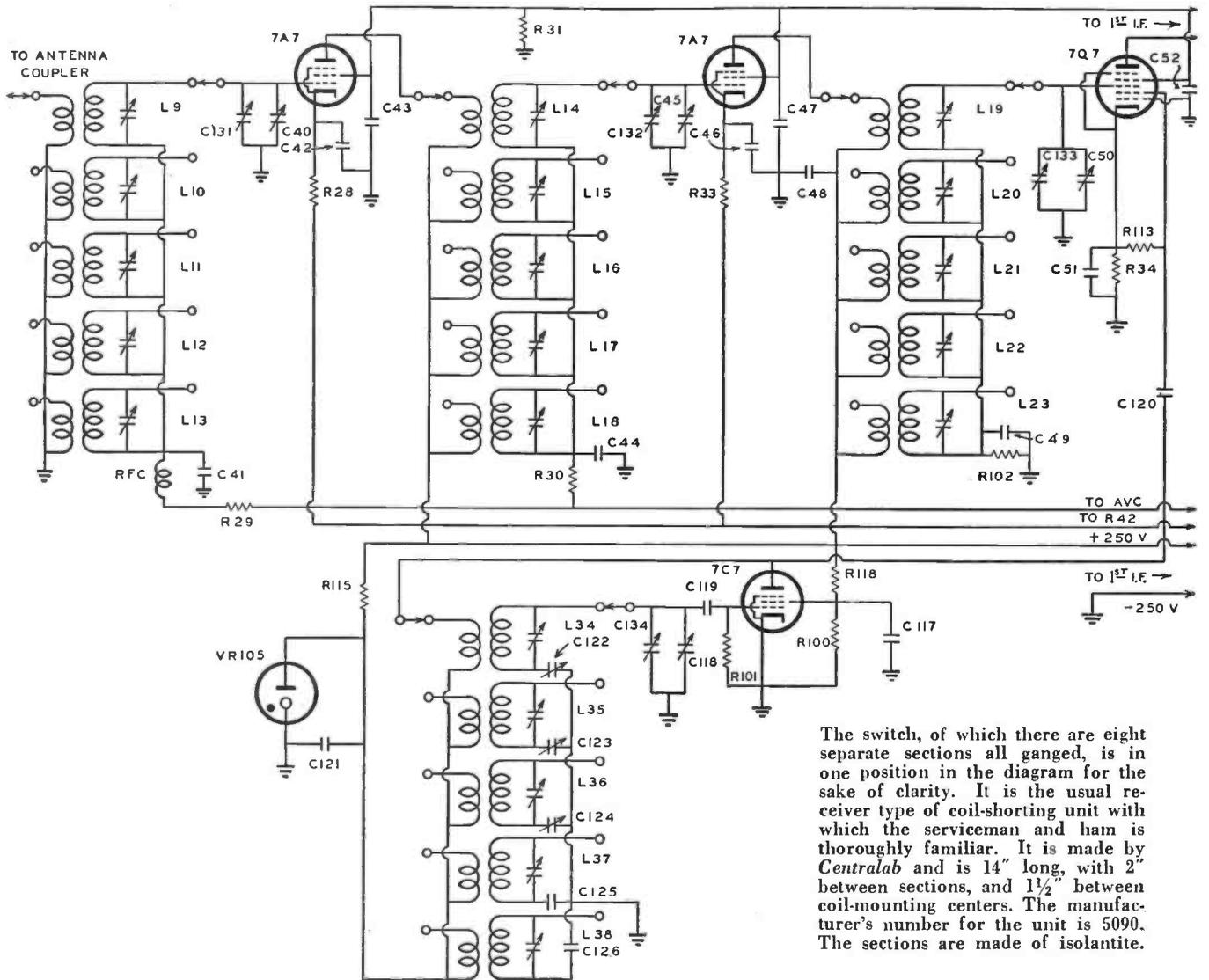
sulation is of prime importance, and soldering must be exact and precise. No "lopped-over" connections—little, if any rosin must be allowed to flow, and every joint should be wiped off while hot, to remove excess rosin.

Leads must be direct and as short as possible, and wherever a right-angle turn must be made, it should be a gradual turn, not a sharp corner. Ultra-high frequency abhors a sharp corner. Wherever shielding is used over wire it must be separated from the wire by extra large "spaghetti," and the usual commercially procurable shielded wire will not do.

Keep all grid and plate wires away from the chassis proper, boosting them up on stand-off insulators wherever the "line" is too long to be adequately self-supporting. Oscillator leads should be rigid, because any vibration will be



For a larger picture of the chassis see the April issue. This is included here for the record so that late readers can visualize the whole unit.



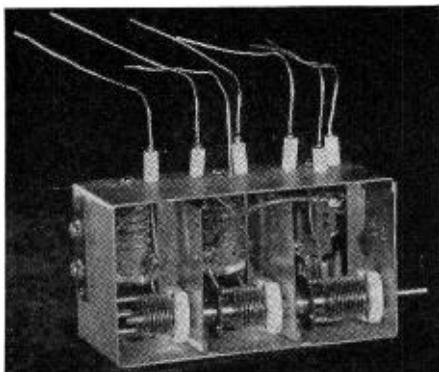
The switch, of which there are eight separate sections all ganged, is in one position in the diagram for the sake of clarity. It is the usual receiver type of coil-shortening unit with which the serviceman and ham is thoroughly familiar. It is made by Centralab and is 14" long, with 2" between sections, and 1 1/2" between coil-mounting centers. The manufacturer's number for the unit is 5090. The sections are made of isolantite.

The R.F. section of the A.M. Tuner circuit. It is standard.

- C<sub>40</sub>, C<sub>45</sub>, C<sub>50</sub>, C<sub>118</sub>—250 mfd. var. Hammarlund MC250M
- C<sub>131</sub>, C<sub>132</sub>, C<sub>133</sub>, C<sub>134</sub>—50 mfd. var. Hammarlund MC50M
- C<sub>41</sub>, C<sub>42</sub>, C<sub>43</sub>, C<sub>44</sub>, C<sub>46</sub>, C<sub>47</sub>, C<sub>10</sub>, C<sub>51</sub>, C<sub>52</sub>, C<sub>117</sub>, C<sub>121</sub>—0.5 mfd. 400 v. paper. Mallory
- C<sub>48</sub>—1 mfd. 400 v. paper. Mallory
- C<sub>119</sub>—0.001 mfd. midget mica. Aerovox
- C<sub>120</sub>—0.0005 mfd. midget mica. Aerovox
- C<sub>122</sub>—Padding condenser (Band 1) Knight 22-7961
- C<sub>123</sub>—Padding condenser (Band 2) Knight 22-7733
- C<sub>124</sub>—Padding condenser (Band 3) Knight 22-7731

- C<sub>125</sub>—Padding condenser (Band 4) Knight 22-4137
- C<sub>126</sub>—Padding condenser (Band 5) Knight 22-4137
- R<sub>28</sub>, R<sub>30</sub>—300 ohms, 1 w. Aerovox
- R<sub>29</sub>, R<sub>30</sub>, R<sub>100</sub>—100,000 ohms, 1/2 w. Aerovox
- R<sub>31</sub>—25,000 ohms, 2 w. Aerovox
- R<sub>34</sub>—400 ohms, 1 w. Aerovox
- R<sub>101</sub>—250,000 ohms, 1 w. Aerovox
- R<sub>102</sub>, R<sub>113</sub>—50,000 ohms, 1/2 w. Aerovox
- R<sub>118</sub>—25,000 ohms, 1 w. Aerovox
- R<sub>116</sub>—20,000 ohms, 10 w. Ohmite
- L<sub>9</sub>—Antenna coil (Band 1) Knight N-3380
- L<sub>10</sub>—Antenna coil (Band 2) Knight N-3381
- L<sub>11</sub>—Antenna coil (Band 3) Knight N-3382

- L<sub>12</sub>—Antenna coil (Band 4) Knight N-3383
  - L<sub>13</sub>—Antenna coil (Band 5) Knight N-3384
  - L<sub>14</sub>, L<sub>15</sub>—RF coils (Band 1) Knight N-3385
  - L<sub>16</sub>, L<sub>17</sub>—RF coils (Band 2) Knight N-3386
  - L<sub>18</sub>, L<sub>19</sub>—RF coils (Band 3) Knight N-3387
  - L<sub>20</sub>, L<sub>21</sub>—RF coils (Band 4) Knight N-3388
  - L<sub>22</sub>, L<sub>23</sub>—RF coils (Band 5) Knight N-3389
  - L<sub>34</sub>—Oscillator coil (Band 1) Knight N-3390
  - L<sub>35</sub>—Oscillator coil (Band 2) Knight N-3391
  - L<sub>36</sub>—Oscillator coil (Band 3) Knight N-3392
  - L<sub>37</sub>—Oscillator coil (Band 4) Knight N-3393
  - L<sub>38</sub>—Oscillator coil (Band 5) Knight N-3394
  - RFCL—25 mhy. r.f. choke, Millen 34225
- Note: "Knight" is the trade-mark of Allied Radio Corp., Chicago, Ill.



The Browning FM Tuner Unit.

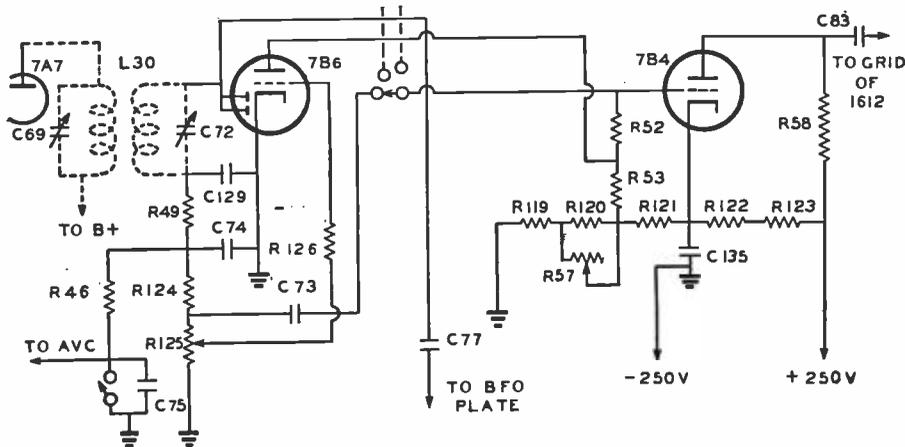
heard in the receiver speaker.

So much for the FM section hints.

The problem of wiring the remainder of the receiver follows good common-sense procedure. Take no chances with the insulation; but the losses will not be as great as in the FM section and so we may relax our concept a bit.

Remember that the BFO and the oscilloscope both have oscillatory leads. That spells trouble if the oscillations are not confined to the circuits where they belong. The oscilloscope is used to measure the modulation of an r.f. signal and is a valuable adjunct to this super; still it must be remembered that if the input leads are allowed to let their oscillations get "away," then not only will the oscilloscope not function as it should, but the entire receiver may be thrown out of whack.

Modulation measurement is by means of a circular pattern which will appear on the face of the C-R tube. As modulation approaches 100% the circle will "fill up" from a "tire"



The squelch circuit. (Courtesy The Hallicrafters)

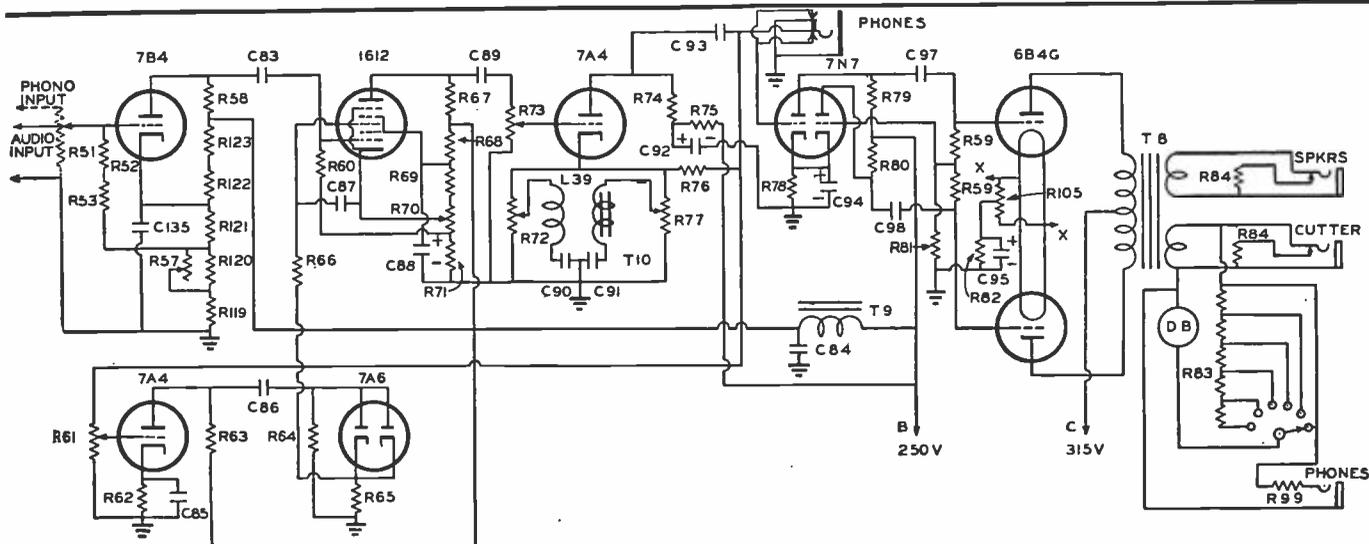
- R<sub>67</sub>—5,000 ohm pot. Mallory
- R<sub>68</sub>, R<sub>122</sub>—20,000 ohms, 1 w. Aerovox
- R<sub>119</sub>—2,000 ohms, 1 w. Aerovox
- R<sub>120</sub>—8,000 ohms, 1 w. Aerovox
- R<sub>121</sub>—150 ohms, 1 w. Aerovox
- R<sub>122</sub>—30,000 ohms, 1 w. Aerovox
- R<sub>123</sub>—250,000 ohms, 1/2 w. Aerovox
- R<sub>124</sub>—500,000 ohms pot. Mallory
- L<sub>30</sub>—Tru-test 16-6644 I.F.

Note: "Tru-test" is trade-mark of Lafayette Radio Corp., Chicago, Ill.

- C<sub>69</sub>, C<sub>72</sub>—in can with L<sub>30</sub>
- C<sub>73</sub>—0.5 mfd. 200 v. Mallory
- C<sub>74</sub>, C<sub>129</sub>—0.001 mfd. midget mica, Aerovox
- C<sub>75</sub>—5 mfd. 200 v. paper Mallory
- C<sub>77</sub>—5 mfd. (approx.) two insulated twisted wires
- C<sub>83</sub>—0.1 mfd. 400 v. paper, Mallory
- C<sub>85</sub>—0.1 mfd. 400 v. Mallory
- C<sub>135</sub>—500,000 ohms, 1/2 w. Aerovox
- R<sub>52</sub>—100,000 ohms, 1/2 w. Aerovox
- R<sub>53</sub>—1 megohm, 1/2 w. Aerovox
- R<sub>57</sub>—150,000 ohms, 1 w. Aerovox

formation to a "disc" appearance. There is nothing very new about this type of modulation meter, and it has been discussed many times in this and other magazines. The amount which the circle fills in, is the measure of the percentage of modulation. Should over-modulation be present on the carrier, then the center of the disc will become brighter than the outside, and the amount by which the center becomes brighter, will indicate the amount by which the over-modulation is taking place.

The BFO is so constructed that a beat each side of the carrier can be made. This enables the operator to create the effect of single-signal reception because when the beat is heavier on one side of the carrier than on the other, it acts to drown out an interfering signal on the same side whereon the BFO is heavier, and at the same time tends to "weaken" an interfering signal on the side of the carrier on which the BFO is "lighter." Of course, this can be carried to extreme, and the further that the BFO is tuned "off"

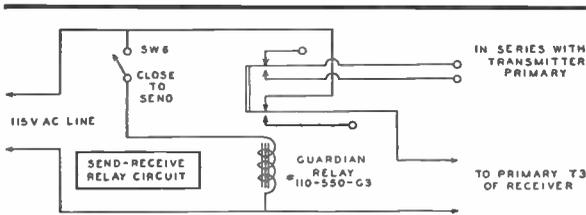


The final and corrected circuit of the audio amplifier section.

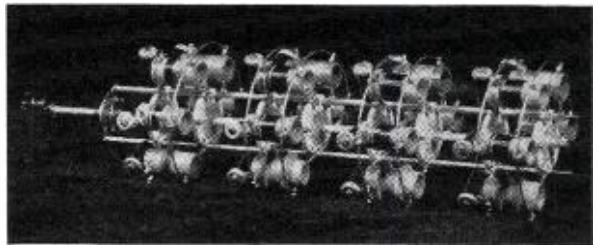
- R<sub>51</sub>—500,000 ohm pot. Mallory
- R<sub>52</sub>—1 megohm, 1/2 w. Aerovox
- R<sub>53</sub>—150,000 ohms, 1/2 w. Aerovox
- R<sub>54</sub>—5,000 ohms pot. Mallory
- R<sub>55</sub>—20,000 ohms, 1/2 w. Mallory
- R<sub>56</sub>—250,000 ohms, 1/2 w. Aerovox
- R<sub>57</sub>—1 megohm, 1/2 w. Aerovox
- R<sub>58</sub>—1 meg. pot. Mallory
- R<sub>59</sub>—10,000 ohms, 1 w. Aerovox
- R<sub>60</sub>—100,000 ohms, 1/2 w. Aerovox
- R<sub>61</sub>—100,000 ohms, 1/2 w. Aerovox
- R<sub>62</sub>—250,000 ohms, 1/2 w. Aerovox
- R<sub>63</sub>—500,000 ohms, 1/2 w. Aerovox
- R<sub>64</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>65</sub>—10,000 ohms, 1 w. Aerovox
- R<sub>66</sub>—10,000 ohms, 1 w. Aerovox
- R<sub>67</sub>—10,000 ohms, 1 w. Aerovox
- R<sub>68</sub>—10,000 ohms, 1 w. Aerovox
- R<sub>69</sub>—800 ohms pot. Mallory
- R<sub>70</sub>—200 ohms, 1 w. Aerovox
- R<sub>71</sub>—200 ohms, 1 w. Aerovox
- R<sub>72</sub>—25,000 ohms pot. Mallory

- R<sub>73</sub>—500,000 ohms pot. Mallory
- R<sub>74</sub>—20,000 ohms, 1 w. Aerovox
- R<sub>75</sub>—50,000 ohms, 1 w. Aerovox
- R<sub>76</sub>—250,000, 1/2 w. Aerovox
- R<sub>77</sub>—25,000 ohms pot. Mallory
- R<sub>78</sub>—1,500 ohms, 1 w. Aerovox
- R<sub>79</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>80</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>81</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>82</sub>—700 ohms, 10 w. Mallory
- R<sub>83</sub>—DB meter multiplier Triplett (order extra)
- R<sub>84</sub>—500 ohms, 10 w. Mallory
- R<sub>85</sub>—5 meg. 1 w. Aerovox
- R<sub>86</sub>—100 ohms center tapped
- R<sub>105</sub>—2,000 ohms, 1 w. Aerovox
- R<sub>120</sub>—8,000 ohms, 1/2 w. Aerovox
- R<sub>121</sub>—150 ohms, 1 w. Aerovox
- R<sub>122</sub>—20,000 ohms, 1 w. Aerovox
- R<sub>123</sub>—30,000 ohms, 1 w. Aerovox

- C<sub>83</sub>—0.1 mfd. 400 v. Mallory
- C<sub>84</sub>—16 mfd. 450 v. electro. Mallory
- C<sub>85</sub>—5 mfd. 200 v. Mallory
- C<sub>86</sub>—1 mfd. 400 v. Mallory
- C<sub>87</sub>—5 mfd. 200 v. Mallory
- C<sub>88</sub>—8 mfd. 450 v. electro. Mallory
- C<sub>89</sub>—1 mfd. 400 v. Mallory
- C<sub>90</sub>—0.2 mfd. 400 v. Mallory
- C<sub>91</sub>—5 mfd. 200 v. Mallory
- C<sub>92</sub>—8 mfd. 450 v. Mallory
- C<sub>93</sub>—0.2 mfd. 400 v. Mallory
- C<sub>94</sub>—20 mfd. 25 v. Mallory
- C<sub>95</sub>—20 mfd. 100 v. Mallory
- C<sub>96</sub>—0.1 mfd. 600 v. Mallory
- C<sub>97</sub>—0.1 mfd. 600 v. Mallory
- T<sub>8</sub>—Output trans. Thord. T15S90
- T<sub>9</sub>—Filter choke Thord. T68C08
- T<sub>10</sub>—Audio filter Thord. T14C61
- L<sub>30</sub>—30 mhy. choke Millen



Left: The send-receive relay hookup circuit.



The laboratory-built band-change switch which contains all the AM antenna and R.F. coils. Pies are self-shorting type of isolantite.

the carrier, the more insensitive the reception of cw signals becomes. The most sensitive spot for tuning the carrier is "dead center." Since the BFO is really just another oscillator which is "beat" against the incoming signal, it is essential that the leads carrying the BFO oscillations be kept away from other receiver leads. Otherwise the BFO will not only not operate correctly, but may even upset the tuning of the entire receiver.

Regeneration is placed in the third i.f. stage. By careful manipulation of the regen control, a signal "down in the mud" can be brought up to come in and over-ride most interfering signals. This control, too, can be over-done and it is possible to place it so far "advanced" that the signals will all be as if received with the BFO "on," i.e. the set will oscillate. The proper setting of the regeneration is the delicate task of operator. Having already experimented with regeneration before we feel that its inclusion will more than off-set the trouble of insertion.

A variable band-width in the i.f. stages is provided for. This gives all-around efficiency on sharp signals plus the beauty of reception on phone signals. The gain decreases as the band-width increases, but the fidelity of reproduction increases as the band-width increases. In the recording of music from the air, for instance, many more highs and lows will be "passed" if the band-width of the i.f. stages is as great as possible. Conversely, to receive c. w. signals through heavy QRM a very narrow band is needed. Since both are available, the receiver is just that much more flexible.

### Construction

There is a right way and a wrong

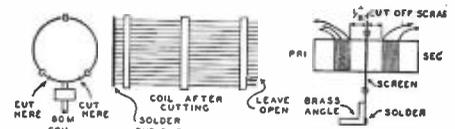
way to wire a receiver of this type. The proper procedure will save many hours of tedious work if the constructor will follow the ensuing suggestions.

Make up the complete a.m. r.f. coil assembly before attempting to mount it in place. After all of the coils have been wired to the switch lugs, the connecting wires that go to the tube sockets and other positions should be soldered in place. Allow plenty of length for these leads. The scrap may be cut off later. The actual mounting of the coils is simplified as they are already provided with long lugs that fit directly to the switch contacts. Coils are all self-supporting. The trimmer condensers are soldered directly to the coil lugs and are position so that the adjusting screw faces a convenient angle where it may be reached with the insulated screwdriver when the coils are tuned.

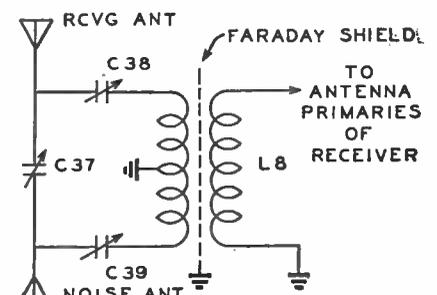
It is best to wire completely one particular section before passing on to another. Some mechanical work will be needed before some of the parts can be mounted. One of the operations is to cut 1" square notches in the back partition so that the leads to the transformers can pass through and be clear of other parts. Holes must be drilled in the chassis at proper points to pass leads to the various parts. They should be figured on before finally putting the particular part in place. Starting with the a.m. tuner assembly we find the following tube lineup:

- 7A7 first tuned r.f. amplifier, followed by a
- 7A7 second tuned r.f. amplifier, followed by a
- 7Q7 separately excited converter, followed by a

(Please switch to page 44)

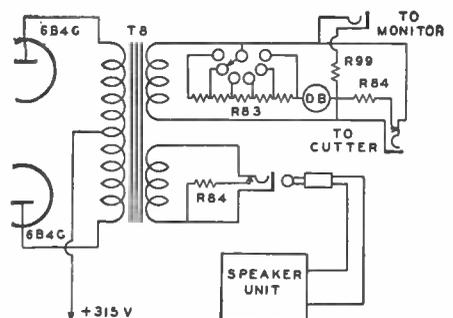


Faraday screen construction details.



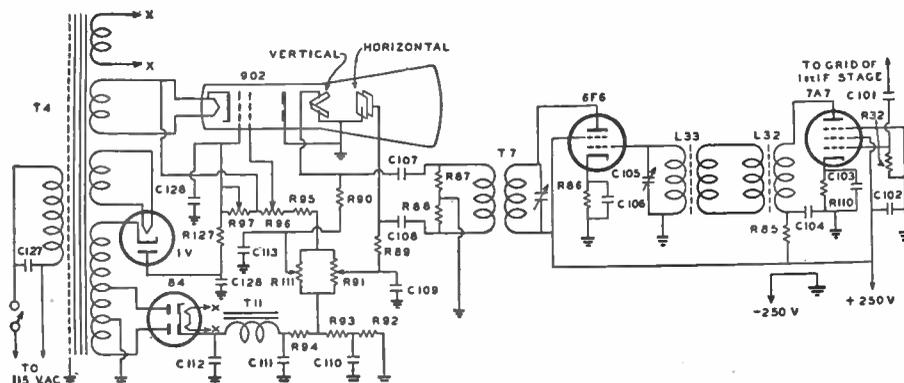
Antenna noise-rejection circuit.

- C<sub>37</sub>, C<sub>38</sub>—0.001 mfd. var. Millen 21100
- C<sub>39</sub>—0.0014 mfd. var. Millen 21140
- L<sub>8</sub>—Pri. 8 t. No. 24 dcc., close-wound, center tapped, 3/4" dia.
- Sec. 8 t. No. 24 dcc., close-wound, 3/4" dia., 1/4" from Pri. (see text)



Speaker circuit. (Courtesy Jensen)

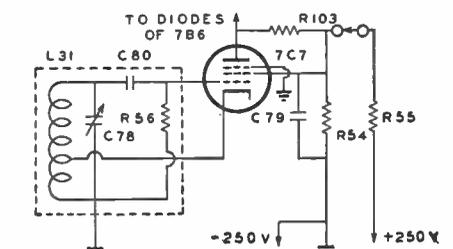
- R<sub>88</sub>—Multiplier resistor to extend range of db. meter to plus 36 db. available on order from Triplett
- R<sub>64</sub>—500 ohm, 10 w. Ohmite
- R<sub>66</sub>—500,000 ohms, 1 w. Aerovox
- Speaker: Jensen dual No. JHP-52

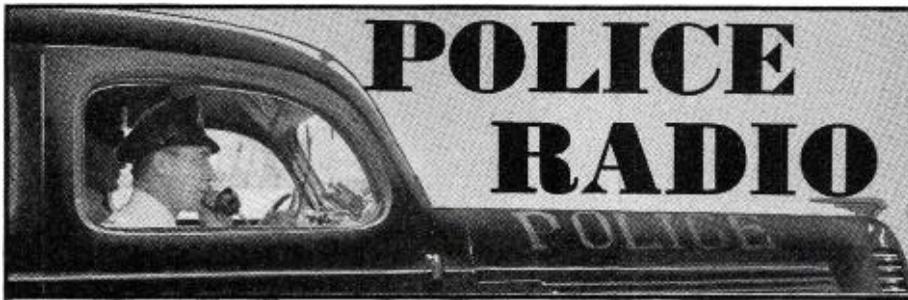


Oscilloscope modulation meter circuit. (Courtesy Radio Mfg. Engineers)

- C<sub>107</sub>, C<sub>109</sub>, C<sub>109</sub>, C<sub>113</sub>, C<sub>128</sub>—.25 mfd. 600 v. paper, Mallory
- C<sub>108</sub>, C<sub>104</sub>, C<sub>106</sub>—.1 mfd. 400 v. paper, Mallory
- C<sub>111</sub>, C<sub>112</sub>—4 mfd. 450 v. electro. Mallory
- C<sub>110</sub>—8 mfd. 450 v. electro. Mallory
- C<sub>101</sub>—50 mfd. midget mica, Aerovox
- C<sub>102</sub>—.05 mfd. midget mica, Aerovox
- C<sub>105</sub>—in i.f. can with L<sub>33</sub>
- R<sub>85</sub>—20,000 ohms, 1 w. Aerovox
- R<sub>86</sub>—400 ohms, 1 w. Aerovox
- R<sub>87</sub>, R<sub>88</sub>—500,000 ohms, 1 w. Aerovox
- R<sub>89</sub>, R<sub>90</sub>—2 megohms, 1 w. Aerovox

- R<sub>61</sub>, R<sub>111</sub>—250,000 ohm pot. Mallory
- R<sub>62</sub>, R<sub>83</sub>—22,000 ohms, 1 w. Aerovox
- R<sub>64</sub>—15,000 ohms, 1 w. Aerovox
- R<sub>65</sub>—100,000 ohms, 1 w. Aerovox
- R<sub>66</sub>—25,000 ohm pot. Mallory
- R<sub>67</sub>—20,000 ohm pot. Mallory
- R<sub>110</sub>—300 ohms, 1 w. Aerovox
- R<sub>127</sub>—40,000 ohms, 1 w. Aerovox
- L<sub>33</sub>, L<sub>35</sub>—Special. RME 5775
- T<sub>4</sub>—Thordarson T-45066
- T<sub>7</sub>—Special. RME 5.3
- T<sub>11</sub>—Thordarson Choke T74C30





by **WILBERT T. PETERSON**

Illinois State Police Dept.

### Chicago Police and FM

**T**HE advantages an FM police radio system offer a large metropolitan city is remarkably displayed by the new Chicago police FM system now in operation under the able guidance of Fred Schnell, W9UZ, chief radio engineer for the department.

Exhaustive tests with both AM and FM showed that FM, because of its noise reduction capabilities, proved itself far superior in this city where man made interference is always a serious problem.

The original plans for two-way communication in Chicago, included AM transmitters with seven remote receiving positions adequately to cover the city.

With the new FM system, only one receiving position, located in the *Field Building* on the shores of Lake Michigan, is necessary!

The receiving antenna is atop the *Field Building*. Two frequencies are used, 35,100 kc. and 35,220 kc., with 75 cars on one frequency, and 75 cars on the other.

The FM mobile transmitters are *REL* equipment, running about 25 watts from a single 807. The maximum swing is held down to about 26 kc.

Directional characteristics of the transmitting antenna, which are usually bothersome in mobile installations, have been elim-



*REL* FM police mobile transmitter.

inated by the use of a tuning unit built into the base of the *REL* antenna.

Three low frequency transmitters, WPDB, WPDD, WPDC on the north, south and west side of the city are remotely controlled from Central headquarters and operate on 1,714 kc.

The two remote FM receivers are brought into headquarters by telephone lines. The squelch circuit of these receivers are remotely controlled at headquarters on the same line. This novel system is a simple remote sensitivity control placing a battery bias on the RF and IF tubes by means of a pot and "C" battery on the same pair of wires with the necessary isolating chokes and condensers.

Plans are now under way to install three other receiving positions at the three transmitting stations. These will act as auxiliary receivers in case of breakdown in the *Field Building* receiver.

At present the longest haul from car to receiver is from the far south-east side to the *Field Building*, a distance of about 20 miles. Reliable communication is always maintained from the cars in this area. In fact very little difference is noted when a car is transmitting under Wacker drive! What does Fred Schnell think of his new system? He replies, "Why didn't someone think of this before."

### State Police Channels Reallocated

**T**HE FCC has reallocated several state police frequencies to clear up interference between state stations on the same channel. Through the cooperation of the

APCO frequency allocation committee under the chairmanship of Robert L. Batts of the *Indianapolis Police* and Col. Edwin L. White of the FCC these changes were worked out.

The two new frequencies recently made available to the police service 1,722 kc. and 1,730 kc. have been allocated to Arkansas and Ohio respectively. At present these two states have a clear channel on these frequencies.

North Carolina is now working on 1,658 kc.; Georgia on 1,666 kc.; Michigan and Tennessee on 1,642 kc.; South Carolina on 1,714 kc.; Missouri on 1,675 kc.; Kentucky on 1,682 kc.

With the changing of 1,712 kc. to 1,714 kc., an 8 kc. separation of all the state police channels is now obtained.

### Radio Telephone Relay

**T**HERE is considerable controversy by various police departments in the interpretation of the radio telephone relay provision in *Sec. 10.125* of the FCC Rules governing emergency services. Part of this section reads: *Municipal police stations shall not engage in point to point radio communication beyond the good service range of the transmitting station. The transmission or handling of messages requiring radio telephone relay or the relaying of such messages is prohibited.*

This definitely states that if one phone station gives another a message, the second one cannot give it to another phone station which, of course, would mean a relay. This second station may give the message to a third station by radio telegraph, that is, if it is so licensed, but not by radio telephone. However (this is where the thing clouds up), a provision now follows the last quoted section: *Provided, however, that after proper showing and in unusual circumstances, the Commission may in specific instances authorize communication routes involving such relays.*

Now what can be classified as "Unusual circumstances"? Just what are these "specific instances" in which the Commission will allow a radio telephone relay?

These two questions probably will receive the more diversified explanation than any other that might come up in the rules and regulations governing emergency services.

The general assumption seems to be that a phone station may receive a message from another phone station, and then in turn dispatch it to a car or a receiving station without obtaining an acknowledgment, but he cannot give it to another station who may, or has the facilities for acknowledging it.

After chatting with several FCC inspectors, we have learned that the ruling may be interpreted as follows:

Since the purpose of the ruling is to keep the phone circuits open for emergency traffic only such as urgent despatches or messages, and eliminate the interference that the relaying of unimportant messages would cause to other stations on the same channel, municipal police stations should not accept traffic if they cannot get it to its destination without relaying. This, of course, does not pertain to urgent messages or where public service facilities are not available. In other words, police stations are emergency stations and should be operated with the proper discretion, not to see how many carrier hours they can put out.

In the case of a squad car cruising in its patrol area who may call its municipal sta-

(Continued on page 58)



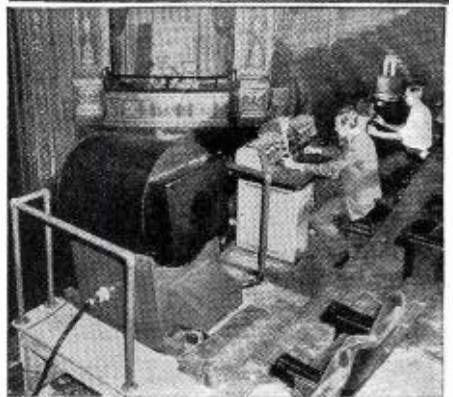
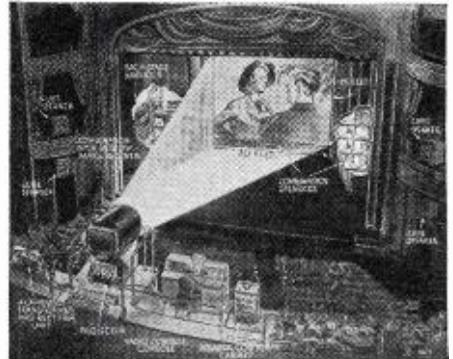
by **Samuel Kaufman**

**"S**TEP up, folks! See the world's greatest show—television! It's here, folks!"

If any barker began yelling the above, he'd be offering an honest "come-on" spiel. In the *Video Reporter's* opinion, television is the greatest show on earth and, further, it is already a practical means of home entertainment that is handicapped only by the absence of *Federal Communications Commission* sanction to proceed.

And, in effect, the *Video Reporter* received the barker's invitation when the *National Television Systems Committee* conducted a series of demonstrations by all leading laboratories for the edification and information of the members of the FCC. We decided to tag along with the *Commission* members at the demonstrations and we got back home tired but convinced that this thing called television will be here to stay once someone gets up enough courage and etiquette to invite it in out of the cold.

It should be noted at the outset of this record of our impressions that there is not too much accord among the firms that shared the conference table at *NTSC* sessions. While 441 lines are recommended to the



Above: Pictorial diagram of the wide screen video setup. Below: How it actually looked in the N. Y. theatre.

FCC in the committee's report, this is by no means unanimous and it seems that while television men, like all good Americans, endorse the message of peace on earth, there is little hope for peace on air—particularly the television air.

The television tour started at the *Allen B. Du Mont* New York headquarters where all

(Continued on page 62)



# Ham Chatter

Courtesy W6LLX

**Y**E goede olde Ham Chatter Editor has just returned from Washington where, among other things, he visited with Chairman Fly of the Federal Communications Commission. He also visited with the Army and the Navy boys and learned some rather startling facts. First of all, the Navy has already taken some 1500 Naval Reservists and put them to work for Uncle Sam. We find many posts, in ships and on shore, being occupied by former hams.

Major Talley of the Army told us of the new questionnaire which is being mailed out from that headquarters. It seeks information of a purely voluntary nature from every ham on record. Dope is wanted on the type of transmitter in use, the receiver, and the facilities of the shack. It is hoped that every amateur will fill out his questionnaire promptly and will forward it in the franked envelope which is furnished. That envelope will have on its face the proper address to which the questionnaire is to be mailed. So you Hams, don't forget when you get your questionnaire fill it out at once and send it right back. Both Major Talley, of the Army and the Ham Chatter Editor will be duly grateful.

We heard some rather disturbing things in Washington, one of them being that there have been a number of subversive transmissions within the United States. We were unable to discover whether such transmissions were those of licensed amateurs or whether they were "bootleggers." Washington is much too tight-lipped to give us that information. We sincerely hope, however, that if they were hams they were promptly apprehended; and if not, that the hams will not be made to suffer because of the illegal transmissions.

It behooves each and every one of us on the air to watch our lingo and watch what we say. This evening a broadcast over commercial waves made certain of one fact: Uncle Sam would consider it most ill-advised to give any information concerning the docking of British war ships in the United States for repair facilities. This is information, said the broadcaster, which would be of military value to our enemies. Therefore, Hams, do not give any information of what you may see or hear concerning British warships, regardless of where you are stationed.

The Ham Chatter Editor.

From the Mail Bag:

**H**AM Chatter Ed.

Radio News

Dear Sir:

Just read W4AXP's letter. Why does he pick class C? Isn't it true that the class B and C exams are the same? According to the license manual they are. The reason that a person takes their exam from an RI does not signify that they know more, or as much about phone xmtrs as one who takes it from an upstanding Amateur. One who is more interested in seeing that you have the necessary requirements, rather than to just get you a ticket through hook or crook.

Even the class C ham who has been given a ticket (if that ever happens, and I sometimes wonder) is I believe as well qualified to operate any kind of transmitter as the class B ham who memorizes the question and answers. There is one thing true you can't blame the class C hams for letting anyone by on code tests for exams. So the next time you qso a new ham on his first or second, even third or fourth, qso and he can only copy seven words per minute, and send less. You can make up your mind that some Class B or A ham has slipped.

I happen to be a class C ham have been on little over a year. Operate CW all the time. And the Amateur who gave me the exam didn't

slip. Nor did he give me any assistance whatever. And he stuck right with me to the finish.

Jack Watt  
W9HYQ  
Ontonagon, Mich.

**E**DITOR, Radio News:  
**EMPHASIS ON DEFENSE** is my idea of stirring up the old ancient rumpus anent Fonevs-CW! Feel both have their pertinent points and advantages and dis-advantages. YET, after all, both are a means to an end—that, of **COMMUNICATION** under any and all conditions. My contention is that: we should devote more time to "Crypt" handling, by whichever method of QSOing we prefer or have facilities for.

We all recognize that any argument asserting CW as being in any sense "secret" is a lot of whooey, as ever the veriest aborigine would have some "traitor ally" who would "read the CW" for them, even as you and I know what is being sent by that method. I have sat at home and heard others at a distance discussing people in my town and their businesses (which was none of my concern, but I heard it just the same) on CW! Think it is in neighborhood of **138 possible errors** the 26 letters and ten figures of our Continental Morse has, and also figure a 10% transmission error; so you-see, CW is not the "holy cow" some interested interests would have us believe. Just as well face the facts, before the OB in command finds "His Maginot Line of CW" pierced. Much better for all of us to discard in part this old mildewed theory that CW IS THE THING; and supplement with some better organized effort along voice lines as well; and, "Crypt" practice a plenty by us hams. Crypt too is only a delay method as generally "the other fellow" too is not so dumb but what given "time" he can figure out what it is all about!

I suggest in licensing us hams we also be compelled to pass a voice copying test of at least 20 WPM for a "C" license; 25 WPM for a "B"; and, at least 30 or 35 WPM for an "A" ticket. Merely a case of training your mind to follow and copy the spoken word the same as you had trained yourself to jot down CW!!! Many of you will be pleasantly surprised too in how quickly you will be able to develop the ability to copy thru quite bad QRM and do it correctly—i.e., when it is correctly "given out" as same like "fists" some voices are easier to copy on paper.

There are a few really good AARS fone



Pulchritudinous Norma of w1lj1.



Hamop & rig of w9qwm, Pontiac, Ill.



Army ham-rig of w1ldr/5 in Texas.

**ARMY AMATEUR RADIO STATION**

OPERATED BY  
**W9DBO**

ELMER F. KLEPPIN, op. Rural Route 1, WENONA, ILLINOIS

w9dbo's fb qsl crd.

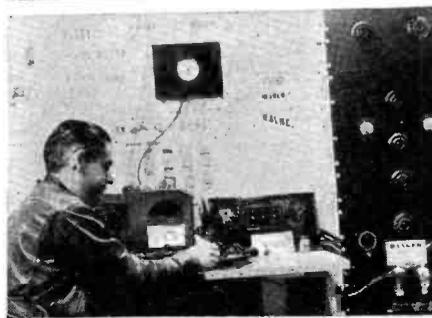
RADIO: 404 BENNETT ST. Pontiac, Ill. HAROLD E. SCHROCK, ARRL W4AS REC. PSE OSL, INX.

**W9QWM**

w9qwm has this fer his qsl crd.

**WAR**

The much-wanted, well known WAR qsl.



w5hct said that pix above, run last month, was old stuff, and sent in the lower pix showing new hamstation.



Doggone! It's w9qwm again. This time showing his very f.b. rotaerial!



"The YL." Miss Gladys Sloan who is sponsored by none other than w9tdh.



"Gawgah's" Bill (w4exn) Webb.

nets, and their methods should be studied and copied by others that we might all benefit thereby. Cinch! We gotta do it ourselves, unless some of the powers that am wake-up and insist the OB come to life and give us a break, as up to now we fone netters are rankly discriminated against and considered a bunch of outcasts which makes it darned hard to get and keep a net going. Feel we should be given the same break as the CW net, which has a station to monitor the corps area frequency and help keep things moving for them; and the code broadcasts from Washington and locally are for CW nets almost entirely (if they mention us, it is generally a sneer) yet they expect us to copy it week after week and use CW on our fone nets! Something darned inconsistent someplace???

Perhaps, we fones should INSIST all CW men use voice, too? ?? Yep, all for no particularly good reason, we are "un-wanted step-children" in our patriotic wish to be a good Army Net!

RADIO NEWS articles in past have depicted how "crypt" via voice in one method or another, has put over vital info or merely "news" for the news-hungry. Simply boil down to accepted prejudice of the "old timers" who love to wiggle a key, that theirs is the "one and only"—trite, and NO LONGER TRUE!

In the interests of the citizens of the USA I'm asking for "fair play" in this old Fone-vs-CW discrimination. Thank you.

Yours for an equal break,  
Bud Crawford, W9BDO.

**B**OB (W7HPH) Gregory of Boise, Idaho reports: W7HSK has 80 ft. hi 250 ft. Zepp sky hook. Nice wire Lloyd.

Boise Junior College under call of W7IKN has nice radio club with swell shack and several antennas up.

W7ZN is an Old Timer with some very swell cards.



w1lzv portable.



A very unusual pix showing a 4-bottle, 25-watt field station of Jno. C. Butala of Arizona. Taken in 1922.



w1mmh & w1kep visiting w1lib.

W7HZV puts out a nice sig wid 12 watts. Also has 100 watt rig.  
W7HZE does a good job wid 200 watts cathode modulated.

W7HAK rolls in wid 65 watts to an 812. W7HAZ reports using 1/2 wave vertical while working 160. Some wire. OM. You will have to explain it some nite. Hi hi.

W6MOV has 1/2 wave 160 Zepp. 75 meter doublet and 3 element beam on 10.

W7CBL does fine job wid 135 watts.  
W7AQA puts in a swell sig wid 14 watts using 1/2 wave doublet.

W6TAV and W6PME are two y's who gave us a pleasant QSO recently.

W7GXD has new phone rig on the air, T55 at 60 watts.

W7IAC gave us a pleasant QSO recently with a friend we had not seen for four years. Thanks a lot Bill.

W7HOV has new location and has fixed up a f.b. shack at the new QTH.

W7AXY who goes in for Homespun Rec. has a new one that is said to be a whiz.

W7DNZ puts in a nice sig on 75 wid 600 watts.

W7WQ when operatin portable fixed at Horse Heaven, Ore. put R 7 sig in here wid 6 watts.

W6DRS also likes homespun rec.; has 11 tube job.

W7HTQ folds his 1/2 wave 160 flat top up like an accordion to get it into the space allowed.

W7HJP is another cathode modulation fan.

W7HBN recently put 4 y's in a row on the mike, introduced as cousins.

W7ACD is 10 meter fan and is said to really do things. Is going to put up a real 5 meter job, so I hear.

W6KMI puts 500 watts into a 75 meter vertical ant. on 90 ft. pole. Some stick. Gave Sheriff's Office as location. Not in housegong, I hope OM.

W7AGH was building an E.C.O. when worked. W7GLN works 5 meters from Mt. Hood in summer time. W7JL and W7ENI cooperate.

W7CTV's homespun rec. has 3 rf. stages. W7FDQ when last worked was to change QTH.

W7FUQ has building bug. Look out, Cecil, sometimes that turns out to be an expensive bite.

W6MRB puts out a good sig wid 35 watts into 2 1/2 waves in phase using E.C.O.

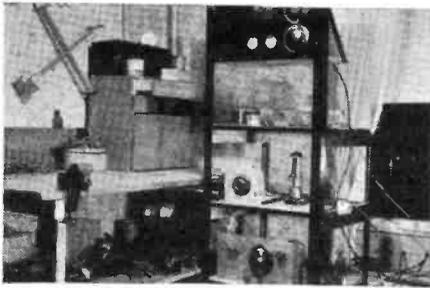
W7HNE is going to put open line on his 160 doublet.

W6MSM grows Tokay grapes but does not report what the end product is. Hi Hi. "Pretty good, Johnny, but that aint the way I heard it!"

W7SY uses a Karr trns. to excite O3A's as linear at 175 watts.

W6SLV in Oroville sure keeps skeds.

**F**ROM Bill (W4CFP) Coe, Sarasota, Fla.: Fond memories of the DX that used to be were recalled for the Sarasota gang when ex-



A new rig a-building. It's w1mkr's.

OE3AH, the Austrian archduke, spent several weeks in Sarasota.

W9GXG/4 has moved to Sarasota from Crawfordsville, Ind., and applied for a W4 ticket. When not on 10 meter fone, he's a cartoonist. *Saturday Evening Post* and *Colliers* use his work under the handle Bandell Linn. [How about *Radio News*, OB? We pay, too. Ed.]

W4DUI and W4CFP both work for the local afternoon newspaper. DUI is makeup chief, but has been neglecting 10 meter fone to build a new home. He's doing the work himself. CFP is Managing Editor of the sheet and is trying to master cathode modulation on 10 fone. [More of the 4th Estate Gang! Hi! Ed.]

W3RGN, formerly of New Jersey, expects to be on 20 meter fone from his new beach home in Sarasota soon.

W4CUZ, formerly of Orlando, Fla., is now chief op at the Sarasota BCL station and has been bitten by 10 fone bug.

W4CDY of Manatee, Fla., plays sax with a swing outfit heard nightly over the Sarasota station.

W4GJQ (Four good juicy oranges) expects to tack up a sheepskin from Rollins college in June but manages to get home over weekends and works some of the 10 meter gang.

W4CCR has a new job with local telephone company and is working on a new rig.

Organization of Sarasota's first ham club is under way. The group meets weekly in the high school physics lab and hopes to get on the air with club call soon.

The Mail Bag Again:

RADIO NEWS  
Dear Editor:

It was quite a surprise to learn of the actions of the A.R.R.L. in recommending the changes in requirements to obtain Amateur Licenses. The surprise lies in the fact that they ask for a reduction in code speed and technical ability. I have always been a contender that the present code speed was not too high nor was the examination too stiff. Our hobby unlike so many other hobbies needs government regulation and therefore we encounter some of the difficulties that will not be found in other hobbies. Amateur Radio has a decisive value to our military forces, for emergencies during disasters and indirectly has a great commercial value in that it requires training to get into, and provides further training while in actual operation. Furthermore the greatest majority are self-made.

Let us consider what we find to be the case of the persent operator when he is first granted his license. First he has passed a code exam at 13 wpm which is definite assurance that he can immediately operate with fair accuracy and speed. Second he has had to pass the technical exam which will enable him to adjust a simple transmitter should there be a need. He is also capable to do a construction job and have enough knowledge to follow instructions accurately.

In order that he could pass the exam he has had to put forth some real effort that he might succeed. Now that he has climbed the ladder he looks back and smiles with pride, a pride



Hamop & station of w0dpu.

that he does not readily relinquish. This ham has had some new training of a type that has quickened his thought and opened a new field with practically no limit.

While the operation of the station continues more experience is gained in operating at higher speeds, with greater accuracy and the practical knowledge on the building, adjusting and maintaining of radio equipment.

Thus far you can possibly not find a trace of my argument as what I have stated you may say is exactly what they are trying to accomplish by letting down the bars that we might have more licensed amateurs that they would gain this necessary experience. Fine, I say but can they gain this needed experience? Here I would like to ask you. You may expect me to answer this right here but lets be broad-minded about this thing. Years back the 'phone boys have used the argument that the 'phone man had no use for code but there need be no argument as the government has already recognized the fact that Amateur Radio operators do need code to be of real value. C.W. is a means of communication and what real value would a 'phone ham be in an emergency when his operation would call for the ability to copy code signals. None, and that single word fully answered that. However I said let's be broad-minded so let's consider a reduction in code speed. Now how much reduction can we stand for and yet not sacrifice all. Too low a code speed would be useless as its usability would be so greatly reduced to a point where it would be ineffective.

Before we consider code speed fully it's turn to the technical side. Many are able to pass the present exam and more would be able to pass an easier one as we can readily see, however, the exam does not teach the practical side and it is of extreme importance. Under the present status and normal conditions the operator can help self but under emergency and field conditions it would be an utter disappointment. The result here is the same as with code speed and that is ineffectiveness.

Let's for an example consider this Amateur fraternity as we would a local Lodge or Club. To become a member you pay your entrance fee and after being admitted you of course pay the regular dues. When you are made a member they give an initiation in order that you be recognized as a full-fledged member. You have got to go thru to rightly earn your place among the members. When there is a need for more new members the charter may be thrown open to others at a smaller fee but they do not relinquish the initiation. Now we have no fees except our efforts in becoming a self-made ham.

We find there is need for new hams with experience. If we open the charter for new hams on the basis of lower requirements we are apt to lower the standards of Amateurs due to the fact the pride that one has developed in meeting the present requirements is the one thing that makes amateur operators the law-abiding citizen and the amateur Fraternity one of the largest and most friendly groups in the world. In order to obtain that coveted license it has meant some real concentrated effort. This has made the amateur worthy of his privileges. Some may think that it is pride that has made me take this point of view but that is not correct as we cannot let pride be detrimental to our progress. Although without some means of making the new-comer as proud of his privileges as we are we cannot maintain such high stand-



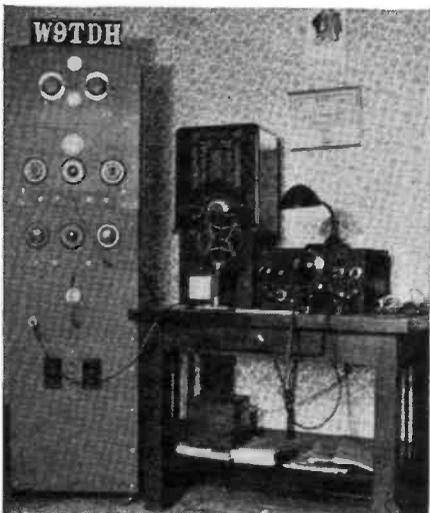
Hamop w0tdh, lucky stiff (see page 30).



Pre-war ve4om.



YLop Kitty, w6sgd.



Oh, yeah! Here's w9tdh's rig!



YLop Mickey, w9ztu.



YLop Myrt, w9afk.

ards in ham radio. This lowering of requirements would lead to more poor operating practices that could not be tolerated and would lead to more suspended privileges and revoked licenses. There is enough discrepancy at present without asking for more. What I mean to imply is that lowering the requirements is comparative to relinquishing the initiation in the local club or organization.

Taking a broad minded view again we find the need for an increase in the number of operators and a means of obtaining such. Up to the present time the only view in mind is the lowering of requirements which might have very detrimental effects and therefore end up disastrous. Maybe we can find a way to solve the



Beautiful qsl crd of w8ozp.

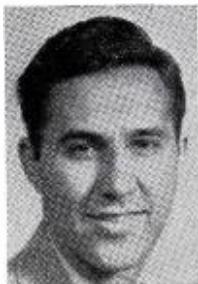
problem and in the end have the assurance that all will be well. If we lower the requirements we find more fellows obtaining licenses and although willing to learn, may find these low requirements so low that progress is difficult unless we design some means of furthering the knowledge acquired for the exam. So to fully answer the question on hand I say do not lower the requirements, unless, some very carefully drafted regulations are made binding upon those who obtain their licenses at the new requirements that they may develop the needed skill and thereby prevent detrimental results.

In conclusion I give the following outline as a basis upon which the new regulations should be drawn.

1. Code speed 6wpm.
2. C.W. operation in the center of the 80 & 40 meter bands.
3. No phone operation.
4. Crystal control only.
5. License good for one year only and not



w1mrm.



w8kjr.

renewable.  
6. Class B Exam must be taken during one year period that license is in effect.

Some added suggestions:

Must show proof of contacts with at least 3 stations monthly.

Special letter added to the call that would be dropped when having passed class B.

L. W. Sherman, W3CDY.

At a recent meeting of the Greater Camden Amateur Radio Association the following members were elected for office:  
W3CZN as President of the club.



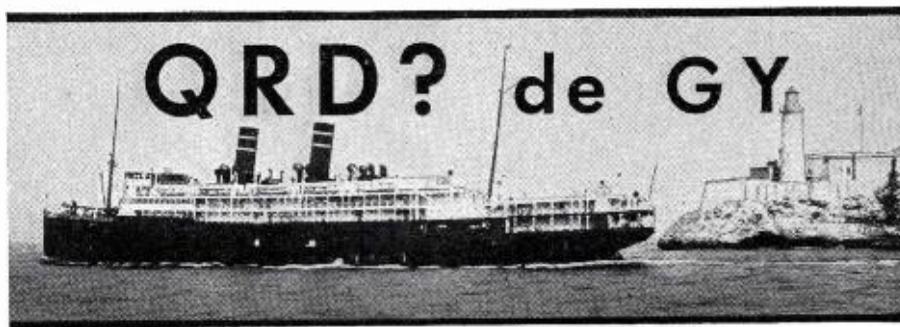
Ham-2-b Hall.



YLop w8uhb.

W3BYK as V. Pres.  
W3EHU as Secy.

The club has reorganized and hopes to put on a worth while program for the coming year. The meeting dates have been changed from the 2nd and 4th Wednesdays to (the 2nd and 4th TUESDAYS OF EACH MONTH) at the Camden (Pse QSY to page 65)



by JERRY COLDBY

IN the February publication of *ACA's MSG*, issue is taken by that organization against the proposed amendment H.R.2074 of Rep. Bland of Virginia. This would amend the *Communications Act of 1934* so that radiops without the six months experience ticket would still be able to man a vessel quote or, in lieu of such six months' experience, such training and experience as the Commission may by rules and regulations prescribe unquote.

Now why does the *ACA* demand that this bill be shoved into the wastebasket? It is obvious that there may soon be a shortage of radiops and this amendment would make it possible to man all the newly-commissioned vessels which are coming down the ways. Does the *ACA* not recognize this possibility? After all, if a union has a contract with a line which might require a radiop to man one of its ships, wouldn't this new man, seasoned or no, receive the regular top wages? It can easily be seen that this bill doesn't intend to lower wages, but on the other hand will increase the number of available radiops which, in turn, means more dues-paying members for the union.

The original six months' law has deterred many radiomen from applying for shipside jobs. This would put more men into the field and with the organized strength of the unions as it is today, there should be no fear of wage cuts or loss of any of the hard-earned gains made in the past years. We believe this bill has the merit of helping the radioman and the unions as we are for it, 100%. For once, we would like to see *ACA* for, instead of agin', some of the recent legislation designed for the betterment of the communications field. We wonder whether their continued arguments against recent governmental legislation is based on a policy of "just bein' agin'" or whether sincere perusal and deep discussion guides their decisions.

At a recent hearing before the *House Merchant Marine Committee*, Rear Admiral S. C. Hooper advised that it would be a good idea if Congress would look into the subversive activities of marine communications inasmuch as a radiop at sea was in a position to do much more than merely harm the vessel or its radio apparatus. Fred Howe, *CTU-Mardiv GST*, previously had testified that there were at least 150 radiops in the American Merchant Marine who were definitely disloyal to the U.S.A. He also stated that the *ACA-Mardiv* was 100% communist controlled. R. A. Winocur, vice-president of the *ACA*, stated that his organization did not require affidavits from its members because the member's political beliefs were not the affair of the organization. This was in reply to a question whether members signed an affidavit that they were not connected with any subversive organizations.

So it looks like the Navy Dept. is taking a hand in the affairs of the merchant marine. Who more than they should have a greater interest in it? And, gentlemen, when the blinkin' ol' Nyvy decides to clean up the rather odorous situation in the Marine communications field, a sand-canvas and ki-yi scrubbing couldn't accomplish a cleaner job. For the past few years investigations have been going on to determine the fire behind the smoke which has been visible in the radiop *ACA*-setup. Up to the present time our benign government permitted things to go on without stepping in and quashing the insipid

doctrines which were being voiced by silver-tongued orators. But the time has come when this is a definitely serious matter; when a man's political beliefs will become the concern to Uncle Sammy, especially when those political beliefs are more of international than national character. I'm sure that those loyal American radiops will not hold back when and if the *ACA* should require them to make an affidavit as to their political beliefs. Don't, however, let us be naive enough to think that the radiops who have committed themselves to a policy of subversion will permit a little thing like an affidavit to stand in their way. We say that every radiop should be given a personal examination by Naval authorities and FCC Inspectors before they are permitted to take a ship out of port.

AND speaking of radiop loyalty, we quote Brother Norman Underwood, *WLO* chief, who sent us newspaper clipping crediting him with being the first one to transmit the news of the "maritime suicide" of the Nazi blockade-runner, *Idarvald*. He continues. *Quote*: Here's a thought that occurred to me after reading your write-up. Where else in this whole world would an inconsequential individual like myself ever get the chance, the opportunity to better his lot in life as I have had? No other government would permit a person like myself to erect a coastal station. I'm a mighty proud American citizen. This grand nation can count on me! *Unquote*. Which we hope, and believe, is the sentiment of all American radiops!

INCIDENTALLY, Brother Art Betterton can use the oft-quoted "the news of my death has been greatly exaggerated." In the previous month colyum we noted this erroneous event and were immediately corrected, for which we thank Brother Anderson of the *CTU*. *Quote*: Betterton left the *West Kyska* at Baltimore, December 6th, then went to Mobile and took out the *SS Yaka*. It was Ivan Hunter who took out the *West Kyska* and died about January 13th. Hunter had just joined the *CTU* before taking the *West Kyska*. So we now mourn the loss of Brother Ivan Hunter. *Unquote*. We hope we haven't caused the friends and relatives of Brother Betterton any grief.

*CTU-Mardiv* has plenty cause for rejoicing with announcement of their New Orleans' Charlie Luck to signed agreements with the *Waterman Line* and the *Commercial Molasses Co.* with upped-wages to \$150 for straight radio and one buck an hour for any overtime performed. Also, the *Seminole SS Co.*, the *C. D. Mallory* subsidiary, signed a new agreement with wages at \$140, \$145, \$150 and \$155 per month for straight radio. Which ain't bad, at all!

FROM Boston we hear Brother Dave Barry say that the Boston fishing fleet (56 Diesel beam-trawlers) is being increased with ten new vessels under construction and slated for early summer delivery. As this entire fleet is under *CTU* agreement, membership in the union is necessary in order to obtain these billets. Anyone interested should contact the Boston office of *CTU* at 170 Summer St., Boston, Mass.

And from sunny California, Los Angeles to be exact, Brother Anderson shoots us the (Pse QSY to page 56)

# WHAT'S NEW IN RADIO



RCA HAS OVERSEAS DIAL ON FIRST TABLE Model. The famous Overseas Dial, designed by RCA Victor to make tuning for foreign stations as easy as tuning for local stations, has been made available for the first time in outstanding new table model, that has been named the "Foreign Correspondent," it has been announced by J. B. Elliott, in Charge of Small Set Sales. The Overseas Dial, which "spreads out" the popular 25- and 31-meter short-wave bands to many times their normal space on the dial, is but one of many features on the low-priced, smartly styled "Foreign Correspondent," Mr. Elliott pointed out.



"RCA Victor dealers have an unprecedented opportunity to satisfy a widespread desire for direct, on-the-scene, broadcasts from the parts of the world where history is being made today," Mr. Elliott said. "The 'Foreign Correspondent,' retailing at approximately \$15, is the answer to the opportunity presented by this mass market. It is being built in our new Bloomington, Indiana, plant."

The Overseas Dial became famous on high-priced RCA Victor radios because it made quick accurate foreign tuning possible. A simplified version of the dial, which retains the same principles, has been developed for the new table model. "Add pure tone, excellent reception of domestic and foreign stations, built-in Magic Loop antennas for domestic and foreign broadcasts, and a handsome continental style cabinet of gleaming plastic, and the 'Foreign Correspondent' becomes a really impressive value."

Foreign band coverage from 8600 to 12,000 kilocycles is provided. The dial is placed on an angle for easy reading, and the markings are easily legible. Other features of the 5-tube receiver are automatic volume control, powerful permanent magnet dynamic speaker, a.c.-d.c. operation, and plug-in for Victrola attachment.

A NEW SOLAR "QUICK-CHECK" CAPACITOR analyzer that affords one of the most complete qualitative or quantitative reports, has just been developed by the engineering staff of the Solar Manufacturing Corporation, Bayonne, New Jersey.

Known as the model "QCA," it indicates leakage, insulation resistance, radio frequency impedance, power factor, capacities, and in addition, affords a dynamic check for shorts, opens and intermittents.

This novel unit works equally well whether the condenser is fully connected

in the circuit, or has one or both leads disconnected, or even if the condenser is shunted by an inductance or resistance.



It comes in either of two styles: portable carrying or service bench panel mount.

NEW ALCO BLANK DISCS. CURRENT SHORTAGE of acetate aluminum recording blank discs has resulted in a shortage thruout the industry. Record Sales Co., Los Angeles, has started to manufacture Alco blanks with steel alloy base and in super-glossy silver blue finish. National Recording Supply Co., Hollywood, will be national distributors. Professional and home type of discs in various sizes were put on the market in April. They may be played back or can be processed and pressed the same as aluminum.

LAFAYETTE GENERAL UTILITY AMPLIFIER. The Model 451-T amplifier offered by the Lafayette Radio Corporation, 100 Sixth Avenue, New York City, is one which will exactly fill the needs of PA dealers and specialists for equipment midway between the "economy" and "de-luxe" classes. Providing 32 watts normal output, 45 watts on instantaneous peaks, it is capable of handling most any type of rental or permanent job.

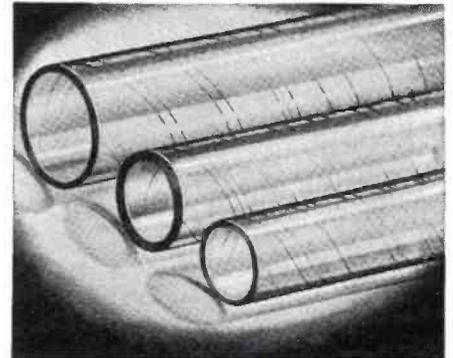


Inputs provide for two microphones and two pick-ups with provision for mixing and fading the two microphones and either of the phono inputs. Overall gain is 120 db.; that of the phono channels, 92 db. Other controls include individual bass and treble equalizers and master mike gain control. The universal output transformer provides for loads of 2, 4, 8, 16, 50 and 500 ohms. Field supply is also included for two 2500-ohm speakers.

The metal case is finished in gray crackle with decorative bands of chromium at the ends and a panel of satin steel and black. The amplifier is 9" high, 17½" wide, 9" deep. It is normally supplied for 115-125 volt, 50-60 cycle line operation but can also be supplied for 25-cycle or 220-volt lines.

SPIRALLY WOUND TRANSPARENT ACETATE Tube. The Precision Paper Tube Company, 2033 Charleston Street, Chicago, Illinois, announces a new self-supporting spirally wound transparent acetate tube.

This new transparent tube is made by spirally wrapping acetate tape over a steel form of the required I.D., and using a new acetate cement for the adhesive to insure a solid non-separating wall. Being pre-formed, the tube will not shrink, eliminating one of the difficulties found in extruded acetate tubes. This new product is supplied in continuous lengths of any wall thickness with any I.D. and O.D.



Due to its superior dielectric properties, it is recommended for many high frequency and electronic applications found in various branches of the radio and electrical industry, and for certain types and applications of low amperage cartridge fuses. Being highly transparent, not easily broken, and having a low moisture absorption rate, it has been suggested for liquid gauges where temperatures do not exceed 180 degrees F.

Further information may be had by writing direct to the manufacturer.

NEW R.C.P. ELECTRONIC TUBE VOLT-Ohm-Microfarad Meter. A new electronic tube volt-ohmmeter, Model 661, has been introduced by the Radio City Products Company, 88 Park Place, New York City. This is the first of an entirely new group of test instruments to be offered the radio and electric fields by this company.

The Model 661, because of its unusual flexibility, will find wide and important applications in the radio, electronic and electrical service fields as well as in the laboratory. Features which contribute to this flexibility are:

Input resistance—16 megohms (low) to 160 megohms.

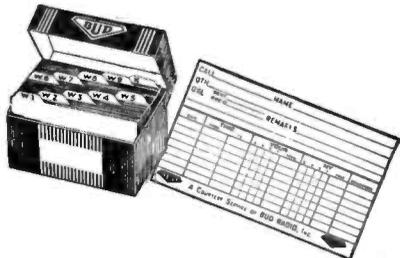
AC/DC voltage range—0.1 to 6000 volts.

Resistance range—0.1 ohm to 1000 megohms.

Capacity test range—.00005 to 600 microfarads.

The instrument is inclosed in an all-metal case with an etched panel.

BUD RADIO, INC., CLEVELAND, OHIO, HAS announced a new QSO Index for the first time. This Index consists of an attractively lithographed steel box containing 10 buff bristol index cards and 100 printed station cards (3" x 5") with spaces for all important information. The index cards are marked from W1 to W9 and K, for all United States districts and outlying possessions.



By means of this QSO Index, an operator can keep an accurate file of the stations he contacts. It saves much tedious time that would otherwise be spent in looking up information in the station log. The regular price of the QSO Index is 75 cents. However, because of a special advertising campaign being conducted during March and April, this item will be sold for only 25 cents with the purchase of any BUD Product at your regular radio parts jobber.

NEW DU MONT CATHODE-RAY INTENSIFIER Tube with Low Deflection-Plate Capacitance. A new type high-vacuum cathode-ray tube designed for oscillographic applications where low deflection-plate capacitances are essential, is announced by Allen B. Du Mont Labs., Inc., 2 Main Ave., Passaic, N. J. This group of teletrons, having four different screen phosphors with identical electrical characteristics, is designated as the Type 2529 series. The deflection-plate leads are short and direct, terminating in caps on the glass walls of the tube rather than in the tube base. The intensifier electrode featured in this tube makes use of the principle of acceleration of the electron beam after deflection in order to increase deflection sensitivity. If the electron velocity during deflection is one-half of the final velocity, the corresponding deflection sensitivity is approximately 60% greater than in conventional tubes having the same final electron velocity. Thus for a given accelerating potential, the intensifier tube makes for economy in deflection-voltage and modulation-voltage amplifiers, and in power-supply designs. The tube is available with the Du Mont types A, B, C and D screens: namely, medium-persistence green (Type 2529A5), long-persistence green (Type 2529B5), highly-actinic short-persistence blue (Type 2529C5), and medium-persistence white (Type 2529D5).

#### NEW GM PORTABLE RADIO ANNOUNCED.

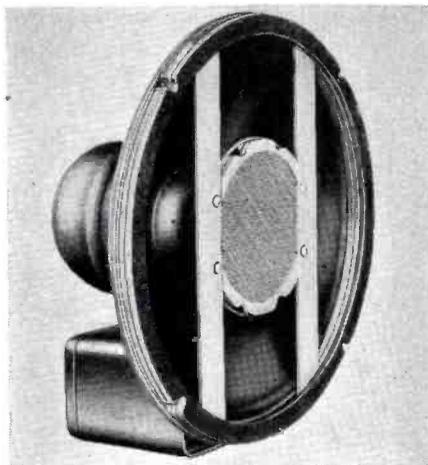


Portable radios continue to gain in popularity. This new GM model is small, compact and simple to operate. An automatic switch turns it on when the case

is opened, and the aerial is cleverly concealed in the cover. The case is molded of lustrous black Tenite, a strong yet lightweight plastic that is non-corrosive and weather-resistant. (General Motors' New Personal Radio built by Colonial Radio Corp. Tenite housing molded by Sinko Tool & Mfg. Co.)

CINAUDAGRAPH SPEAKERS, INC., ARE NOW in full production on their latest development, a Cin-axial Dual Speaker System, incorporating a 12" woofer, a 5" tweeter, and complete cross-over net-work.

The system is expressly designed for use in high fidelity phonograph equipment for commercial, professional, and home use; also for FM receivers. Frequency response is remarkably flat from 30 to 12,000 C.P.S. Its useful range is considerably in excess of 12,000 C.P.S.



J. S. Gartner, Sales Manager, states that orders for Cin-axial speakers received at the factory in advance of formal announcement are exceptionally heavy and are indicative of the tremendous interest in high fidelity.

NEW HOWARD COMMUNICATION RECEIVERS. Howard announces a new line of communication receivers, tuning from 550 KC to 43 MC (545 to 7). All models have a stage of tuned radio frequency on all bands. Howard states that this is the first time communication receivers in the lower price bracket have been available with this feature. Illustrated is Model "435-A" with an amateur net price of \$29.95, having seven tubes (including rectifier) and a built-in Howard-Jensen



speaker. The seven tube model is designed so that it can be returned to the factory at any time and changed into an eight or nine tube model. Accessories, including a two stage preamplifier, monitor and carrier level meter, are available and can be added at any time. This Howard Progressive Series permit the "Ham" to start with the seven tube model and then build in easy stages until he has a complete fifteen tube receiving station.

THE F-500 WATT RHEOSTAT FOLLOWS THE time proven construction of earlier Hardwick-Hindle Rheostats, the outstanding design features being—Metal-porcelain-vitreous enamel construction—Resistance

wire or ribbon wound over a solid porcelain core, each turn being locked against shifting by vitreous enamel—Large flat surface upon which contact brush rides—Completely enclosed contact system—Metal-graphite contact brush with one end of spiral connector integrally



moulded and other end connected to center terminal—thus eliminating all wiping contacts except that between the brush and resistance element—Exceptionally rugged stops at each end of contactor travel—Ceramic form mechanically fastened to cast aluminum base independent of enamel or cement—Ample air space between winding form and base, insuring cooler Rheostat with minimum heat transfer to mounting surface.

Common with all Hardwick-Hindle Rheostats, exceptionally smooth, gradual, close control is assured, each turn of wire being a separate resistance step.

The F-500 Rheostat is particularly well adapted for applications such as motor speed control, generator field control, lamp dimming, electronic tube control, etc.

The F-500 Rheostat is available with tapered windings, special shafts, etc.

NEW PILOT SET. A DISTINCTIVE MODERN design is well-executed in this new Pilot table model. Molded of Resinox, Monsanto phenolic plastic, the color and surface are inherent with the material and cannot wear or peel. The use of this



plastic gives wide freedom of design, for grilles and lettering are molded integrally with the rest of the cabinet. At the same time the satiny, long-lasting luster of the plastic gives a smooth flowing appearance that befits the cabinet's modernity.

Associated Attleboro Manufacturers, Inc., Attleboro, Mass., mold the cabinet for Pilot Radio Corporation. Plastic Division, Monsanto Chemical Company, supplies the material.

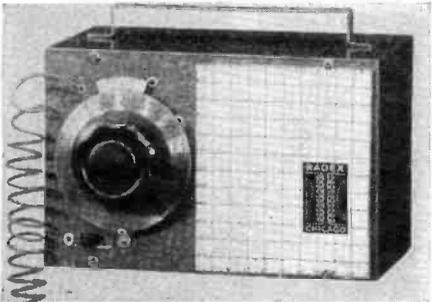
THE DAVENOL CO. ANNOUNCES THE release of a new Superfine lubricating oil expressly prepared for delicate and precise instruments. Will not leave a residue of dirt or sticky gum. Recommended for

laboratory test equipment, watches, cameras, microscopes, etc. . . . Furnished with metallic applicator. Additional informa-



tion from *The Davenoil Co.*, 158 Summit Street, Newark, N. J.

**RADEX STATION FINDER OSCILLATOR AND Generator.** With ten million push button sets to be changed over in a hurry after March 29th it is imperative that the serviceman have a station finder oscillator and not have to wait for station announcements.



The serviceman can triple his calls per day by using the new type *Radex Station Finder* which has just been put on the market to sell for \$7.95, less batteries.

This unit is sturdily built, easily portable, calibration chart adjacent to dial, very small battery drain, grid blocking electron coupled type oscillator, accurate within .2 of a channel, frequency range 500 to 1750 kc.

**A NEW ANTENNA MAKES ITS BOW TO THE trade.** The *Vertrod*, claimed by manufacturer to eliminate most of the man made static which has previously defied the best efforts of engineers, employs entirely new principle. Line interference is effectually prevented from reaching aerial. Supplied in convenient, compact package, *Vertrod* aerial can be quickly set up, wherever four inches of space are available. Patented rotary base accommodates aerial to any surface or angle. Only a screwdriver is required for mounting. Solid duraluminum parts insure greatest efficiency and durability. Electric circuit patented by *Amy, Aceves & King*.

**MOTOROLA HELPS SOLVE RADIO DEALERS' problem.** "It has become increasingly difficult for the *average radio dealer* to offer a car radio that fits and matches every car," says the *Galvin Mfg. Corporation*, makers of *Motorola Auto Radios*. This concern also points out that the increased life of automobiles due to technical improvements has helped aggravate this situation to the point where the *average radio dealer* is ready to throw up his hands in disgust.

However, in this connection *Motorola* dealers are more fortunate this year than ever. Simultaneously with the announcement of their new line of 1941 models, *Motorola* surprised their distributor or-

ganization at their recent convention with the statement that they now offer over 200 different *complete* control heads for matching and fitting the instrument panel of every make and model of automobile on the market today regardless of age.

This enormous number of control heads has been built up over the years *Motorola* has led the field in pioneering and developing car radio improvements, and each control is perfectly engineered for the car for which it was designed.

In addition to this *Motorola* furnishes matched instrument panel speakers for 1939, 1940 and 1941 cars, so as to complete the custom-tailored installation.



Much favorable comment has been created by this feature and dealers all over the country claim that advertising this fact to the consumer has resulted in a great increase in sales, especially among the owners of older model cars who felt that they could never get a set that would match their car and didn't care for an unsightly, bulky one that didn't.

*Motorola* says any automobile owner can have a radio that fits and matches his car perfectly and they are planning to bring home this fact with an expanded National Advertising campaign.

**RCA MANUFACTURING Co., CAMDEN, N. J.**, have announced a new microphone. This new aeropressure microphone is shown with the new "paracoustic" reflector baffle in place in such a way that the directional characteristics are sharpened, and feedback is reduced. When the baffle, held in place by the thumbscrew shown, is reversed, the opposite directional effect is obtained. Without the baffle, the microphone becomes a normal pressure micro-



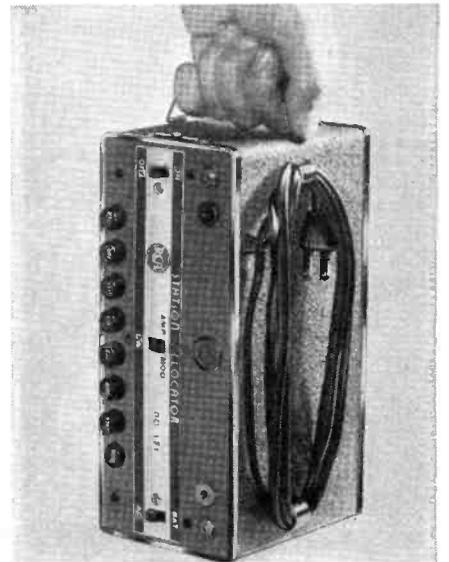
phone. The unit is ideal for all types of public address applications, as well as for amateur radio telephone transmitters. The attractive black and chrome plastic case is weather resistant.

**RCA HAS STATION ALLOCATOR FOR "Radio's Moving Day."** A compact, highly efficient test oscillator unit, christened

the *RCA Station Allocator*, has been made available to assist *RCA Tube and Equipment Distributors*, service men and radio dealers in the job of re-setting the nation's push-button radio receivers after *Radio's Moving Day*—March 29.

Development by the Tube and Equipment Division of the *RCA Manufacturing Company* for year around service as well as for the golden opportunity presented to the radio servicing fraternity by the frequency reallocation program instituted March 29, the *Station Allocator* completely satisfies the basic requirements for an instrument of this type—accuracy, speedy operation, and portability. Dealer net price is \$17.50.

The *RCA Station Allocator* has eight push-buttons that can be set to the frequency of any eight stations in a given locality. The instrument then generates a signal which is supplied to a radio receiver as a guide in re-setting the push-buttons, or in tuning the buttons in periodic check-ups.



A station allocator is invaluable for the service man in any locality. In many areas stations frequently listened to at night are not audible during the daylight hours. In many localities, especially in the East, network programs are heard from a half dozen or more stations in addition to the chain outlet nearby. In both cases, the *Station Allocator* presents the only method by which any or all stations can be re-set and checked.

The *RCA Station Allocator* operates from a.c. current or from self-contained batteries. A flip of a switch on the instrument saves time that would be lost otherwise in connecting extension cords or attempting to operate the instrument at a distance from the receiver. The battery power is also valuable when the *Allocator* is used to re-set automobile radios.

Frequency adjustments are made quickly with a screwdriver after the front nameplate has been removed from the *Station Allocator*. The tuned circuits are so constructed as to give a high degree of stability, frequency drift being only 0.05%. The fine-threaded magnetite core adjusting screws permit accurate initial calibrations.

The first two push-buttons have a range of from 405 to 825 kilocycles. The next three range from 595 to 1180 kilocycles, while the remaining three range from 820 to 1700 kilocycles. The first two may be set at i-f frequencies while the others may be set at test frequencies throughout the broadcast band, thus providing remarkable flexibility for all push-button setting and alignment work.

The *RCA Station Allocator* has virtually the same outside dimensions as the *RCA Personal Radio*. It weighs only 5½ pounds, and is housed in a welded steel case with gray crystalline finish and chrome trim. A sturdy carrying handle  
(Continued on page 46)

# Communication & Electronic MAINTENANCE

by **W. H. BOHLKE**

Director of Test Equipment Merchandising, R.C.A. Mfg. Co., Camden, N. J.

## Putting the Service Test Bench to Use

### Part 7

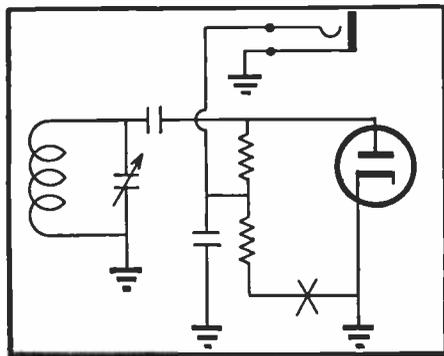
#### Test Bench Applications

AS to the tests which can be made with this equipment and the other supplementary units suggested, it is difficult to find a starting point. If we aggregate the possible applications of all the units, we doubt seriously if anything in the line of service or maintenance operations would be omitted, despite the broad field that we cover. In fact numerous laboratory tests are possible, for while the units selected are not offered as laboratory standards, with the possible exception of the crystal calibrator, the degree of accuracy is entirely within many laboratory applications.

Since it is not within our right to publish what would be instruction bulletins, yet we feel that the readers of these pages would like to know how these various units are used, it might be a good idea to select some special applications, that is unusual applications, and talk about them. So with this in mind let us start with the high frequency converter and the *Chanalyst*. We include the converter because we have worked with it, and more than likely, within a short period after the publication of these lines, *H-F Chanalyst Converter* will be available for that individual who is interested.

When these two units are combined for operation, the operating range of the complete system embraces the measurement of signals from 100 kc. to almost the limit of the highest television band, 90 mc. The indicators used in conjunction with the calibrated level controls are electron-ray tubes in place of meters. During the experimental design of the original *Chanalyst* meters were tried and decided against on a number of counts.

Break where marked "X" for connection of oscillograph vertical plate input to diode plate and ground across rf-if tuned circuit of Chanalyst for observation of rf-if waveform without rectification.



First they were absolutely unnecessary and not worth the additional cost. Second the calibrations in absolute signal values, which would be the most logical form of calibrations upon such instruments if they were used, mean nothing in view of the fact that their function is purely that of a reference level indicator and also in view of the fact that since they terminate a multi-stage amplifier, variations in amplifier gain under various conditions of humidity, temperature and other conditions, nullify the absolute voltage calibrations. That this is so, is proven by the fact that some of the finest and very expensive laboratory devices intended for signal measurement depend upon level control calibrations used with a reference indicator rather than upon absolute indications upon a meter.

Then from the practical angle, the one relating to longest trouble free life and greatest ease of replacement if something does go wrong, (which always is a possibility with electrical equipment), the electron-ray tube is replaceable with virtually no trouble at all, whereas meters require an extensive delay. As to longest trouble free life, overloading of the electron-ray indicator does not damage, whereas overloading of a meter, and this happens very often during the process of tracing a signal, means banging the meter pointer off scale, possibly bending of the pointer, creation of excessive friction, binding of the pointer and all of those conditions which mean impaired operation.

All of these things were taken into account and tried in the original design and the final decision was to use electron-ray eyes and this has been followed out for almost four years. Today with the problems introduced by the *National Defense Program*, this was indeed a fortunate course, for virtually no obstacles are in the path of electron-ray tube production, whereas, had meters been selected, defense material production situation would hamper replacement of such devices, when they became necessary—just as existing demand for meters for government use is creating a shortage of electrical meters for serviceman application.

#### Signal Tracing Uses

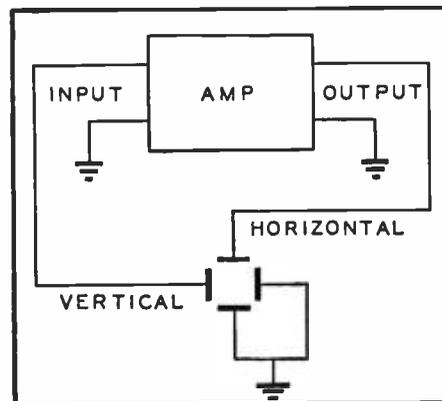
But let us consider a few special applications of not only signal tracing, but of the complete signal tracing device as well as the high frequency converter. The matter of identifying the absence of a signal, where a signal should be present is a very simple matter. It involves nothing more than

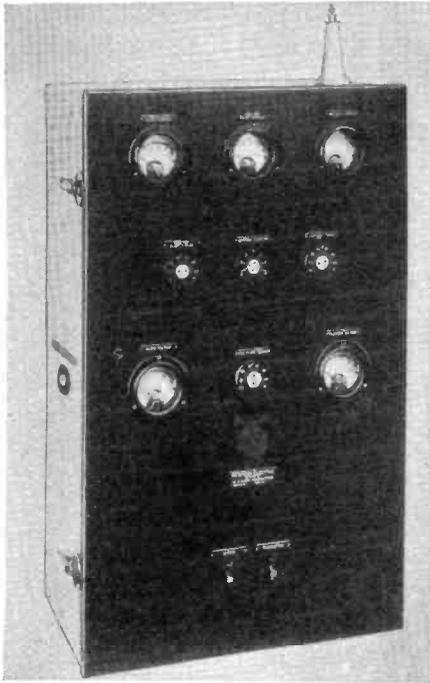
feeding a test signal into the antenna circuit of the receiver under test and then locating that point where the signal is *not normal*. However, all problems are not those which revolve around a "dead" receiver or poor sensitivity. Problems of interference, so-called cross-modulation, excessive regeneration and others of like character are the one which keep servicemen awake at night and gnashing their teeth. Why? All voltages seem normal, yet the system does not operate well; and the defect is complicated only in analysis, not the manner of production.

There is the case of the high frequency receiver which seemed afflicted with a peculiar sickness. A powerful local broadcast station was always a background to the desired station, even when operation was being carried on over the ultra-high frequency band. Everybody was certain that it was associated with the antenna system and the usual wavetrap was installed and the location of the antenna was changed. It lessened the interference but did not eliminate it. Not until a check was made to establish the presence of the interference signal in the diode-demodulator system, although it was absent in preceding circuits other than the antenna coil, was the clue found. The antenna lead from the antenna binding post to the antenna coil ran close to the lead which connected the i.f. transformer to the diode plate. The interfering signal was introduced into the diode, where it was rectified and the audio signal went right through the audio system.

Then there is the case of the broadcast receiver which oscillated when tuned to below 580 kc., but which operated perfectly when tuned to fre-

Connections for input-output load test of amplifier by means of phase relation image on the oscillograph.





A low-powered airport type transmitter which can be "signal-traced."

quencies above this band. Being a superheterodyne and without an r.f. stage, the servicemen who got this job, was most confused. The fact that everything was perfect at frequencies above this range indicated satisfactory alignment, so that the problem narrowed itself down to what was happening below the 580 kc. point. Signal tracing showed that the i.f. system was aligned to about 560 kc. instead of 460 kc. When the mixer input was tuned to about the same frequency as the mixer plate circuit, the system started to oscillate.

Subsequent investigation showed that the receiver had been in that condition for almost a year, but that the owner never tuned below the 610 kc. point for the stations his family listened to were at 610 kc. and higher. It was a certain particular broadcast that he tried to get at 570 kc., which led him to tune to below 580 kc. and he discovered the fact that the receiver did not operate well. Apparently the individual who had serviced the receiver before, had lined up the i.f. system 100 kc. too high. As a rule, such a wide range of tuning is not available in the i.f. system, but as is invariably the case, it is that which is not supposed to be possible, which exists and causes the trouble.

Then there is the case of the serviceman who tried to increase the receiver output by supplementing the coupling between the antenna winding and the secondary winding adding a small coupling capacity—but—did not note the presence of the i.f. trap and connected the antenna side of this trap to the secondary, which means to the grid of the r.f. tube. Subsequently, the set owner moved and another serviceman was given the work of finding out why the distortion. Signal tracing established overloading of the r.f. tube.

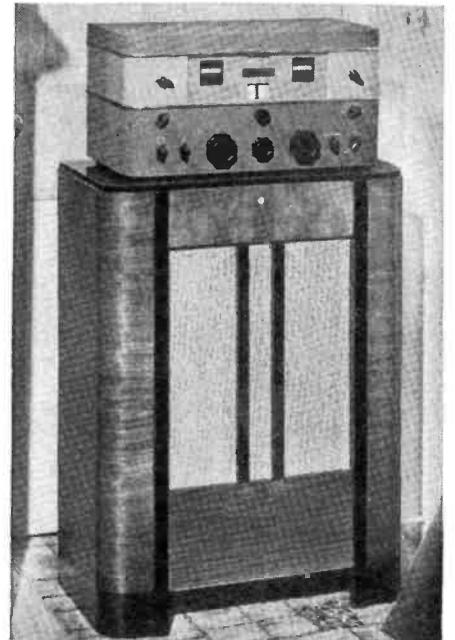
Then among hundreds of interesting cases relating to oscillator systems in superheterodyne receivers, there are the two in two different communication receivers. In one instance switch-



High-freq. police receiver for which the Chanalyst Converter is necessary.

ing to one of the high frequency bands caused operation at a very markedly reduced sensitivity. The fault was located by signal tracing as being a poor connection in the coupling capacity which fed the 30-60 mc. band oscillator signal to the mixer, resulting in a very low value of heterodyning voltage at the mixer and greatly reduced sensitivity. The other is the case of the receiver which when tuned to the police band would bring in nothing but WWV over the entire band. What happened was that when the receiver was switched to the police band, the oscillator system was not connected to the main tuning condenser, instead it was connected to the trimmer only and that resonated the oscillator coil to a frequency which brought in WWV the standard signal (5 mc.) station at Washington, D. C., and the receiver was dead for all other frequency adjustments on that band—yet all normal tests other than that of frequency showed the oscillator and all other parts of the system functioning perfectly.

As you can readily appreciate it is possible to cite many cases of this character and any attempt to cite the usual run of applications would fill this issue of RADIO NEWS. But as to the unusual cases, as for example the location of i.f. signals in a.f. circuits; the manner in which an a.f. lead may act as a coupling link between the input and output portions of an i.f. amplifier, the field around the bottom of an i.f. transformer can and consequent coupling to adjacent wires, the presence of signal voltages at points which were supposed to be bypassed, the presence of signal voltages at supposedly grounded junctions, the checking of circulating currents in chassis



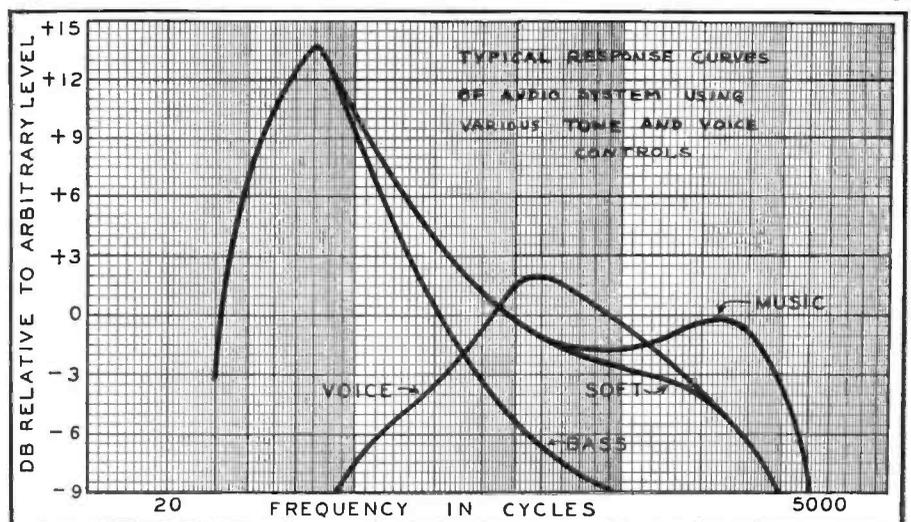
Locating trouble is easy by signal tracing in this communications set.

and switch bars, the fields between sections of tuning condensers and signal fields around glass tubes and grid and plate terminals—these are applications of unusual character.

#### Transmitter Checking

But receivers are not the only devices which come within the province of the signal tracing devices recommended for this service shop. Transmitters, low powered are also within its province, for just as it is possible to check the passage of signals through a receiver, so is it possible to trace signals from the oscillating system, through the amplifiers and buffers and tanks. Of course the character of the probe intended for receiver work is not entirely suitable for use in checking transmitting systems where fairly high voltage are used and the fields are very strong. However, it is a safe forecast that when the servicing industry finds itself in that position where small transmitters are within their scope of operation the correct type of probe will be available.

In such transmitter operation, both audio and radio frequencies are within reach of the man who does the testing,



for just as it is possible to use the a.f. channel for checking audio signals in the receiver audio amplifier or a.c. voltages in power circuits or in rectified d.c. voltage distribution systems, just so is it possible to check a.f. voltages in transmitters, percentage of modulation by combining the a.f. and r.f. channels, etc.

With the oscillograph hooked into the system, means are available for the observation of the character of the audio signal being checked. In this connection one of the paramount considerations which we have deemed to be of importance was the minimization of hum and distortion in the a.f. channel. In altogether too many instances, the presence of hum and distortion in the checking system has interfered with the correct conclusions. It is well to say that hum and distortion can be checked and measured, but it is a different matter to provide the proper apparatus for such measurement and observation. This we have specially tried to do because we felt that such mode of application would become commonplace.

#### Audio System Testing

Speaking about audio systems, brings one significant fact to mind. Many radio receivers are equipped with various types of tone compensation and multi-section tone controls. What is done about the testing of such systems? For we cannot recall having seen anything describing such operations. The variable frequency audio oscillator and either the oscillograph or the audio channel in the chanalyst can be used for this work. For example herewith are given the receiver output voltages for four different settings of the tone control upon an auto radio receiver. These tests were made by feeding a 1000 kc. signal of 1000 microvolts strength and modulated 30 percent, with various audio frequencies, into the antenna. Maybe this overall electrical fidelity test is a bit too elaborate, but it does make sense to visualize feeding an audio frequency signal over a 500 cycle range into the audio system and noting if the output response is in accordance with the receiver or amplifier manufacturers specifications.

We realize that such data is not generally available, but that does not signify that it cannot be available and we feel that the closer the servicing industry approaches to what can be called electronic servicing, the more readily will manufacturers release such information. After all, if it is sufficiently important to the industry at large to provide multi-position tone controls and frequency compensation circuits, and to use them as a feature in advertising, then it deserves a test.

It is entirely within reason that some component in such systems may go bad and that switch setting which is supposed to provide a certain amount of attenuation of the high frequencies; that amount which still makes listening pleasant to that man who does not like the higher audio frequencies he will not be forced to listen to excessive attenuation and too much accentuation of the low audio frequencies.

The fact that a design engineer tries to attain such a wide range of control as shown in the graph, is in itself evidence of the fact that it is deemed im-

(Continued on page 55)



by CHARLES J. SCHAUERS

#### Quick Shifting

**I**N domestic commercial service where transcontinental circuits are divided into several sections with a different frequency or pairs of frequencies assigned to each, the advantage of shifting easily and quickly to any of several channels is immediately apparent. When flying from one sector into another, it is far more desirable to turn a small frequency selecting switch than to replace or retune the transmitters, causing delays and equipment wear. Also with present-day long-range operations it is frequently desirable to communicate beyond the limits of one sector, thus requiring accommodations for more than one pair of frequencies.

For transatlantic and other services where consistent long-range communication is essential, even power output becomes secondary to the matter of selecting the proper frequency for the distance and time of day involved. Such operations require a wide selection of accurately pre-set frequencies from which the proper one may be easily and quickly chosen to suit conditions.

Military radio operations are continuously confronted with the problem of channel blocking by interfering enemy signals. Further, the possibility of direction finding from the ground makes it desirable to limit aircraft transmission to an absolute minimum. Multi-channel operation permits instantaneous selection of up to ten channels that may be widely scattered throughout the spectrum to avoid malicious interference. The employment of precision quartz control of frequency makes it possible for the receiving operator to hear the first word of every transmission, thus eliminating the time otherwise required to establish communication by preliminary calling which also would allow the enemy to tune in on the transmission, determine the frequency, and take directional bearings.

#### Bendix "RTA-1"

**I**NFORMATION from the Bendix Radio Corporation of Baltimore, Md., tells us about their RTA-1 Communication Unit. The unit consists of a transmitter and receiver, housed in one case, simultaneously tuned to any one of ten frequencies which come within the ranges of 2,500 to 13,000 kilocycles. The time required to shift from one channel to another is 6 seconds maximum, and less than one second is required when shifting between channels physically adjacent. Each "pre-set" frequency in the transmitter is controlled by a quartz crystal whose temperature coefficient is less than 3 cycles drift per million cycles per degree Centigrade; and power output of 50 watts (100% modulated) is achieved by utilizing two 807s as power amplifiers. The transmitter employs six tubes in all; and the receiver employs nine in a highly efficient superheterodyne circuit.

Before production began, orders were placed for 300 units by six major airlines.

#### How to Enter Aircraft Radio Servicing

**W**HEN the "general radio serviceman" desires to enter aircraft radio servicing and installation, he's usually up against it for pertinent information concerning the important aspects of the aircraft radio situation; as attested to by the many letters received by the writer during the past four months.

"What parts, tools, special test equipment, and service manuals should I have on hand

in order to efficiently install and service various aircraft radio installations?" one reader asks.

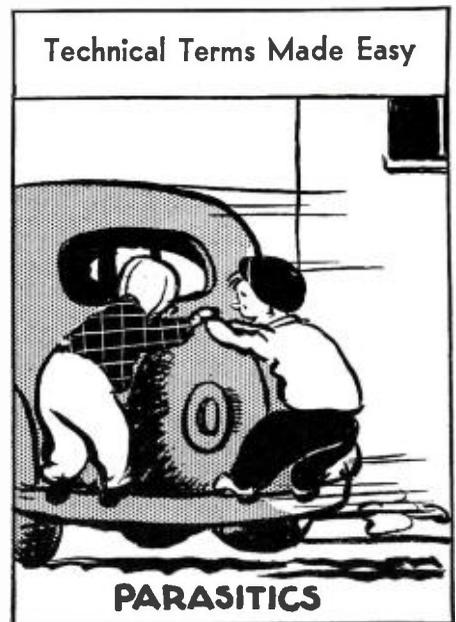
"Is special training in aircraft radio really essential?" asks another. Questions similar to these and many more, relative to the aircraft radio service business were received. Space limitation does not permit answering all inquiries, but it is believed the following information will prove helpful to those desirous of entering the aircraft radio service field.

Most radio servicemen today, possess most of the tools, instruments, etc., for aircraft radio installation, service and adjustment. However, the greatest majority do not possess the necessary Government license which enables them to legally tune and adjust the aircraft radio transmitter. Too, there are a great number who do not have the experience nor the specialized training, both necessary requisites for this work.

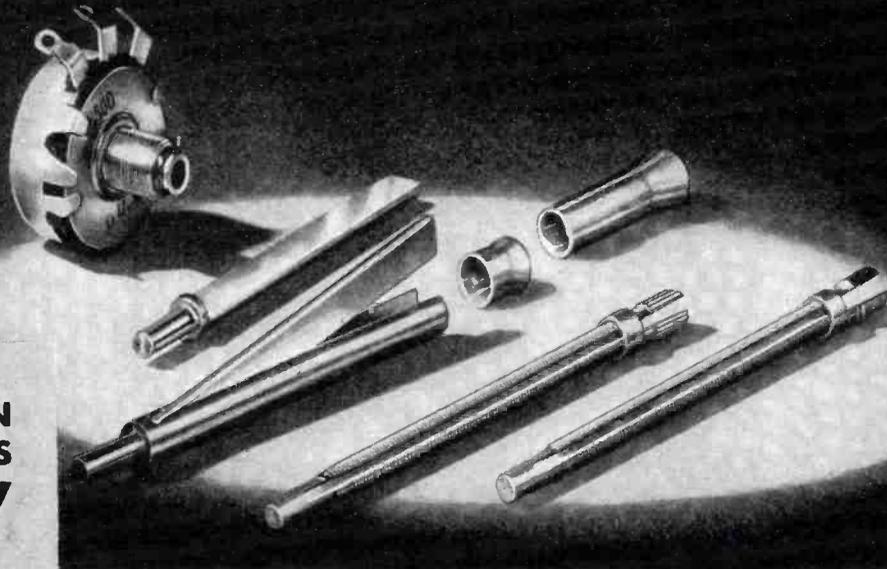
The aircraft radio technician must not only know the "how and why" of the receiver, but he must also know the "why and wherefor's" of the aircraft radio transmitter; antennae systems; power supply equipment; and the aircraft electrical system.

Specialized training and experience are "musts" because without these, efficiency prevails not! Haphazard work around aircraft radio equipment endangers lives; and those, whose careless attention introduces "flying hazards" should readily be branded as criminals! The substitution of inferior quality parts in aircraft radio components, so that large profits may be realized (a practice encountered now and then in the "general" radio service business) is not tolerated. One strike, and you're out! The average aircraft radio technician realizes this, and it has seldom been found that an inferior replacement part was the direct cause of mal-operation. Even though every part has a "life-line," those parts used by aircraft radio manufacturers have more than the usual safety factor because design standards must be high.

In addition to the usual tube tester (dynamometer) (Continued on page 61)



# "THE Easiest SHAFTS IN THE WORLD TO INSTALL!"



**TAP-IN  
SHAFTS  
STAY  
PUT..**

**and here's why!**

*IRC Tap-in Shafts won't slip or vibrate loose. The shaft socket is carefully gaged to a standard Brown & Sharp taper and the shaft taper is accurately machined to such a smooth, close fit that the surfaces are practically bonded together when engaged by a few taps of a hammer. This taper-socket principle is standard practice in machine tool work—from screw machines to giant lathes—where cutting tools for high speed or rugged work must be held securely in place.*

## **NEW DOUBLE-FLATTED TYPE "A" SHAFT ELIMINATES INSERTS and FILING**



This isn't our verdict . . . it's the verdict of thousands of servicemen who have found the Tap-in Shafts of IRC Type D Controls the answer to countless problems. They save your time—they save you money. Tap-in shafts make it possible to handle the big majority of all replacements with only a small stock of controls. They frequently enable you to use a standard Type D Control instead of a more costly, hard-to-get "special." Flats are easily located in any desired position. Shafts can be inserted *after* the control has been installed. It's unnecessary to remove other parts when making an IRC replacement in a crowded chassis. Once inserted, and tapped solidly in with a hammer, the shaft *is there to stay*. You don't have to fiddle with lock washers to hold it in place.

Don't fail to examine Type D Controls the next time you visit your distributor . . . and be sure to ask him about the IRC Master Radiotrician's Control Cabinet with its stock of only 18 Type D Controls, 6 switches and 5 special Tap-in Shafts that handle from 60% to 75% of all replacements!



*Shaft position in knob requiring 3/32" flat.*



*Shaft position in knob requiring 1/32" flat.*



*How shaft is positioned for set-screw knob.*



*Only edges of shaft are filed for odd types.*

Here's the answer to simplified fitting for *all* knobs. No more bothersome metal inserts necessary . . . shaft filing eliminated for all 1/32" or 3/32" standard flats . . . easier-to-cut to length, too.

## **IRC TYPE D UNIVERSAL VOLUME CONTROLS**

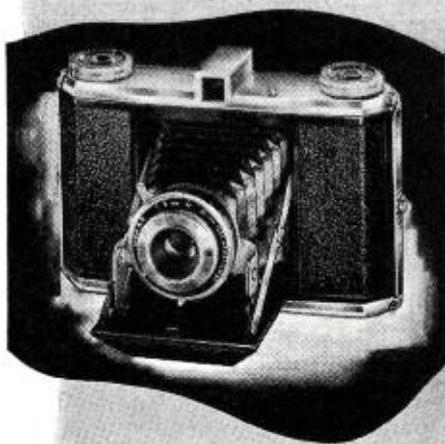
INTERNATIONAL RESISTANCE CO., 401 N. BROAD ST., PHILA., PA.

NOW YOU CAN BUY

THE

Camera  
Sensation

OF '41!



THE new 1941 Vokar takes the always popular  $2\frac{1}{4} \times 2\frac{1}{4}$ " pictures with no complicated attachments to confuse you. Vokar gives you "big picture" performance in a streamlined light weight camera with all the compactness of the finest pocket miniature, and pictures four times their size without the expense of enlarging. Uses standard center numbered 120 roll film available everywhere.

Finely ground and polished f:6.3 Vokar Triple Anastigmat color corrected 75 mm. lens—Geared type shutter and iris diaphragm—Speed range 1-25 to 1-100 time and bulb—Precision graduated focussing mount from  $3\frac{1}{2}$  feet to infinity—Uses standard center numbered 120 roll film 12 pictures  $2\frac{1}{4} \times 2\frac{1}{4}$ " contact size—Exquisitely streamlined case with top and bottom finished in blue white chromium. Folded size  $1\frac{1}{2} \times 3 \times 5\frac{1}{2}$ ". Weighs only 14 ounces. Vokar Model B \$16.50. (Distributors and dealers write for complete details.)

YOU ALWAYS GET BETTER PICTURES  
WITH

ELECTRONIC  
PRODUCTS  
MFG. CORP.  
ANN ARBOR,  
MICH.

VOKAR

40

## MANUFACTURERS' LITERATURE

Our readers are asked to write directly to the manufacturer for this literature. By mentioning RADIO NEWS and the issue and page, we are sure the reader will get fine service. Enclose the proper sum requested when it is indicated.

NEW AEROVOX CONDENSER CATALOG bearing the busy radio man in mind, *Aerovox* has compiled its new 1941 general catalog in concentrated or tabloid form. Illustrations, descriptions and listings are reduced to the absolute minimum consistent with providing all essential data, so as to save time, effort and patience of the practical reader. The new catalog covers the general line of electrolytic, paper, oil, exact-duplicate replacements, transmitting and other condensers. Copy may be had on request from local jobber or by writing *Aerovox Corporation*, New Bedford, Mass.

**Erratum:** We are advised that the transmitter catalog described in April, 1941 issue is not generally available. Only recognized engineers, etc., may have it free. For misleading our readers, we apologize.

PLUG-IN TUBE-TYPE RESISTOR REPLACEMENT MANUAL. The Fourth Edition of the *Clarostat* Plug-In Tube-Type Resistor Replacement Manual has just been issued. It contains all previous listings covering existing set replacements, together with many new listings bringing the data squarely up-to-date. For the first time the listings include the new Type MTG resistors with glass-insulated windings which, with a three-times increase in wattage, are intended for extra heavy duty such as for sets in which both 300 and 150 milliamper tubes are to be served by the voltage-dropping resistor. A copy of the manual may be had for 15c, from the local *Clarostat* jobber, or direct from *Clarostat Mfg. Co.*, 285-7 N. 6th St., Brooklyn, N. Y.

A SHORT STORY ON SHORT-WAVE RADIO RECEIVER. Many radio listeners, urged on by the desire for more dependable reception of war news direct from the short-wave broadcast stations of Europe, are puzzled as to what type of receiving equipment will best serve this purpose. It is for such that *Hallcrafters* offer a 12-page illustrated booklet entitled "A Short Story on Short-wave Radio Receivers."

In the various professional short-wave services, where the utmost in effectiveness and dependability is demanded, receivers of the "communications" type are universally employed. These receivers are available to the public as well.

This new booklet discusses the advantages of this type of receiver in general and explains the purpose and functions of the various controls, all

in non-technical language. It stresses the fact that to operate a communications receiver effectively does not call for technical training or knowledge and is well within the ability of the serious short-wave listener. While the controls are more numerous than in the case of the ordinary home receiver, each has its logical purpose and they all combine to provide the greater operating flexibility called for if best short-wave results are to be obtained.

Any interested listener may obtain a copy of this booklet free by addressing a request to the *Hallcrafters*, 2611 Indiana Avenue, Chicago.

NEW GARRARD CATALOG. The *Garrard Sales Corp.*, American representatives for the *Garrard Engineering and Manufacturing Co., Ltd.*, Swindon, England, manufacturers of "the world's finest record changer" announce the release of their new 1941 Catalog No. 41. The new catalog describes and illustrates the complete *Garrard* line of Automatic Record Changers, phonograph turntables, motors, pick-ups and accessories. Copies may be obtained free by addressing *Garrard Sales Corp.*, 296 Broadway, New York City.

ALLIED 1941 SPRING RADIO CATALOG. *Allied Radio Corporation*, Chicago, Illinois, announces the release of a new 180-page 1941 Spring Catalog. A costly publication, *Allied's* new catalog employs direct-color photography for all covers. The effect is especially striking on the front cover with a scene of unusual dramatic interest, portraying the use of modern radio in the National Defense Program. The latest techniques of photography and layout are embodied in 80 pages of rotogravure. Many striking photographs of the new KNIGHT radios, with attractive models selected for beauty and personality, are used extensively throughout.

Complete new lines of Everything in Radio are included in this new book. All equipment is carefully arranged in clearly defined sections and precisely indexed for speedy reference.

Fifty-seven new 1941 KNIGHT radio models are introduced in a big and strikingly original 40-page rotogravure section. Featured are new "Personal" Portables, Three-Way Portables, latest Recorder-Phonograph Combinations, Midget Plastic Sets, Table Models, Luxurious Console Receivers, Auto Radios, Farm Sets, Record Players, and an unusually

(Continued on page 63)

RADIO NEWS

# radio *Trade* news

FOR THE DEALER, JOBBER & SERVICEMAN

---

## *The Trade Month in Review*

Lend-Lease Bill will mean radio equipment for Britain. This may cause a greater log-jam in employment in radio industry. Many dealer-employed servicemen will demand and get higher salaries to resist the threat of being gobbled up by factories.

Expansion and strikes are walking hand in hand. Many parts factories have expanded to the limit of the floor space available within their own buildings, and have as a consequence taken additional buildings for the extra work involved in National Defense. A condenser factory strike was settled; a P. A. factory's was not.

Some union activity is being felt in the sound industry as well as general radio factories. The right to organize is being demanded. Where they are entrenched, a completely closed shop is being sought by unionists.

Uncle Sam will eventually crack down on strikes wherever they involve National Defense production; and this will act to curb strikes wherever they are occurring in the factories of the industry filling only civilian orders.

Refrigerators for 1942: In spite of the fact that raw materials will be pre-empted mostly for National Defense, most companies are planning production of a normal amount of new models for 1942. One large company, however, reveals that they will make their new line "as short as possible" for reasons stated above.

Recording disc manufacturers are looking for a good substitute for the metal which backs their product. Being considered are plastic, paper, and a coal-tar derivative. Most substitutes are said to be fair. An excellent one will be found.

Quality in sound, whether in a radio or in a P.A. system continues to front the demand lists of the buying public. Midget radios are giving way to rather better class radio receivers with excellent sound possibilities.

Condenser manufacture will not be seriously cut in spite of aluminum being on the priority list. Reason: Civilian radio is too good a National propaganda asset to let it suffer for want of parts. Replacements may be harder to get in the future though.

Summer will see a boost in sales of portables. That market is by no means saturated. Competition in the P.A. field will be greater because more servicemen are now familiar with that type of work.

FM will not replace AM as the popular radio medium during 1941-42. Sales of some cheap FM receivers will boom, as will cheap FM converters. FM will be responsible for an increase in antenna-installation business, since a special type of sky-wire is almost a necessity for good reception.

Dollar value sales for the month ending March 15 were about the same as for the like period last year. A slight increase is looked for during the next month.



**T**HE NATIONAL DEFENSE situation in Washington is becoming acute in that it will eventually act to restrict certain activity in the radio production line as pertaining to civilian consumption.

Already, aluminum is on the priority list; and, while a great many condenser factories have made arrangements to use aluminum from sources which they had contacted prior to the priority, still it is expected that the production of condensers to a great extent for "replacement" civilian use may be curtailed.

Test equipment will become scarce, and users of the same are advised to make purchases now, or otherwise equip themselves with it.

Meters are already hard to get and will become still more difficult to buy. Users of meters are advised to place their orders at once if they expect to get them at all.

For home recorders, the loss of aluminum-backed discs, due to National Defense means no hardship, but for professional recordists it is another story.

FM may suffer a setback before the end of the year owing to an investigation by the FCC into the newspaper ownership of FM stations. The FCC is not too anxious to have a great percentage of the FM stations owned by newspapers.

There will be a boom in the purchase of radio receivers by workers presently getting larger salaries in National Defense work. This will offset the reluctance of draftees to buy, especially on time.

Servicemen will find it easier to get more money for jobs and will require higher pay when working in salaried positions so as to remain even up with the defense radio industry personnel. Everywhere there will be a buying boom of which every retailer and dealer should take advantage. Refrigerator sales will increase as will electrical appliance, especially under impetus given by government finance agency such as the Electric Power & Housing Administration.

## \$800 SUGGESTION

SCHENECTADY, N. Y. Eight hundred dollars for a single idea. That is what Rudolph Black has received from the *General Electric Company*. Black, an employee in the radio transmitter department of the Schenectady plant, made a suggestion a year ago for improved calibration of transmitter frequencies. The company rewarded him with \$200. Increased production of transmitters this past year brought increased savings to the company, so Black received an additional \$600 bonus.

# Defense & the Dealer

## AN EDITORIAL

**W**HAT does defense mean to the retailer, the jobber and the serviceman? To all, it must mean that they must meet, if they are employers, the rising wage situation created by a shortage of trained radio employees. To employees it means an increased wage due to pressure of National Defense work.

On the selling side of the ledger, however, the picture is very rosy. With increased buying power apparent in almost every field, luxuries will come in for their share. The recent shift of frequencies will call the attention of the public to their radios and will result, for the most part, in an increased sale of latest type receivers to replace the older editions.

Every dealer and retailer is warned that he must find a reasonable market for the sets he will be required to take in trade. In fact, the situation may become one akin to the automobile field where every new car house claims that it is in the "used car" business. The development of the market for the sets taken in trade will be slow, and may even go to the extent of the breaking down of the receivers and the selling back to factories such component parts which can be used over again in the manufacture of cheaper units for 1942-43.

National Defense, therefore, bids fair to bring a tremendous buying boom, not only in radio, but also in electrical appliances, to the door of the retailer and the dealer. It brings to the serviceman an increased return for the hours spent repairing sets; and it should bring to the entire retail industry a healthy glow of prosperity.

To those who are prepared for this boom but will remember the lean years that went before and not over-expand, affluence will bring much that is good and nothing of a headache. But to those who will think that the bonanza will last "forever," and who will over-expand or over-buy, or fail to take cognizance of the fact that they must establish a market for their used receivers and units taken in trade, the boom will only presage an epoch of depression, which must necessarily follow every period of opulence.

RADIO TRADE NEWS.

## HOW THEY'RE DOING...



*Philco*: Income for 1940, net amounted to \$2,268,568 as compared with \$1,899,323 in 1939. Earnings per share were \$1.65. Gross sales were \$52,311,131. Claims to be the first manufacturer to produce 2,000,000 receiving sets in one year.

*General Electric*: Reports an increase of 81% over 1939 in appliance orders. New business amounted to \$654,189,642. Selling prices have been materially reduced while product efficiencies were materially increased. Number of employees increased from 70,000 to 88,600; average earnings were \$2,011.

*Stewart-Warner*: Net profit of \$1,470,804 reported for 1940. Earnings per share were \$1.18 compared with net of \$555,224 and earnings of 45c for 1939. Tax bill for 1940 reached \$1,855,000; payroll was \$9,102,974. A bonus was paid all weekly and hourly employees in 1940.

*RCA*: Quarterly dividends on outstanding shares of RCA Cumulative Convertible First Preferred stock of 87½c per share were declared. Dividend on "B" Preferred stock was \$1.25 per share.

*Westinghouse*: Increase of 87% in gross income from orders which totaled \$400,-477,724 were reported. Unfilled orders December 31, 1940 amounted to \$223,685,737, up 216% over 1939. Total employees were 58,503 as compared with 48,487 in 1939. Total payroll was \$109,743,043.

*Hygrade Sylvania*: Net earnings for 1940 were \$880,625.42 as compared with \$856,-806.99 for 1939. Earnings per share on common stock after payment of preferred dividend on old preferred stock were \$3.59 per share. Total taxes paid were \$755,-531.98.

The *Radio Manufacturers Association* reports: A drop in collections, February, 1941, of radio excise taxes is reported by the U. S. Bureau of Internal Revenue. February radio excise taxes, largely covering January operations, were \$350,149.97, a decrease of 44.7 percent from the same month last year. January 1941 collections were \$632,760.71. Refrigerator taxes were maintained substantially, totaling \$917,931.38 last February, an increase over January collections which were \$531,839.96, and compared with refrigerator taxes in February 1940 of \$1,000,820.13.



## OUR BUSINESS IS SOUND SAYS RIDLEY'S OF TULSA

(Special to RADIO TRADE NEWS.) A radio-movie band that draws 25,000 customers in four days, and an invalid grandmother who wants to hear the next-door church service, may sound like two entirely different propositions to some people, but they are all part of the same problem to Ridley's, Inc., Sound Specialists of Tulsa, Oklahoma. Solving the problem has given the firm a 20% advantage, Ridley's believe, over what they would have if they didn't know just where to direct their attention.

The public not only demands sound with its entertainments—it demands comfortable sound. The good old days when

part of the audience were willing to be deafened while others were content to see motions without sound, are definitely out. The thing holds good for both large and small audiences, and Ridley's have utilized the largest events of their four state—Oklahoma, Kansas, Arkansas and Missouri—territory to show that they can produce *Comfortable Sound* under any conditions.

These are the rodeos. The Bob Wills' Texas Playboys band, which broadcasts over KVOO daily, except when filling movie engagements, are the highlight attraction of the Bob Wills Roundup, a four day rodeo held in the Tulsa State Fair pavilion. This pavilion is full of steel

girders, and notoriously bad acoustic conditions have bothered the large percent of Ridley's customer personnel who have attended public events there.

It takes three times as many loud speakers to give adequate sound service in the pavilion as it would in ordinary cases, but Ridley's find it a very important step toward their eventual advantage. Wherever they serve a rodeo, or other public event—and none of the many rodeos in Oklahoma feel quite complete without this company's services, they take along a display truck for no other purpose than showing loudspeaker equipment to observers who wander by the set-up.

## MAINE PASSES BILL TO HELP RADIO REPAIRMEN

Gives Serviceman Mechanics Lien on Radio Left for Repair

MAINE (Special to RADIO TRADE NEWS). In a recent Bill signed by the Governor of Maine, servicemen who do repairs were given a mechanics lien on the radio set until their bill was paid. Heretofore they had only had a common-law right, but the new law now not only gives them the lien, but allows them to sell the set after holding it for only 6 months. The usual lien period in Maine has been 1 year. A 30-days notice to the owner is required, and if after sale there be a sum remaining over after paying the serviceman's bill, it is to be deposited with the county treasurer. The Bill follows below.

Part of Chapter 105 of the Revised Statutes of Maine as it will read when finally passed and signed by the Governor.

**Liens on Watches, Clocks, Jewelry and Radio Equipment**

Section 63. Every individual, partnership or corporation, having an established place of business in this state, engaged in making, altering or repairing any watch, clock, jewelry and or any kind of radio equipment or expending any labor or materials thereon, shall have a lien upon such watch, clock, jewelry or radio equipment for a reasonable compensation for said labor and materials, which shall take precedence of all claims and incumbrances, and such watch, clock, jewelry

or radio equipment shall be exempt from attachment or execution until such lien and the cost of enforcing it are satisfied. [Italics ours.—The Editors.]

Section 64. May be sold after six months' provisions.

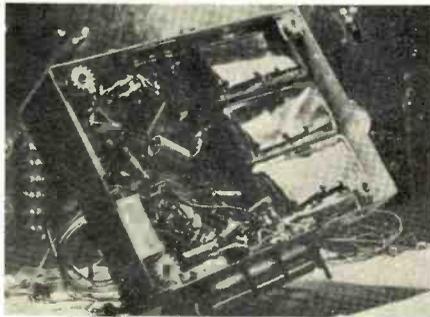
The lien holder shall retain such watch, clock, jewelry or radio equipment for a period of six months, at the expiration of which time, if such lien is not satisfied, he may sell such watch, clock, jewelry or radio equipment at public or private sale, after giving thirty days' notice in writing to the owner, specifying the amount due, describing the property to be sold and informing him that the payment of such amount within thirty days will entitle him to redeem such property. Such notice may be given by mailing the same addressed to the owner's place of residence if known, or if the owner's place of residence is unknown, a copy of such notice may be posted by the holder of the lien in two public places in the town, village or city where the property is held. [Italics ours.—The Editors.]

Section 65. Residue, if not claimed by owner, deposited with county treasurer.

After satisfying the lien and any cost and expenses that may have accrued, any residue remaining from said sale shall on demand within six months, be paid to the owner, and if not so demanded within six months from such sale, such residue shall be deposited by such lien holder, with the treasurer of the county in which said property was held, together with a statement of said lien holder's claim and the cost of enforcing the same, a copy of the published notice, and of the amount received for the property sold at said sale; said residue shall be credited by said county treasurer to the general revenue fund of said county, subject to the right of said owner, or his representatives, to reclaim at any time within three years of the date of deposit.

## CANOPENER USED ON I.F. STAGES

TOPEKA, Kan. (Special to RADIO TRADE NEWS.) Many and ingenious ways are used by the home-repairer of radio to side-step the serviceman. But a most unusual case recently uncovered by the Appliance Service Co., 605 Topeka



Ave., was when they opened a set brought in for repair and found that the "would-be" serviceman of the home had used a canopener to try to get at the i.f. stages. More peculiar was the fact that there is no particular difficulty in getting the cans off by "regular means."

## GREATER PROFITS FOR THE SERVICEMAN IN NEW SIDELINE

**W**IDE awake servicemen have an opportunity to cash in on additional sales by equipping their service shop with a small portable recording studio that has been placed on the market recently. Compact as a telephone booth, this collapsible studio will offer new revenue in addition to serving as a new medium for obtaining sales prospects for other merchandise.

Everyone likes to hear his own voice if only for the kick one gets out of it, or for more serious purposes; to send greetings back home, to try out a favorite song or recitation, to test the voice for stage or radio, or for business talks or sales addresses. One of the latest ideas in the recording field is the portable studio that can be set up in a few moments' time and be placed in service.

It may be used in any store, hotel, theatre lobby, resort, market, depot, club,



cocktail lounge, school, arcade, amusement park, excursion boat, or wherever a small space is available. It is best installed where large crowds assemble. It is useful for recording song, speech, music—for teaching, coaching, correcting of speech. Any intelligent child can operate the equipment as the system is practically foolproof in design and construction.

The repair and maintenance are negligible and all of the service one would need can be obtained from any radio serviceman or amateur operator. It is fully electric and operates from the regular supply source as is used in the home (120 volt, 60 cycle). The popular appeal of this method of entertainment and instruction has been amply tested by the *Speak-O-Phone Recording and Equipment Co.*, 23 W. 60th St., New York City. This was done at sites located on 42nd St., Broadway, and other locations. It has been pulling in crowds for years, say the manufacturers.

Many other locations have proven successful, the conclusion being that almost any location will offer possibilities for making profits from this new idea. As a business, many possibilities for a steady income will be had. The entire portable studio is comparatively inexpensive to purchase and the upkeep practically nil.

While this recording studio might be used profitably by the largest organization, its real importance lies in its offering to the "little fellow" a dignified and lucrative business. There is nothing mechanical to worry the operator. He has only to watch his supply of blank records, needles, envelopes, etc., which should be reordered periodically so that no sales will be lost.

The complete outfit includes: A *De-Luxe Speakophone Recorder*, electric phonograph, 2-way inter-communicating system, crystal microphone, headphones for monitoring, sound-treated booth, built-in record compartments, completely wired, removable door and lock for the operator, and a supply of assorted blank records.

The electric phonograph enables the customer to hear the record played back right after it has been made. It also plays commercial records so that some entertainment may be had to attract crowds or to amuse the customers. The intercommunications system makes it possible for the operator and customer to engage in conversation when they are in

their respective compartments.

The complete booth measures 58 x 30 x 76 inches. A sign is also available which mounts on top of the booth. This adds another foot to the overall height. The net weight is 250 lbs. and the gross weight 300 lbs.

This new idea can be used by the serviceman to increase his set sales, especially for gaining new prospects for radio receivers and accessories, record players and tubes. Many uses for these records will appeal to the public tastes, among them being: For congratulating graduates, felicitations on births or weddings, condolences on misfortunes, valentine greetings, having Mother record her voice, for glee clubs, quartets, choral societies, recording lessons for tots or grown-ups, for the teaching of languages, to develop speaking talent, recording new song hits, building up a family vocal album, party novelties, addresses, and for family reunions.

The user of this type of portable studio may find an excellent source of revenue by tying-in with the local photographer.

## FINISHING KIT SHOULD BE POPULAR SERVICE AID

The *General Cement Manufacturing Co.*, 919 Taylor Ave., Rockford, Ill., has introduced a new kit, designed to aid the



serviceman in re-finishing cabinets that are in need of attention. The item is known as the *Deluxe Felt-Koat Finish Kit* and is used for finishing phono-gram turntables, cabinets, testers, tool chests, compartments, displays, etc.

## HIGH EFFICIENCY MOBILE PA AMPLIFIER

Weighing only 20 lbs., the *Thordarson* 12-watt mobile amplifier which operates from a 6 volt storage battery answers many portable P.A. problems. It measures only 13½" x 7½" x 7¼"—a compact unit to carry. The unusual quality and high efficiency of the Model No. T-30W12 amplifier (less than 5% distortion) makes it ideal for use on military drilling fields, athletic fields and parade grounds.

## G-E WILL RE-OPEN TAUNTON PLANT

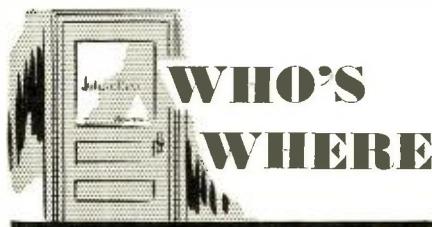
Further expansion of *General Electric's* facilities for the manufacture of plastic molded parts has been announced by officials of the company, who said that plans had been completed for the reopening and renovation of its former motor plant in Taunton, Mass.

## FLEXIBILITY FOUND IN NEW PORTABLE SOUND SYSTEM

*Erwood Sound Equipment Co.*, 223 West Erie St., Chicago, have just announced a new 28 watt complete portable system. The case design of this system



is unique in that provision is made for carrying two full length floor type microphone stands with microphones.



**R**OYAL J. HIGGINS, for the past five years in charge of Sales promotion for *The Hallicrafters Company*, Chicago, has been appointed Director of Advertising and Sales Promotion for Hallicrafters effective March twenty-fourth.

In order to handle more adequately and efficiently the special distribution problems which are peculiar to certain products in the Metropolitan New York area, the *General Electric Company* has established a new Metropolitan Distributing Branch, with headquarters in the General Electric Building, 570 Lexington Avenue, New York City. Earle Poorman, who has been district manager of appliance sales for *General Electric* in New York since 1931, has been appointed manager of the metropolitan distributing branch. He will continue as district appliance sales manager, in addition to his new responsibilities.

G-E air conditioning and commercial refrigeration products will be distributed by the new branch in the counties of Bronx, New York, Westchester, Kings, Nassau, Queens, Richmond, and Suffolk.

A. E. Pierce has been appointed sales manager for heating and air conditioning.

D. W. May has been named sales manager, in the new branch, for radios and vacuum cleaners, and in addition to the above-named counties will have wholesale distribution responsibility for northern New Jersey. The radio branch, which formerly had headquarters at 450 Fourth Avenue, is consolidated in the new organization.

P. L. Griffin has been appointed operating manager of the metropolitan distributing branch. Product service and warehousing facilities for the new organization will be located at 416 West 13th St., New York City.

Appointment of F. Earl Page, formerly of Erie, Pa., as district manager of the



F. E. Page  
tri-state area.

*Anchor Distributing Company*, of Pittsburgh, has just been announced by Harold W. Goldstein, general manager of the Anchor company, which is wholesale distributor for *Crosley* products in the tri-state area.

Mr. Page had been general manager of a major appliance distributing concern in Erie and, previous to that, had been service manager for another distributor in Pittsburgh. He is widely known throughout the

Organization of *Jenks, Knipschild and MacCowan, Inc.*, which provides an industrial design service for manufacturers that includes not only the styling of products but their presentation and promotion in printed advertising material, was announced here today. Offices and studios have been opened in the Mather Tower, Chicago, Illinois.

Henry Olczak, formerly copy chief of the *Rosenow Company*, will have charge of plans and copy. He also is secretary of the corporation.

Francis H. Brown, Hollywood, has been appointed west coast factory representative for the *Federal Recorder Co.*, New York. He will handle seven western states with offices at 1065 Vine St.

James R. Fouch, president and general manager of *Universal Microphone Co.*, In-

glewood, Cal., returned to his desk the middle of March after a three weeks business trip through the mid-west.

Robert Reid, formerly sales manager for *Radiotone, Inc.*, Los Angeles, has been appointed general sales manager for the western states for the *National Recording Supply Co.*, Hollywood. L. R. (Barb) Barbley, formerly with *Packard-Bell*, Los Angeles, has also joined the National sales force to handle downtown dealer contacts.

As part of the *Crosley Corporation's* new program of increased service to dealers and



C. W. Rados

engineers for the State of Ohio, of the *Ambos-Jones Company*, 1085 The Arcade, Cleveland, Ohio.

Herbert S. Baumgarten, of Pittsburgh, Pa., has been appointed purchasing agent for the *Universal Microphone Co.*, Inglewood, Calif.

The appointment of the *H. E. Ransford Company*, Fulton Building, Pittsburgh, Pa., as sales representative for Western Pennsylvania and the state of West Virginia, effective March 1st, is announced by Allen B. Du Mont Laboratories, Inc.

Mr. A. D. Davis, President and General Manager of *Allied Radio Corporation*, Chicago, announces the appointment of Mr. Charles S. Kiger to the position of Merchandise Manager of the Radio Set Division.

H. T. Ziegler has joined *Howard Radio Co.*, as Advertising Manager.

Mr. Charles B. Shapiro, Executive Vice-President of *Howard*, has taken over the sales of *Howard Household Receivers* on the Pacific Coast, including California, Oregon, Wyoming, Utah, Washington, Arizona, Nevada and Idaho.

A. D. Davis, President of *Allied Radio Corporation*, Chicago, announces the appointment of Mr. Walter F. Marsh to the position of Sales Manager of the Chicago Metropolitan District



W. F. Marsh

The *John B. Varick Co.*, Manchester, N. H., and the *M. B. Barkan Co.*, of Milwaukee, Wisconsin, have been appointed distributors for *General Electric* heating devices. The latter will also continue as a distributor for G-E electric clocks.

The *Auto-Electric Service Company*, 1214 Elm Street, Manchester, N. H., has been appointed to distribute the *Stromberg-Carlson* line of radios and radio-phonographs in the New Hampshire area. E. P. McAfee, treasurer of the Manchester firm, will be in charge of *Stromberg-Carlson* sales.

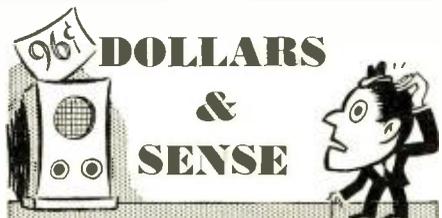
The *Tri-City Radio Supply Company*, 1921 Second Avenue, Rock Island, Ill., will distribute the *Stromberg-Carlson* line of radio equipment in its area. Max Laity, who heads the distributing firm, will be in charge of *Stromberg-Carlson* sales.

Milton Reiner, president of *Radio City Products Corporation*, 88 Park Place, New York City, announces the appointment, effective February first, of the *Herb Erickson Company* to represent his company's line of radio and electrical test equipment for the territory including Florida, Alabama, Georgia, South Carolina and Eastern Tennessee.

Mr. J. I. Cornell, Chief Engineer of the *Solar Manufacturing Corporation*, Bayonne, N. J., makers of capacitors, has been elected a Director of that company.

Stephen Nester announces the formation of a new manufacturing and selling organization, with headquarters at 799 Broadway, New York City, which will produce a complete line of American-made recording and playback needles for every professional and lay use.

Announcement was made today that W. G. H. Finch, President of *Finch Telecommunications, Inc.*, of Passaic, New Jersey, has been licensed by Major Edwin H. Armstrong, inventor of Frequency Modulation, to manufacture FM mobile communication and miscellaneous apparatus.



**NEW COLLECTION  
IDEA CLICKS**

(Special to *RADIO TRADE NEWS*.) Believing that return envelopes get your bills paid quicker one radio jobber adopted the unique idea of enclosing a return envelope with each bill, printing the envelope with his name and address on the mailing side, and with four words on the flap which reads: *Our Story Is Inside*.

When you open up the flap to enclose check and bill, you find this printed message underneath:

**OUR INSIDE STORY**

One of our ideas about being in business is to be as helpful as we can to our customers.

We even help them pay their bills by sending them handy return envelopes like this one.

Won't you slip your check into this envelope to balance your account and help us with our collections? Thank you!

Underneath that on the envelope (over which the flap fits and seals out of sight when mailed) is this printing:

**MEMO STATEMENT**

Of Your Account

Balance Due . . . . . \$.....

**THANK YOU!**

"Since putting this plan into effect our collections have increased noticeably and returns stream in much quicker than before. By furnishing them ourselves we have the opportunity of printing a good collection message, or sometimes we deviate by running a piece of advertising, to feature some item which will induce buying and bring us a nice volume of telephone business. This return envelope also makes them conscious of the necessity of paying their account."



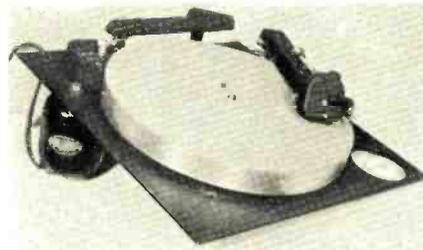
### CHICAGO CHAPTER OF V.W.O.A. MEETS

Over thirty members of the Chicago Chapter of the *Veteran Wireless Operators Association*, attended a dinner at the Lake Shore Athletic Club in that city, to discuss their part in national defense and to further the progress of the Chapter.

The retiring chairman, George I. Martin of *R.C.A. Institute*, presented a life membership certificate to the new chairman, W. J. Halligan, President of *The Hallcrafters Company*. Plans were formulated for future meetings.

### RECORDING MECHANISM SIMPLIFIES INSTALLATIONS

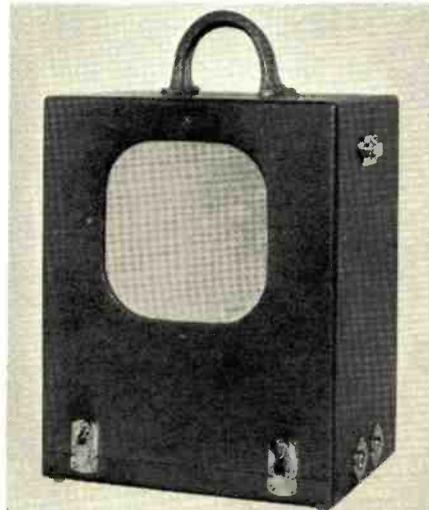
The Speak-O-Phone Model 9-MA Recording Mechanism helps solve the problem of making up-to-date phono-recorder



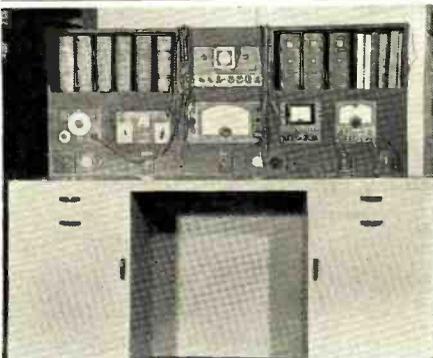
units. It includes a constant speed type motor, heavy duty turntable with speeds of 33 $\frac{1}{3}$  and 78 r.p.m.

### STROMBERG-CARLSON INTRODUCES PORTABLE SOUND SYSTEM

First product of *Stromberg-Carlson's* expanding line of sound equipment to be announced is a new portable sound system (No. 18-P) suitable for a variety of



applications requiring up to 10 watts of power, including use in auditoriums seating as many as 2,000 people. It is a three-piece unit that fits into a handy carrying case measuring 18 x 14 $\frac{3}{4}$  x 11 $\frac{3}{8}$  inches.



The service bench of Radio Service Engineers of Ft. Wayne, Indiana. . . .

### SOMETHING BESIDES ELECTRIC APPLIANCES TO FILL IN THE SLACK

(Special to *RADIO TRADE NEWS*.) E. G. Peters of the *Gulf Radio Sales, Inc.*, St. Petersburg, Fla., has discovered a way of making money besides handling the usual electrical household appliances to take up the slack in the radio business.

He has gone in for selling oil burning floor furnaces which fit in flush with the floor and is a modern oil burning heating plant (*H. C. Little Floor Heater*) down where central heating plants are practically unknown. It is a regular furnace and not just a space heater. It goes down under the floor out of sight and is thermostatically controlled, which makes an ideal set up for Florida.

"It is the first thing I ever sold that people came in here to buy," Peters explained. "We sold eighty of them the first three months. All you do is to put an ad in the paper as soon as the cold weather starts and people come in and buy them. So far it has been a matter of our being able to install them.

"We also do a big attic fan business (*American Cool-Air*, made in Jacksonville, which is one of the best fans built and used by every cafeteria and restaurant in Florida). It is a ball bearing fan and is slightly more expensive than the average fan.

### NOVELTY DISC CATCHES "HAM" MONEY

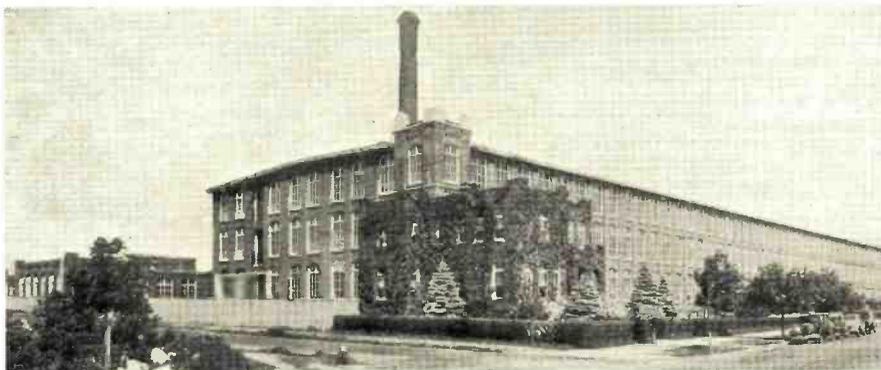
A new disc has just been put on the market by the *National Recording Supply Co.* of Hollywood, California. This disk is actually a *QSL* recording of an ama-



teur's station's signal and is designed so that special data can be written in by the use of a special marking ink. The manufacturers claim unlimited playback with wide frequency response and a minimum of surface noise. They retail at 10c each.

### MONEY HINT

Many mothers bring their children in to be photographed. It should be easy to sell the idea of recording the child's voice at the same time.



### Cornell Dubilier Expands

The *Cornell-Dubilier Electric Corporation*, manufacturers of electrical capaci-

tors, announces through its president Octave Blake, Jr., the purchase of the million-dollar plant of the *Kendall Company* at New Bedford, Mass.

## ANNUAL DEALER MEETINGS PAVE WAY FOR SALES VOLUME

(Special to RADIO TRADE NEWS.)  
R. P. McDavid, Inc., Birmingham, Ala., hold a meeting of all dealers in the State and the western section of Florida, once a year in Birmingham, usually at some hotel or country club, followed by a banquet and entertainment.

"The object is to get all of our dealers together when the new models come out and to show them," explained R. P. McDavid, III, Advertising & Sales promotion manager, "and at the same time to make closer contact with these dealers. As a result of such meetings we increased our business 75% in radio sets alone.

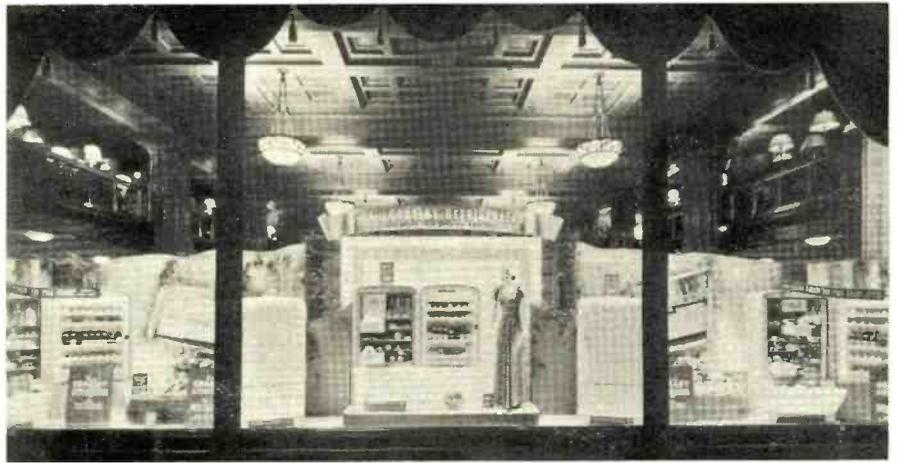
"These annual meetings are an all day affair, starting with luncheon, followed by a golf tournament, and a banquet at night.

"We not only hold these annual meetings but we take the models of all of our lines to the key cities in our territory and set up displays in the hotel rooms and have lunches or dinners in those cities, including Montgomery, Ala., Mobile, Ala., Pensacola, Fla., twice a year.

## WORLD'S LARGEST RADIO LABORATORIES TO BE BUILT BY RCA

The world's largest radio research laboratories will be built by the Radio Corporation of America, at Princeton, N. J., David Sarnoff, President of RCA, announced today. It will be known as "RCA Laboratories," and will be the headquarters for all research and original development work of RCA, and for its patent and licensing activities. The new organization is planned to promote the growth of radio as an art and industry, and to meet the expanding demands of national defense.

"To equip our research staff with the best and most modern facilities and conveniences, we have purchased a large tract of land at Princeton," said Mr. Sarnoff, "upon which we will erect a laboratory building which will include a lecture auditorium and the combined technical and patent libraries of the RCA organization. We hope to have the building completed before the end of this year.



Cincinnati's Gas & Electric Co. put on this superb refrigerator display which resulted in a substantial sale of Crosley Super Shelvador Models.

## NOVEL ADVERTISING PAYS

(Special to RADIO TRADE NEWS.)  
"We have tried newspaper advertising and it is a failure," says Chas. Vredenburg of Van's Radio Service in Miami, Fla. "Novelty advertising is better.

"For instance, taking a small radio and painting it white, we have put them in barber shops and drug stores. When a man is in a barber shop he is relaxed and can give more attention to the advertising message. Or a person sitting at a soda fountain is listening to the news or sports events of the day.

"The radios in those places run almost continuously. This saves a lot of servicing. We have twelve machines out and we only had to service one of them last year. And that is one of the best methods of advertising.

"I plan putting one in every drug store. All they have to do is to put the machine in a conspicuous place and play it as long and as loud as they want to. We pay for everything in the way of repairs and service. We let them have unlimited use of it free.

"If a power transformer burns up, it doesn't cost them a cent. I pick it up and fix it. On a job of that type we don't put our best models, but we use old models, repair them, and put them in tip-top shape.

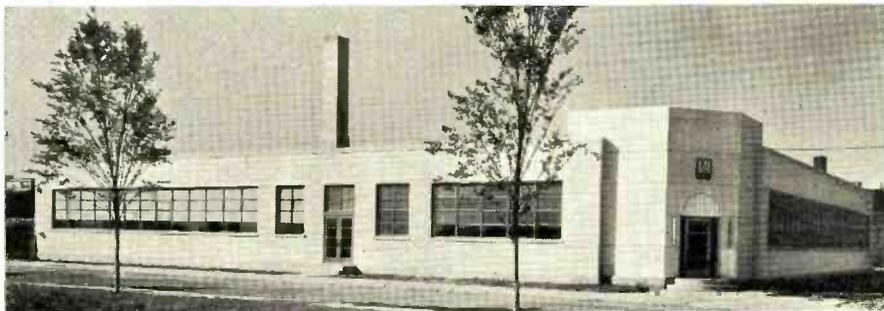
"Another thing we do is to install a call system in all parking lots free of charge in order to obtain the privilege of getting our sign in a conspicuous place."



NYA youths are being trained as servicemen to replace those who are being called into National Defense Work.



The Hallicrafters Portable S-29 can be installed in any car as is shown.



## G.M. LABORATORIES MOVE INTO NEW HOME

The new building is located at 4314-26 North Knox Avenue, Chicago, Illinois, in the Montrose Industrial District, and is of modern daylight type of construction.

## PHILCO DOES TERRIFIC AUTO RADIO BIZ

Philco Corporation has just received an order for 100,000 special automobile radio receiving sets from Chrysler Corporation for use in its 1942 line of Chrysler, DeSoto, Dodge, and Plymouth motor cars, it was announced today by Russell L. Heberling, Vice President of Philco Radio and Television Corporation.



# DISC and THAT

by Wm. (Bill) Mogle

## TEN TOP TUNES WITH WHICH TO STOCK YOUR SHELVES

NAME	ORCHESTRA	NUMBER
"Yours"	Jimmy Dorsey	Decca—3657
"Jenny"	Eddy Duchin	Columbia—35978
"Perfidia"	Carlos Ramirez	Victor—4545, or
"Perfidia"	Gene Krupa	Okeh—5715
"The Mem'ry of a Rose"	Benny Goodman	Columbia—35992
"William Tell"	Alvino Rey	Bluebird—B-11072
"Amapola"	Jimmy Dorsey	Decca—3629
or		
"Amapola"	Xavier Cugat	Columbia—36013
"High on a Windy Hill"	Lanny Ross	Victor—27254
"They Met in Rio"	Tony Martin	Decca—3624
"There'll Be Some Changes Made"	Vaughn Monroe	Bluebird—B-11025
"Chica Chica Boom Chic"	Xavier Cugat	Columbia—35995

### ALBUM HITS

Decca "Conga" Series, No. 211  
Columbia C-46, "Hot Jazz Classics"

SINCE the ASCAP-BMI situation has come to pass, the problem of listing a true picture of Hit Tunes has been a difficult one. Recordings of ASCAP tunes has not been affected in the least. Many of these tunes would have become all time hit numbers if they were allowed to be aired over the major networks.

This situation gives you record dealers an opportunity of a life time. Many of the great popular songs that find their way into the motion picture world via the silver screen—are at present banned on the radio.

There is much song and romance this time of year. The young folk will want their music lush and thick with romantic lyrics. The older folk, too, will seek their pleasure in songs of unrequited love and, also, classics on the more serious side.

For the younger folk, the song must be in dance tempo. This is an important feature. The recording of a tune should have a listenable lyric as well as rhythms that set the feet to dancing.

The ASCAP songs are not banned from recording rights, and it is here that the record dealer can cash in. What I'm driving at is this. The same folk who attend the motion picture theatre are those that buy records. And you can bet on the fact that the motion picture fan will want to hear the same songs on records. It is up to you to see that such tunes are available for sale.

Radio hit tunes should also get a share of record sales. Dealers should acquaint themselves with the story behind a recording—whether or not it is a BMI tune or of ASCAP origin. All BMI recordings are so marked on the record seal. That means the tune is available for airing on the major networks.

### The Needle Problem

AFTER taking the rounds of several record dealers, I have come to the conclusion that many of you dealers are afraid to recommend a higher price needle. I made the rounds primarily as a buyer interested in purchasing phonograph needles.

The results of my making the rounds of some one-dozen places, was that not over twenty-five per cent of the dealers bothered to recommend a better needle.

Just why is it that some dealers are neglectful in this respect? I guess it's because fifty cents or a dollar seems to be too much to pay for one needle.

I came in and asked for phono needles. The dealer, in most cases, did not bother to explain to me the virtues of the so-called sapphire needle, or any of the

other better quality needles for all that matters.

One dealer, in particular, did take the trouble of introducing to me a needle that sold for a dollar—and he made the sale. He explained to me the features of the needle—the fact that there was very little record wear, new beauty of tone, less needle talk and, above all, convenience in far less needle change.

I wonder just how many of you record dealers neglect this important sales item? Certainly your customer will more than appreciate your interest in his phono needs. And in the matter of dollars and cents, the dollar needle is cheaper by far record for record.

### The Visiting Artist

DON'T be shy on inviting visiting recording artists to spend a few hours in your place of business for a session of record autographing. Most of the boys in the game are only too glad to give you a hand in the sale of their recordings.

Of course, the artists' appearance is advertised, the windows "tied in" and the best buys out in front so that the fans can't miss a thing.

The visiting artist stunt has been tried many times, and always with a great deal of success. It's a sure bet that you will sell records at the time.



Gertrude Lawrence records a musical summary of her show for RCA-Victor.

## SOUND-ON-FILM AMPLIFIER DESIGNED FOR SMALL THEATRES

The Model A-35-K amplifier, introduced by Clarion is especially designed for use in small and medium sized theatres in conjunction with all types of standard sound-on-film reproducing



equipment and features such advancements as a special equalizing control affording a maximum 10 db. rise at 7,000 CPS, to compensate for any possible loss existing on high frequency sound track recording; is manufactured by the Transformer Corporation of America, 69 Wooster St., New York, N. Y.

## ELECTRIC RAY WARNS OF VISITORS

(Special to RADIO TRADE NEWS.) In Florida where doors are always open and for Summer time use anywhere, Henry Lehfeldt of Boulevard Radio Company in Miami, Fla., installed his own burglar alarm system. Only it happens to be an ordinary door chime which rings whenever any one enters or leaves the store.

He bored two holes on one side of the door entrance, away from the sun, because it is important to keep your photo cells from keeping reflected light going into them, and then installed an electric ray to ring the door chime whenever any one cut off the electric ray.

"It is a handy thing for a one man radio store," Lehfeldt explained, "where you might be busy in the back repairing radios or working on the books or unpacking a shipment. This electric ray rings a little gong and warns you of visitors."

**TECHNICAL BOOK  
& BULLETIN REVIEW**

**VACUUM TUBE VOLTMETERS**, by John F. Rider, published by *John F. Rider, Publisher, Inc.*, 404 4th Avenue, New York City, 170 pp., price \$1.50. "Vacuum Tube Voltmeters" is a practical exposition of the numerous types of such measuring devices with the intention of providing a source of information for those who desire to compare the different types, establish their principles of operation or construct them . . .

A vast amount of original research was done in the author's laboratory prior to the writing of this book, so you will find facts herein not to be found elsewhere.

Not only have the various types of vacuum-tube voltmeters been described, but also several chapters are devoted to their design and construction, their calibration and testing, as well as many notes on their practical applications. Price \$1.50.

**YOUR CAREER IN RADIO**, by Norman V. Carlisle and Conrad C. Rice, published by *E. P. Dutton & Co., Inc.*, 300 Fourth Avenue, New York City, 185 pp., price \$2.00. This book is written by two young authors and deals with the generalities in radio and television. Conducting three selected boys from Central High School on a tour of one of America's great stations, they observe all the modern methods of announcing, speaking, advertising and management. They discussed continuity writing, acting and program direction. In fact, the whole "business end" of radio. The book is sound and concise and easily read and is written for those students who want to watch the wheels go round in broadcasting. Price \$2.00.

**PRACTICAL ELECTRICITY FOR HOME STUDY**, by Frederick C. Raeth, published by *D. Van Nostrand Co., Inc.*, 250 Fourth Avenue, New York City, consisting of Books 1, 2, 3, & 4, 1144 pp., price per set, \$8.95. Here is an excellently written complete home-study course which has been used in the Canadian School of Electricity at Montreal and at the Milwaukee School of Engineering. Heretofore, this particular course has been available only to resident students of the above named schools, or to those taking the correspondence course in electricity from the Canadian School of Electricity in Montreal. This series of books presents the basic principles of electrical engineering in the order in which the science developed. The student with a knowledge of basic mathematics can readily comprehend the mathematical sections of these books. The student who is interested in illumination and illumination design will find the up-to-date information on the subject to be a valuable aid in handling problems in this field. Price per set of four books, \$8.95.

**CALLING C-Q, Adventures of Short Wave Radio Operators**, by Clinton B. De Soto, published by *Doubleday, Doran*, 14 West 49th Street, New York City, 291 pp., price \$2.00. Radio  
(Continued on page 63)

*You owe it to yourself—*



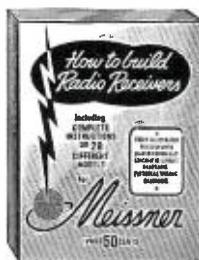
**to see the Meissner Recorder LAST!**

In all fairness—to yourself and us—you should see the others first. Examine carefully and test thoroughly—find out what each has to offer—and then call for a Meissner Portable Phono-Recorder!

You can see as well as hear the difference! Truly professional in appearance and performance, this instrument is built UP to a pre-determined standard of quality—not DOWN to a pre-determined price! Every feature that could possibly be desired for utmost satisfaction in making life-like home recordings has been incorporated in this versatile 3-purpose instrument. With all this, the price is well below the average for instruments of comparable quality and performance!

Don't delay—see this remarkable Portable Phono-Recorder at your Meissner distributor's at once—comparison will tell the true story!

Meissner Portable Phono-Recorder, Complete. **\$64<sup>50</sup>**  
Model 9-1045 List Price.....



**Just Off the Press!**

The new 1941 Meissner Instruction Manual is now ready! Contains complete schematic and pictorial wiring diagrams for all the Meissner Kits; circuits and operating instructions on all ready-built units! In addition, a wealth of F-M data, theory and design information, charts and useful tables are included for the serviceman and experimenter. Get your copy from your Meissner distributor at once or mail request with 25c directly to address below.

1941 Instruction Manual, Net Price.....\$0.25

Write Today for Free Meissner Complete Catalog!

ADDRESS DEPT. N-5



## Washington Communication (Continued from page 8)

tional disaster. He pointed out that such an operator could direct enemy ships to the position of his convoy, give away the position of units of our fleet which he might see in the course of secret maneuvers, deliver false messages to the master of his own ship or maintain direct communication with the enemy.

Fantastic as such things may sound, they've been done. The British definitely have attributed a number of ship losses in the current war to this sort of activity. The circumstances of attacks on several convoys have indicated that the Germans were getting information by radio. Three spies who were executed possessed radio equipment.

In the hands of traitors, radio is a dangerous weapon. The Germans got control of the Norwegian radio when they invaded that country. Just before their big boats sailed into the Norwegian fjords, they sent by Government radio a message to all Norwegian ships and shore emplacements that German ships weren't to be fired on. The radioman on one Norwegian boat was away from his post at the time and didn't get the message. It was his boat that surprised and sank the German cruiser *Bleucher*—the only Nazi ship casualty.

In the Spanish civil war, Franco's revolutionists seized the Government radio and sent orders to all ships to return to the ports of Spain under Franco's control. This boomeranged—because the operators on about one-half the vessels were Loyalists, who never delivered the "orders" to their skippers. In the World War, Admiral Spee's squadron was lured to its doom off the Falkland Islands by a false radio message.

The Navy is determined that this country's security shall not be imperiled by radio leaks. Admiral Hooper suggests that "loyal operators keep watch."

### Army Goes FM

THE Army has placed its first large order for FM equipment. It has purchased a considerable number of Link sets—one order was for \$90,000—similar to those being used by police departments, for the Armored Force. Experimental work is continuing on three new types of FM sets and within a short time, more FM orders will be forthcoming.

The order which has been placed marks

the end of a long period of hesitation and experimentation with FM by the Army. The research work has been highly secret. In fact, orders for FM equipment were placed secretly with several manufacturers. Some of this equipment was assembled by *General Electric*, spirited to a "blind" factory in the northwest, where units for the armored force were being made, and installed for test work.

Major Edwin F. Armstrong, who holds the basic patents on FM, has turned over to the War Department, free of charge, all his 17 patents. Further, he has agreed to make these patents available, for \$1 a year license, to any manufacturer designated by the War Department to make FM equipment for defense. The inventor notified all manufacturers who are now licensed by him and will notify any who take out licenses under the \$1-a-year arrangement, that he will waive all royalties on equipment made for defense purposes.

The FM sets have proven, in actual field tests, to be superior for some types of armored vehicles, in which static has always been a serious problem. In the hope that FM may be more widely adopted in the Army, research is being intensified toward two ends. One is to narrow the band—the wide band required has been the principal drawback in Army use—and the other is to reduce the number of quartz crystals required, because of the difficulty in getting such crystals now.

Note: It was while he was with the A. E. F., three months before the Armistice was signed, that Major Armstrong perfected the invention which was to make his fortune, the superheterodyne receiver.

### 5th Column Hams?

THE Amateur Section of the FCC hasn't yet burrowed its way out from under the paper blizzard which came with the fingerprinting of operators. Result: an order which states that all operators making applications between July 1, of last year, and September 30, 1941, for renewals will be granted automatic extensions of their tickets.

In the course of checking over the fingerprint applications, it was discovered that about 10 per cent of the hams had failed to fill out the blanks, electing to forfeit their licenses instead. When Army and Navy intelligence officers heard about this, they began to get up steam. They couldn't understand why so many operators would surrender their licenses rather than send in their fingerprints.

An investigation was begun, which was rather extensive because of the number involved. The investigators found that most

of those who hadn't filled out the "proof" forms thought it was just too much trouble. Some of those who didn't send in the information were the percentage of operators who normally drop the hobby every year.

But some few looked bad—not more than a dozen, at most. The F. B. I. is doing a quiet check up on these men now.

### Low Code License Bugged Down

THE jam in the Amateur Section promises to delay consideration of the latest ARRL proposal to build up the reservoir of ham operators. Under this plan, a new Class D license would be established. This ticket would permit the ham to operate on 160 meters, 5 meters and 2½ meters c.w. only. It would be good for one year only and at any time during the year the licensee could take a code examination at 13 words per minute and obtain a Class B license.

Pressure of other business, it appears, will delay any serious consideration of this scheme for a while.

### Radio Labor Rumbles

THE ACA and the Defense Communications Board are still glaring at each other as a result of ACA Prexy Joseph Selly's demands for more complete labor representation on the board.

Selly created a problem for the DCB some weeks ago, demanding that the CIO have a representative on each of the DCB's many sub-committees. The AFL and telephone workers compounded the problem by announcing that if the CIO was going to have a man on each committee, so were they.

Recently, Selly cut loose with a blast at the whole DCB set-up, charging that the Board was being run without consideration for the labor unions. It is the contention of Chairman Fly of the DCB that the Board's exclusive function is national defense and that it wasn't concerned with labor problems. Army and Navy members of the Board are bristling over Selly's attitude and insiders predict a blow-up before long.

### AARS Code Speed Trial Results

AND so, the ham they couldn't keep down won the Army amateur's speed proficiency contest. W. B. Hollis, W5FDR/WLJR, of Houston, Tex., was declared the winning Army amateur and the only one of the 800 AARS members who participated to qualify at the speed of 65 words a minute.

You read here last month how he got up from bed, where flu and a strep infection had put him, to take the test. Since he is not a professional nor a Government operator, he is eligible for the *Marconi Memorial Award*. Those letters—FDR—just can't lose!

The Ninth Corps area, which had 221 members participating, won this competition with a score of 3,695 points. This Corps Area includes the states of Washington, Montana, Oregon, Utah, Idaho, Nevada and California.

The following is the outcome of the competition between corps areas: First place, Ninth Corps area; with 6,310 points, 58.5% participation, total score of 3,695. W6BRV area winner with speed of 55 w.p.m.

Second place, Second Corps Area, with 2,340 points, 54% participation and a total score of 1,264. W2KYF, with 60 w.p.m., had top speed in area, but since operator is professional first place went to W2KLD, with 50 w.p.m.

Third place, Fifth Corps Area, with 2,625 points, 48.2% participation, 1,262 score. W8KKG and W8HRA tied for first in area with 50 w.p.m.

Fourth place, Third Corps Area, with 2,030 points, 42.2% participation and a total score of 859. W3AKB, with 45 w.p.m., won top honors in area.

Fifth place, Eighth Corps Area, with 2,055 points, 35.6% participation and a total score of 731. W5FDR's 65 w.p.m., of course, was tops.

Sixth place, Sixth Corps area, with 2,210 points, 25.9% participation and a score of 574. W9HLB, with 50 w.p.m., was first.

Seventh place, Seventh Corp area, with 2,325 points, 23.9% participation and a total

## WHY SOUND ENGINEERS Prefer



### THORDARSON AMPLIFIERS

arate gain controls for mixing. Two tone controls, one for bass and one for treble, facilitate adjusting for acoustical conditions.

Model T-30W20 incorporates many quality features such as choice of impedances for speakers, high gain mike inputs and hum level 70 db. below rated power output. Model T-30W20 with selected tubes, \$82.50 list.

Thordarson amplifiers will meet your sound requirements up to 900 watts and include rack panel and cabinet models with and without phono turntable.

Consult Thordarson sound engineers about your special sound installations.

Thordarson amplifiers are sold by leading parts and sound equipment distributors everywhere. Ask for Catalog No. 600.

ANALYZE the model T-30W20—a typical Thordarson Amplifier. Frequency response flat within 1 db. from 30 to 15,000 c.p.s. with a deliberate bass boost of 7 db. below 100 cycles on the phono channel. This extended audio range assures natural voice amplification and life-like record playing. Output 20 watts with less than 5% distortion. Two high impedance microphone inputs and one high impedance phono channel have sep-

500 WEST HURON STREET  
CHICAGO, ILLINOIS, U. S. A.

## THORDARSON

ELEC. MFG. CO.

TRANSFORMER SPECIALISTS SINCE 1895

score of 556. W9TKX, with 50 w.p.m., was first.

Eighth place, First Corps area, with 1,930 points, 27.7% participation and a total score of 534. W1LVQ, with 50 w.p.m., was first.

Ninth place, Fourth Corps area, with 935 points, 10.5% participating and a score of 98. W4DVO and W4AAO, with 45 w.p.m., tied for first.

In addition to those named above, W5GPV and W6IIG hit 50 w.p.m., while the following touched 45:

W1LWH, W1INT, W2LEI, W8UXT,  
W3AKB, W4DVO, W4AAO, W8QLO,  
W9QIL, W9YTV, W9YXH, W9GMT,  
W8TIV/9, W9FLI, W9WIN, W9UHT,  
W9ZQW, W9GNS, W5BHI, W9WWB,  
W5ENI, W6MKW, W6BMC, W6ETJ,  
W6DVD, W6IMI, W6JGA, W6AGF,  
W6HKM, W6MRT, W6INH, W6ELL.

The average speed for AARS was estimated at 25 w.p.m. with about half capable of 35 w.p.m. or better.

More than 800 of those extra fancy WAR QSL cards have been mailed out so far to hams who have contacted the Army's Washington transmitter. The station is on 6990 kc. from nine to ten p.m. every night except Sunday and is on 4020 kc. from seven to eight p.m. Tuesday, Wednesday and Saturday with "ZCAA CQ."

### That Radiop Dilemma Again

**F**EW have much comprehension of the large scope of the activities of the Army and Navy at this time in training operators. When this war is over, this is going to be a nation with every third man a radio expert!

The Naval Reserve schools, which are operating in seven cities, will train 4,000 operators this year. These are members of the Naval Reserve V-3 Class, who are getting four months in the class room, plus active sea duty. Nearly 2,000 of these operators are now in school and some 700 have finished their class work.

There is a waiting list longer than a line of battleships and, for the time being at least, enlistment has been closed. Next year, candidates from this school will be drawn only from those already in the Reserve or ordinary Navy seamen who wish to learn the specialty.

This makes for an odd situation: the Navy desperately needs trained operators now, yet it is not accepting applications. The operators must go through the schools and the schools have all they can handle now. The goal of the program is a reserve of 6,000 trained men.

The Army is going at it on an even larger scale. For the 1,500,000 man Army, there will be 100,000 communications experts. About half of this number will be radiomen.

At Fort Monmouth, N. J., the Signal Corps Training School has started a program to train 24,000 officers and enlisted men this year. In addition, other thousands will attend schools in other parts of the country. The Fort Monmouth school will turn out about 2,000 operators, servicemen and radio specialists every three months.

The Navy has called more than 900 of its 1,100 communication reserve officers to duty. The Army has called up more than 1,000 reserve officers in the communications service and by July 1 expects to have every junior communications officer in uniform. This will push the Signal Corps officer strength to 2,500—compared with 350 in normal times.

### Radiana

**T**HOSE operators on the SS Manhattan who stood by during long tense hours when the ship went aground off Florida could have heard some words of praise around the FCC. . . . Murray Wincoeur's defense of the ACA made a good impression on the House Merchant Marine Committee. Wincoeur, representing the marine department of the ACA, praised every member of the ACA as "an American citizen and a marine radioman" and said the union had raised its members from "coolie wages." . . . And still they come—the FCC notes an increase in the number of youngsters who write in to find out how to learn radio!

More big military appropriations are going through the Congressional committees

JOHN F. RIDER PRESENTS

# "Clarified Schematics"

We have always sought to supply in Rider Manuals, the information that would keep the servicing branch of the radio industry in step with the manufacturing division. As a result, we have in recent years given special attention to information on complicated circuits—whenever data were released by manufacturers.

However, this available material has in many cases become so complicated—as the result of involved circuits and innovations—that the serviceman can only with difficulty, and at great expense of time, follow many of the schematics.

For months we have been working on a solution of this problem and are proud to announce "Clarified Schematics"—a new service beginning in Rider Manual Volume XII.

Bound right in the volume itself, these "Clarified Schematics" break down more than 200 models whose original schematics were so involved that they required hours of study to decipher.

Naturally, "Clarified Schematics" is a costly additional service for us to prepare and print. It requires the maintenance of a new department manned by competent technicians who are constantly breaking down the hard-to-read, complicated circuits and redrawing them so you—at a glance—can know everything about any section of the circuit.

In the establishment of this new service, which will be an increasingly important part of all Rider Manuals beginning with Volume XII, we have spared no expense in order that you may save time and decrease your operating cost per hour.

This new feature is fully explained with illustrations in the current issue of "Successful Servicing." If you do not have a copy, write and we will send one by return mail.

Order Rider Manual Volume XII today. Out on April 10th, it covers sets that are coming to your bench for repairs right now.

JOHN F. RIDER PUBLISHER, Inc.  
404 FOURTH AVE., NEW YORK CITY

Export Division: Rocke-International Elec. Corp.  
100 Varick St., New York City Cable: ARLAB

VOL. XII RIDER MANUAL OUT APRIL 10th



this month and there is no indication that Army and Navy request for money for radio will be slashed. Manufacturers are preparing for more big contracts under the new budget. Meanwhile, here are the latest contracts for radio equipment for defense:

National Union Radio Corporation, Newark, for tubes, \$43,532; RCA, Camden and Harrison, N. J., for sets, sound recorders, tubes, etc., \$764,932; Radiomarine Corp. of America, New York City, transmitters and other equipment, \$53,080; Federal Telegraph Co. of Newark, equipment, \$465,191; Hytron Corp., Salem, Mass., tubes, \$48,996; Bendix Radio, Baltimore, sets, \$123,570; Fred M. Link, Brooklyn, \$91,000; Northern Radio Co., Seattle, transmitters and receivers, \$12,004; Crosley Corp., Cincinnati, direction finders, \$31,486; Farnsworth Television and Radio Corp., Ft. Wayne, Ind., equipment, \$201,376; Kellogg Switchboard and Supply Co., Chicago, equipment, \$70,845; Western Electric, microphones and headsets, \$938,864.

## Super-Superheterodyne

(Continued from page 27)

7C7 high frequency converter-oscillator, followed by a

1612 first i.f. and noise silencer stage, followed by a

7C7 noise silencer amplifier, followed by a

7A6 noise silencer rectifier, followed by a

7A7 second i.f., crystal filter stage, followed by a

7A7 third i.f. regenerative stage, followed by a

7B6 second detector, AVC and first audio stage, followed by a

7C7 BFO stage, followed by a

7B4 second audio and squelch stage, followed by a

1612 volume expander stage, followed by a

7A4 volume expander amplifier, followed by a

7A6 volume expander rectifier, followed by a

7A4 tone control stage, followed by a 7N7 phase inverter, followed by two push-pull

6B4G's output amplifier stages.

The oscilloscope section contains: a 7A7 first oscilloscope i.f. amplifier, followed by a

6F6 oscilloscope i.f. driver, followed by a

902 2" Cathode-Ray modulation indicator tube.

The 1612 tube is identical to a 6L7. The only difference is in the selection of a tube that is free from microphonic tendencies. In other words—the 1612 is a hand-picked 6L7.

Losses can be reduced by mounting the i.f. transformers so that the lugs will be closest to the tube sockets. It is necessary to take certain precautions in a receiver of this magnitude so that self-oscillation will not occur. This includes the shielding of certain plate and grid leads. In no case should high-capacity shielding be employed as this will introduce losses into the circuit. We used regular push-back wire that was covered with a thick-walled spaghetti tubing and this was covered with shielded braid.

Holes should be drilled in the sides of the coil can to aid in the alignment of the trimmer condensers. They may be located after the coil assembly is put in place temporarily at the same time that the other holes are located, including those for the padder condensers. All of the r.f. leads that pass through the coil can go through small Millen isolantite bushings. These leads are No. 14 tinned wire. The same type of wire is used for all of the r.f. leads in the receiver.

Some parts are located within this coil compartment. They must be wired before final assembly takes place. It is almost impossible to specify any particular procedure to follow in wiring the receiver. The 115 volt primary circuits are one of the first to receive attention. Next the 6.3 volt filaments. Note that the current load must be divided between the two transformers. The 5.0 v. filament transformer for the 5Z3 rectifiers is mounted on the shield.

The tube lineup for the FM section is as follows:

7A7 tuned first r.f. amplifier, followed by a

6K8GTX self-excited converter, followed by an

1852 first i.f. stage, followed by a 7A7 second i.f. stage, followed by a

7C7 limiter, followed by a

7A6 discriminator-detector, which feeds the 7B4 second a.m. audio and squelch stage.

Power supplies have the following tube lineup: For the main power supply, 2—5Z3's in parallel; the oscilloscope power supply consists of a 1V and an 84. Two VR-105's are used to regulate the plates of the 6K8GTX and the 7C7 high frequency oscillator, respectively. A 6U5G is used as a tuning eye for the f.m. section.

The Browning tuner comes completely wired as far as the coil assembly is concerned, so much of the work is done for the builder. This assembly includes all of the coils and their tuning and padding condensers and the unit is very substantial in construction.

The chassis is cut so that the entire assembly will fit over the cutout with the leads, which pass through isolantite bushings, extending downwards. Operation and the alignment of this tuner will be covered later.

The oscilloscope circuit was taken from information supplied by the RME manufacturers and the unit is also available from them in kit form. All of the long leads, especially those connecting the tube, must be carefully shielded. This includes the coupling condensers. These are wrapped with scotch tape and the shielded braid is put over all. An extra meter case was purchased for use as an escutcheon for the cathode ray tube. This provides a match of pleasing appearance.

The antenna circuit of the f.m. section is conventional in design. The usual short wave type of antenna, well known to the amateur fraternity, especially those operating on 5 and 10 meter bands, should be used. Servicemen who have been installing television and f.m. antennae will have no trouble with its design.

The Amplitude Modulated section makes use of two antennae so as to attempt to create a noise-free antennae installation. One antenna is run as close as is possible to the noise source, such as may be found in electric light lines, neon signs, and the like. The other antenna is run at least 90° away from the "noise" antenna and is run as far away from noise interference as possible.

The operation of the two antennae and the three-condenser circuit is as follows: the noise is introduced into one antenna, and together with the signal, is tuned 180° out of phase with the other antenna. This acts to cancel the noise out and to a certain extent would also act to cancel out the signal were it not for the fact that the receiving antenna (as opposed to the "noise" antenna) picks up a greater proportion of signal than does the noise antenna. It is a well-known fact that if two signals, equal in strength, are mixed 180° out of phase, they tend to cancel. That is the purpose of the antenna phasing network, and the intent is to cause the noise to be cancelled, or greatly diminished.

The coupling of the antenna phasing network to the receiver is by means of two specially constructed coils and a Faraday screen. The coils are each alike in numbers of turns, with the exception that the primary is center-tapped. Each coil is wound on a 3/4" diameter tubing of No. 912 Amphenol polystyrene product and consists of 8 turns of No. 22 double cotton covered wire, close wound. The distance from the end of each coil winding to the end of the tubing is 1/4". After the coils have been wound and doped, allowing ample pigtailed for connection, the Faraday screen is next constructed.

It is to be noted that the Faraday screen consists of a number of parallel wires in a plane, shorted at one end. The Faraday screen we used is constructed from a National AR-16 80 meter coil. With a pair of shears, cut the coil from the base and then cut the coil open by cutting at right angles to the turns, twice near the former base connections. After the coil has been cut open, it is flattened out carefully so as not to break the insulating strips. One end of the coil is shorted by soldering a piece of bus across the

## Pocket Tester FOR THE AMATEUR

TRIPLET  
Model 666-H



\$14.50  
Net Price

Size:  
3-1/16"  
x 5 3/8"  
x 2 1/4"

### 5000 VOLTS SELF-CONTAINED

Model 666-H Volt-Ohm-Milliammeter is a complete pocket size tester—with AC and DC Voltage ranges to 5000 Volts (self-contained), AC and DC Voltage at 1000 ohms per volt 0-10-50-250-1000-5000; DC Milliampere 0-10-100-500; Resistance 0-300 ohms; shunt type circuit, 10 ohms reading at center scale; 0-250,000 ohms, series type circuit, 2500 ohms at center scale. Higher resistance measurements available by using external batteries. Selector switch for all instrument readings. The ideal Pocket Volt-Ohm-Milliammeter for amateurs, radio technicians, industrial engineers, research. Black Molded Case and Panel, Completely Insulated. RCO & DOT Lifetime Guaranteed Measuring Instrument . . . Dealer Net Price . . . . . \$14.50

"For full cooperation with the National Defense Program, Triplet engineering and production facilities are being rapidly expanded to continue the service and delivery to which our trade is accustomed!"

WRITE FOR CATALOG!

Section 155 Harmon Avenue

THE TRIPLET ELECTRICAL INSTRUMENT CO.  
Bluffton, Ohio

end of every turn. When completed, at this stage the screen looks very much like a long toothed hair comb. Next, prepare an angle bracket of brass and solder the previously soldered end of the *Faraday* screen to the brass angle, which then makes an adequate mounting strip.

The next stage is to mount the two coils on the *Faraday* screen. This is done by placing them directly opposite each other on each side of the screen so that the distance between the primary and secondary winding is  $\frac{1}{4}$ ". (This is why the tubing was cut  $\frac{1}{8}$ " from the end of the winding.) The coils are mounted on the *Faraday* screen by "gluing" with *Amphenol 912* liquid dope so that at least  $\frac{1}{4}$ " space is allowed between the edge of the coil and the end of the *Faraday* screen, or the top of the brass angle. With a pair of shears, cut off the balance of the unused portion of the screen.

Further pointers on construction include the fact that a T9 filter choke is not mounted in the same compartment with the balance of the component parts. It is mounted on one of the "walls" but on the side away from the audio component parts. Similarly, the tone control choke, T10, is mounted close by, but not directly under the 6B4G tubes, as is also the small filament transformer.

Wherever shielding is used, it should be grounded to the chassis in many points so as to prevent any r.f. build-up between grounding points.

The input to the f.m. section is by means of a low loss coaxial cable which is "snaked" around from the back along the side of the chassis thence directly

to the input terminals on the *Browning* tuner. The a.m. antenna input is by direct short leads, since this line is of low impedance and not liable, therefore, to pick up any a.c. hum within the chassis.

Some form of color coding in wiring should be employed. The normal procedure would be to wire all filament leads with yellow covered wire, plate leads with red, grid leads in green, screen leads in red and white, and extraneous leads in black.

R.f. winding should be done with bare No. 14 tinned wire, wherever possible, and wherever these wires go through one of the brass chassis walls, *Millen* feed-throughs should be employed for best insulation.

In shielding resistors and condensers, where indicated in the diagram, the resistor or condenser is first covered with scotch tape, or other insulating material, and then covered with metal braid. In shielding resistors, be sure to use at least the wattage specified in the parts list, since there will not be much ventilation possible when the resistors are shielded.

It is a good policy to check continuity on all i.f. transformers and coils before mounting them. Should the coils have become damaged in transit so as to cause a dis-continuity, the "ohm-sifter" will reveal this at once, and save many tedious hours of later checking.

The leads from the f.m. tuner, since they are bare, should be covered with "spaghetti" so as to avoid any possible shorts. The terminals of the toggle switches should be insulated from the chassis wherever the toggle switch

contacts come in close proximity to the chassis to prevent arc-over or flash-over in their continuous operation.

Terminal lugs should be freely used and the chassis itself, since it is made of brass, can be used as a "ground" wherever it is indicated, and no ground bus need be run.

One final point to the constructor: the receiver is not of a character or type which can be built in a day, nor can it be wired in a night. It will, therefore, pay the constructor highly to wire slowly, carefully, but nevertheless, surely. He will find it far easier to wire *right* the first time than to check for incorrect wiring at a later date.

In the next month's concluding paragraphs, we will describe the lining up of the receiver and the proper tuning procedure to obtain the finest results.

### For the Record

(Continued from page 4)

apy machines belong in medical magazines, and not in popular books.

\* \* \*

AND last, but not least, we have not a run construction advice on any hard-of-hearing units. Having personally seen how the unfortunate ones afflicted with loss of hearing grasp at any straw, how they are willing to spend their last dollar chasing down some will-o-the-wisp in what might be a vain attempt to regain their lost sense, we cannot bring ourselves to-



# BRUSH

**Crystal Phonograph Pickups . . .** For the finest reproduction with virtually no record wear. Used by leading broadcast stations.

Easily adapted to any phonograph.

**RC-20 Record Cutters . . .** Unsurpassed quality at low cost. Inherent stiffness permits finest recording on soft or hard record materials.

Adaptable to all types of recording equipment.

**Crystal Headphones . . .** The recognized standard for high quality response. Light weight yet durable, easy and comfortable to wear.

Not affected by magnetic fields.

THE BRUSH DEVELOPMENT COMPANY  
3311 PERKINS AVENUE  
CLEVELAND, OHIO

wards raising their hopes when, in fact, we might be doing them a great wrong.

For hard-of-hearing people there are the physicians; and these gentlemen, if reputable, will be more than eager to recommend a proper aural device. We here are radiomen—not doctors. So we leave to the followers of the caduceus the work of filling the need for information on hearing aids. They will know when these units will help and when they won't. They will also know which one to use, and which not to buy. We will freely offer our help to any physician—but design something along these lines by ourselves . . . why, we even have trouble taking an aspirin without choking!

\* \* \*

**F**ROM the above paragraphs the reader can see that the editing of a radio magazine is not all roses. We have our taboos and our "must nots." What, then, do we do?

We try to bring to our readers a great cross-section each month of what is going on in technical radio as it particularly pertains to the serviceman, the "ham" and the experimenter. We have our engineer-readers, too, and from our columns they get an insight as to what is new in radio.

What have we accomplished? Well, some of our transmitters, receivers and tuners are now on the market commercially, some of our sound apparatus is for sale from stores and factories, some of our gadgets have found their way into the production line, and some of our short cuts are being used by servicemen the country over. Many of the reforms advocated to better the American Amateur radioman and serv-

iceman status have been adopted; and we have been successful in awakening many of our readers to the romance, interest and advantages of radio.

We are quite proud of our readers. They are a wide-awake, energetic, patriotic group. Our advertisers, also, have brought us pleasure and satisfaction; pleasure through their use of RADIO NEWS and the resulting monetary return to us;—satisfaction, because through them we have been able better to understand the radio field.

All of which can be definitely put down under the head of "Running a Radio Magazine." 'Tis an interesting, absorbing and unique profession. We like it; and had we our choice all over again, we would still do what we are doing in preference to anything else.

\* \* \*

**M**ANY have written in asking what they ought to know to get themselves a job in a radio factory. From personal observation, one of the best paying jobs around a factory is that of "receiver aligner." We told Guy Dexter about the letters, and he came through with the corking article which tells all. We know which factory furnished the information to Guy, but we're honor-bound not to reveal it. Suffice to say that it is one of the leaders in the field. Guy knows his stuff, also. If you know the rudiments of radio, and can grasp the facts and technique Dexter writes about, there should not be any trouble in your getting a job these days. Receiver production is booming. The weak link in the chain is a great insufficiency of aligners who know their business. If you can fill the bill, you're on the road to a nicely paying position which may last for several years to come.

And if you have real ability in addition to knowing the technique, you may be advanced into a permanent position, and be independent of the boom. Why not try?

\* \* \*

**F**UNNY how the "Aligner-Upper" came into existence. We had just finished a neat, but not gaudy, home receiver. We had not yet received a signal generator from the factory which had so graciously promised it to us. We wanted to line up the IF stages. How to do it with a fair degree of accuracy?

Ray Frank solved the problem by building the "Aligner-Upper." With this gadget (workable from either 115 v. AC or DC), the IF can be lined up,—if you have a crystal on the IF frequency. Then we decided that it would make a good signal generator, so Ray changed the hook-up slightly and now any non-IF frequency crystal can be checked.

Also, the unit is an external crystal oscillator—a valuable adjunct for any ham shack. The 400 cycle (more or less) audio addition was an afterthought. It helps with the alignment.

And when using a "ham" crystal, the audio makes the set into a miniature transmitter which can be used to fix "spot" frequencies on any old "All-Wave" receiver one might be using instead of a communications rig.

\* \* \*

**A**ND that about makes this issue. We are sorry to have word that some hamfests and conventions, which we delighted in attending throughout the summer, have been called off on account of the National Defense. It seems that the "all-out" aid, plus the

shortage of time to get Defense units off the Production Line, plus the fact that many hams are now in the government service, is finally being felt by the rank-and-file. We always knew that would be what would happen.

But we didn't know it would be so soon!

KAK

## What's New in Radio

(Continued from page 35)

is provided, and on the side are cleats for winding up the a.c. cord when it is not in use.

Two output pin jacks are provided, one for high output and the other for low. There are also two ground pin jacks. An antenna coupling lead is furnished, and variations in coupling to the receiver input may be obtained by moving this lead further from or nearer to the receiver antenna lead. Operation may be obtained either with or without 400 cycle modulation.

**EXTRA-HEAVY-DUTY CLAROSTAT PLUG-IN Tube-Type Resistors.** For extra-heavy-duty service such as in sets employing both 300 and 150 milliamper tubes served by a single voltage-dropping resistor, a new glass-insulated-element plug-in tube-type resistor Type MTG is announced by *Clarostat Mfg. Co., Inc.*, 285-7 N. 6th St., Brooklyn, N. Y. Instead of the usual bare helical wire winding supported directly on the mica "card" or form, the new type employs a fibre-glass core for the winding which may also be covered with a fibre-glass braiding, supported on the mica. The glass-insulated element handles over three times the wattage of the usual bare winding. Some units are made with a combination of bare winding and glass-insulated winding, supported on the same mica form.

## CQ "PITC"

(Continued from page 7)

world over as *PITC*.

Young is entirely self taught, having picked up his knowledge from books and magazines sent to Pitcairn, and from an occasional chat with the operator of a passing ship. The station itself is located in a rough shack about ten feet square on the hillside beside the operator's unpainted one story house.

Three years ago, the *Yankee* called at Pitcairn and Al Eurich, W8IGO, the operator on the *Yankee* at that time, stayed at the home of Young for a week and acted as second operator of station *PITC*. At that time the equipment still consisted of the 12 volt spark coil, but a newer crystal receiver had been given the islanders; although, Al claims they still preferred the original one.

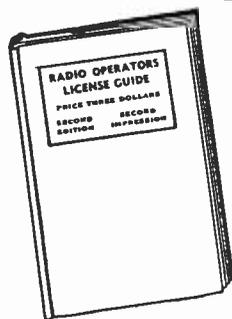
Here he found many unusual customs and reported them in an article in *QST* (Aug. 1937). Watch was regularly kept from 4 p.m. until midnight, although frequently days would go by with hardly a sound in the receivers. The station is of great importance to the inhabitants, because it informs them when a ship is expected and tells them what its needs are.

The trading of baskets, wood carvings and fruit is the only source of income for the islanders and the only way in which they are able to obtain many of the necessities and simple luxuries of life. In case of accident or serious disease, the radio is the only means of obtaining medical aid.

In Eurich's article in *QST* he pre-

# WANTED!

## Radio Operators



National Defense Program Creating Many Openings for Radio Operators...

★ **NOW** is the time to capitalize on your radio training and experience by obtaining a commercial operator's license and taking advantage of the many opportunities presented!

★ The "RADIO OPERATORS' LICENSE GUIDE" has been especially prepared as a study and reference manual for those radiomen having considerable training and experience who are unfamiliar with the exact requirements for a commercial radio operator's license.

★ Containing over 1,250 questions and answers to the new type examinations, it will aid you to pass the tests. Purchase from your local parts distributor or order direct. Postpaid only. . . . . \$3.00

**WAYNE MILLER**

The Engineers Building

Chicago, Ill.

dicted that in a few years the equipment of *PITC* would have to be changed or the station would be forced out of existence, because present day ship installations cannot be heard on a simple crystal receiver. Legal difficulties would probably arise also, due to the great amount of interference caused by a spark transmitter.

Largely through the efforts of one man, Lew Bellem, W1BES, a group of prominent American manufacturers of radio equipment were approached, and almost without exception donated necessary equipment. The transmitter was built and a complete station was soon on its journey to far off Pitcairn. Delivery was difficult because there is no established freight or mail service. Because of treacherous reefs and the absence of any kind of harbor it is avoided by freighters and cruise ships alike. Following one delay after another, the station finally reached the island and the first signal was sent out in 1938.

Pitcairn is a paradise for radio operators. There is no interference from power lines or automobiles, and the private call is well known by amateurs the world over. During the following year Andrew contacted thousands of hams in all parts of the world and sent out more than 3,000 Q.S.L. cards.

All was well in Paradise until a year ago when the transmitter refused to operate. In desperation, it was sent to Panama, 3,000 miles away, for repairs, where it remained until the arrival of the *Yankee*.

Two months later, after calling at Ecuador, Galapagos, and Easter Islands, the *Yankee* expedition arrived at Pitcairn and was met by almost the entire male population in their two, forty-foot homemade whale boats. After a wild and wet row through the high surf, the radio and part of the *Yankee's* crew landed on the island itself. Here we received the most hearty welcome. While the rest of the crew spent the following week exploring the island, the radio operator stayed at the home of Andrew Young and helped set up the transmitter.

The receiver is a Sargent, model 12, similar to that used on the *Yankee's* last trip.

The transmitter is constructed in a steel cabinet, thirty-six inches high by nineteen inches wide. In the top compartment is an *Ampere ZB-120* final amplifier with three tank coils controlled by a switch to operate on twenty, forty, and six hundred meters. Six hundred meters is essential for communication with passing ships. Here are located five 3" meters, indicating various voltages and currents.

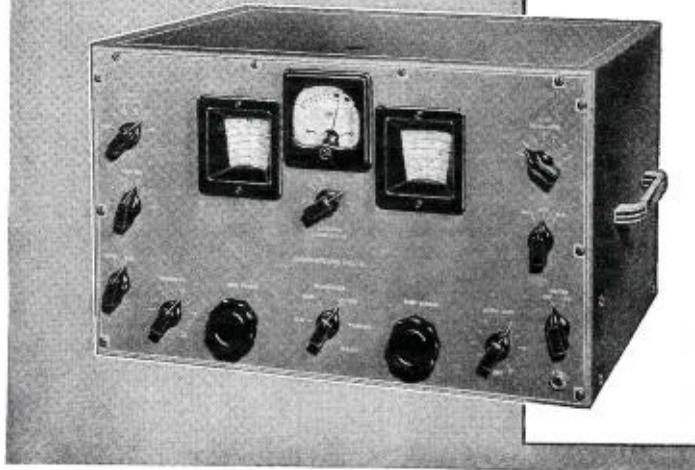
In the middle compartment is the *RCA-807* crystal oscillator with three

crystals ground for 14,346 kc., 7245 kc., and 478 kc. operation. The selection of any one crystal is controlled by a switch ganged to the tank coil switch.

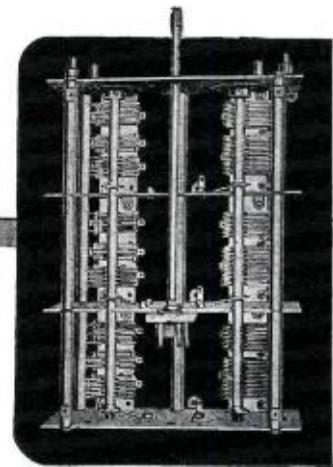
On the lower chassis is the modulator, consisting of a pair of 6L6's in push-pull, and a distribution center for the power supply consisting of a 750 volt dynamotor, and a 12 volt storage battery. A 12 volt wind driven generator mounted on a twenty foot wooden tower keeps two six volt, 300 ampere hour storage batteries charged. This provides a necessary reserve of 8 to 10

*Engineering*

*in every*  
**PART!**



**HQ-120-X**



**T**HERE'S a lot more to a radio receiver than meets the eye. Careful planning of the original design and thorough engineering of the parts which make up the receiver are of extreme importance, but can only be appreciated after considerable experience with the receiver. It usually takes two or three months to find out whether or not a mistake has been made in the selection of a product, and then it is too late. You can get some idea of the hidden values in the "HQ" by consulting present owners and surveying the used receiver market. You will find the "HQ" stays sold. Also, the many outstanding features such as variable selectivity crystal filter, calibrated band spread, and antenna compensator are original Hammarlund developments. These were planned and engineered into the original design. The more critical you are in selecting a receiver, the more likely you are to choose an "HQ-120-X."

**IMPORTANT!**

**U**NTIL recently, the "HQ" has been available in standard black cabinet and panel. Gray models were available at a slight increase in cost. Standard models will, henceforth, be finished in gray, and black models will be available only on order. There will be no extra charge for either the black or the gray.

Our technical department will be glad to answer any questions you may desire to ask regarding the "HQ-120-X." Also, write Dept. RN-5 for 16-page booklet containing complete technical data.

Canadian Office: 41 West Avenue, North, Hamilton, Ontario

**HAMMARLUND MFG. CO., INC.**  
424-438 WEST 33rd ST., NEW YORK

EXPORT OFFICE: 100 VARICK STREET, NEW YORK CITY

hours continuous operation of both transmitter and receiver.

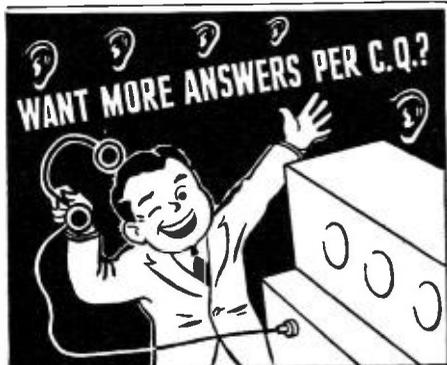
Antenna for the transmitter consists of two half wave doublets, fed through concentric cable. A separate antenna is used for the receiver.

A 3-position switch allows the selection of c.w., phone or "off." With the dynamotor drawing 28 amperes at its maximum continuous output, the transmitter is capable of about sixty watts modulated output. On c. w. the output can be raised to eighty watts.

In the old days, when a message was received from a passing ship, the operator walked to the door and yelled "Sail Ho!" at the top of his lungs. The call would be taken up by the natives and relayed all over the island to everyone, it mattered not where they were, in the field, on the mountain, or at the sea shore. The cry would go out from the radio shack and in one great wave spread completely over the island. A meeting was called and arrangements made for gathering fruit and loading it into the open boats. Soon they would be miles at sea ready to meet the passing ship. Today though both ship and island is dead. Due to exigencies of war, English amateurs have been taken off the air and ships are afraid to transmit because of enemy raiders. Silence has rolled across the oceans enveloping this lonely island inhabited with people who know nothing of war. Yet this island has a voice, a powerful voice that can instantly warn the world if sea raiders approach or attempt to establish a base here.

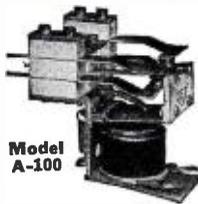
Thus closes another chapter in the colorful history of this far away island.

-30-



★ Sure—it's tough to get signals with so many new, snappy rigs in your district! But . . . you can send faster . . . push to talk . . . and get more answers per C.Q. How? Rebuild your rig to rate with the best. Do it with Automatic Changeover Relays by Guardian. Mighty low in cost . . . proved by years of dependable performance . . . Relays by Guardian are obtainable for every application in the radio amateur and radio service field.

### RELAYS by Guardian . . .



Model A-100

Standard A-100 and A-100-C Antenna Relays Alsmag insulated operate on 110 V., 60 cycle A.C.

Amateur List Prices:  
A-100 Double Pole Double Throw Relay . . . . . \$5.95  
A-100-C Single Pole Double Throw Relay . . . . . \$3.30

R-100-G Triple X insulated . . . . . \$5.00

Write for New Bulletin "N" and Free Circuit Diagrams. Order Today!



## GUARDIAN ELECTRIC

1630 W. WALNUT ST. CHICAGO, ILL.

## Field Day Portable

(Continued from page 11)

constructed on a 11"x8"x2" eraydo chassis. The problem of including all of the components on such a small chassis was met by some careful planning and by using a few unusual mountings for the HY.60's. The first job to tackle is the coil assemblies. These may be purchased outright or home-wound. The necessary data is included for those who wish to wind their own coils. One of the 5P assemblies is ganged to the 5G assembly by means of a flexible coupling. The 5P mounts on the baffle and is the one nearest the panel.

Short leads are provided, for stable ECO operation, by mounting the oscillator tube on its side so that the plate cap will be within the compartment housing the plate coil assembly. This leaves the base of the tube within the grid coil compartment. The mounting of this tube and socket is clearly illustrated. The baffle is cut from 1/8" eraydo metal and is held in place with spade lugs and spots of solder. Two other baffles are used. These run back of the panel, one on each side of the meter. These also permit the amplifier tube to be mounted horizontally so that the input will be within the oscillator tube plate coil compartment and the plate directly above the amp. plate coil assembly.

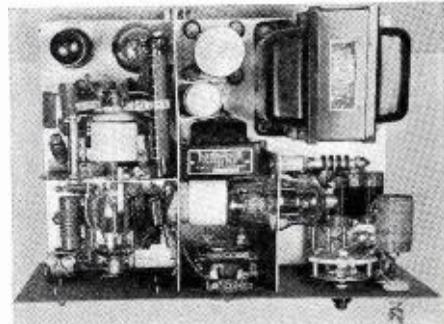
Isolantite sockets are used in the oscillator and amplifier stages. The modulation transformer may be seen mounted between the two baffles and below the meter. In back of the meter is the Mallory vibrator and two 450 volt electrolytic condensers which are connected in series. One of these cans *must be insulated* from the chassis. This was done in this model by wrapping a piece of fibre around one can, and then inserting it in the clip furnished with the condenser. The universal plate and filament transformer is mounted at the back corner of the chassis behind the amplifier plate coils. A large hole is cut so that all of the lugs will clear the chassis by at least 1/8". Other parts appearing on the top of the chassis are the 6W5G rectifier tube and the 6V6 modulator. The VR150 was added after the chassis was drilled so it had to be mounted beneath the chassis out of the way. This presents no difficulty as very little heat will be given off by this tube.

The underside view shows the placement of the remaining parts. The filter choke is mounted directly under the power transformer. All of the tuning condensers are mounted on the chassis where they are held in place firmly. They are all at ground potential which further simplifies the insulation problem. The oscillator grid condenser is mounted back under its coil assembly to reduce the length of connecting wiring. A sturdy flexible coupling must be used so that no play will be introduced to upset the calibration. One of the solid extensions could be used to good advantage.

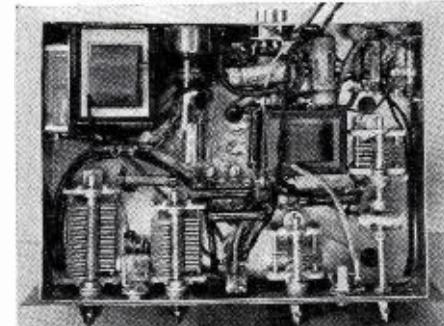
After all of the parts have been fitted on the chassis, the units should be wired in proper order. Do the coil assemblies first. Be sure that the two units are so ganged that the switching will be the same on both sections. Tinned bus wire is used for all r.f. connections. It must be rigid so that vibrations will not upset the tuning

after the ECO is calibrated. The two leads should next be run from the meter to the selector switch and all of the circuit leads wired to the proper points on this switch. This should be done *before* the modulation transformer is put in place.

The three baffles should be assembled next and bolted in the position indicated. Then the power transformer and remaining parts may be wired. The by-pass condensers and small parts are wired last. The cable socket may be seen at the back of the chassis next to the VR150 tube socket. Heavy leads must be used in the vibrator circuit to prevent any voltage drop between the 6 volt supply and the transformer. This is important for full



Top chassis transmitter view.



Bottom chassis transmitter view.

### Coil Winding Data

If the commercial band-switch unit is not used, care must be taken in using the proper type of switch. A coil-shorting, isolantite or bakelite 2-section type should be used. The switch is a 5-position unit.

#### E.C.O. GRID COIL ASSEMBLY

L<sub>1</sub>—104 T. No. 33 PE., close-wound, tap 20th T.  
L<sub>2</sub>—53 T. No. 28 PE., 60 T. per inch, tap 10th T.  
L<sub>3</sub>—27 T. No. 24 PE., 34 T. per inch, tap 6th T.  
L<sub>4</sub>—14 T. No. 14 tinned, 16 T. per inch, tap 2 1/2 T.

Note: Browning 5G Coil Assembly includes above.

#### E.C.O. PLATE COIL ASSEMBLY

Note: L<sub>5</sub>, L<sub>6</sub> wound on 3/4" Dia., others 1/2" Dia.

Note: Browning 5P Coil Assembly includes above.

#### AMP. PLATE COIL ASSEMBLY

L<sub>11</sub>—31T, No. 24 PE., 34 T. per inch, 40 M.

L<sub>12</sub>—Same as L<sub>8</sub>, 10 M. or Browning 5P assembly.

output of the transmitter. Two separate cables are used. The battery cable should consist of a pair of No. 10 flexible insulated leads and should be provided with heavy storage battery clips.

The panel is of steel and finished in grey wrinkle. The chart is for dial settings of the ECO grid condenser.

The bottom row includes the ECO grid, ECO plate, and the two antenna-plate tuning condensers. The center row includes the two band switches and the meter switch. The control opposite the chart frame is for the antenna loading coil switch. Two jacks may be seen at the bottom edge of the

panel—one for the key and the other for the microphone. Note that no variable gain control is used for the mike. It is unnecessary in this transmitter as it is almost impossible to overmodulate when using the 6V6 modulator tube. Of course, one may add a control if desired.

#### Transmitter Operation

Operation on 5 bands may be had with the transmitter with an average r.f. input of 12 to 15 watts on phone, or 15 to 18 watts on c. w. The ECO grid coil always tunes to one harmonic lower than the plate circuit for best performance. In other words—if the output of the transmitter is on 14.2 mc., the oscillator grid is actually operating on 7.1 mc. A Hi-C tank circuit is used in the grid coil assembly in accordance with good practise. Each coil is shunted with a fixed silvered-mica condenser having an average capacity of 200 mmf. for each coil. The variable condenser is 100 mmf., that is used for tuning the coil over its range. A sturdy unit should be used for this position so that the condenser will maintain its characteristics for a long period of time.

The HY 60 r.f. amplifier may be operated on either the fundamental frequency from the oscillator plate, or on the second harmonic, as a doubler. There is some advantage in using this procedure for 10 meter output, possibly due to a small amount of regeneration in the circuit at this frequency. No trouble was experienced from self-oscillation of the amplifier stage due to the complete shielding provided by the two baffles and the short grid lead from the oscillator. The isolation is most complete between the input and output circuits which has an advantage for trouble-free operation.

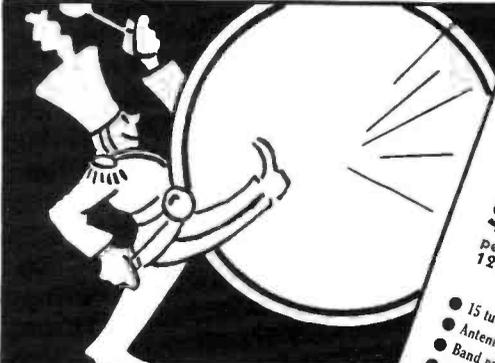
The 40 meter coil was removed from the oscillator grid and plate assemblies to conserve space. When operating on that band the oscillator is set for 80 meters and the amplifier used as a doubler for 40 meter output. The switch used on each coil assembly is a two gang-5 position, coil-shortening type. All coils not used are shorted together at both ends. This prevents any absorption of r.f. currents and adds to the efficiency of the band switching.

Tuning on each band follows conventional procedure. The ECO grid dial must be calibrated against an accurately tuned receiver. This dial is rather small in diameter, so operation near the edges of the bands must be avoided. A chart is prepared showing the safe limits that should be employed when setting frequency. A ¼ watt neon lamp is connected to the antenna circuit on the amplifier output to indicate the presence of power at the input to the antenna.

The EC-1 Communications receiver comes with a schematic diagram of

the circuit. We have reproduced this circuit with all of the changes included. The first operation is to rewire all of the filaments from the series to parallel. The original tubes are not used. Some dealers may be willing to exchange them for the 6 volt types required in our modified version. A rectifier tube is not used. The socket may be removed to provide an opening for the phone jack leads. This jack is mounted on the panel above the original phone-speaker switch.

Considerable B drain may be saved by using a jack provided with extra



**JOIN THE "PARADE" TO NEWARK**  
for your hallicrafters SX-28

★  
**\$15.95**  
DOWN ...  
and  
**\$12.68**  
per month for  
12 months ...

★

- 15 tubes
- Antenna trimmer
- Band pass audio filter
- Adjustable noise limiter
- 2 stages of preselection
- Micrometer scale main tuning
- Machine tool grey wrinkle steel

**SPEAKERS**

- Regular PM 23 speaker in metal cabinet..... \$159.50
- Hallicrafters Jensen bass-reflex enclosure 30" high, 16" deep, 22 1/2" wide..... \$29.50
- Hallicrafters Jensen bass-reflex enclosure 23 1/2" high, 10 1/2" deep, 17 1/2" wide..... \$19.50



### Sky Champion S20R

Buy It the Easy Newark Way

**\$4.95** down **\$5.90** per month

**Eight Months to Pay!**

Sensitivity, selectivity, and all-around quality performance you'd expect only in a high priced receiver... yet Hallicrafters give it to you for only \$49.50! Has all the essential controls for good amateur reception. Complete with tubes and speaker. Nothing else! **\$49.50** to buy. Cash price.

### HIGH VOLTAGE POWER TRANSFORMERS

One of America's largest transformer builders made these... and NEWARK's immense amateur radio business enabled us to get them for you at a price! We guarantee every one. Real "huskies" they are, and just the things for your Ham rig!

Choice of Two Filament Types

No. 4140 — 600-0-600 V. — 200 Ma. Filaments: 7.5 V.C.T.-3A. — 5.0 V.C.T.-3A — 2.5 V.C.T.-10 A. Wt. 8 1/2 lbs. **\$2.85**

No. 4240 — 600-0-600 V. — 200 M.A. Filaments: 6.3 V.-4 A. — 6.3 V.-3 A. — 5.0 V.-3 A. Wt. 8 1/2 lbs. **\$2.85**

### FILTER CONDENSERS

Oil Filled—Impregnated  
As low as **59c**

Thousands now in use by "hams" who are still wondering how we can sell such dependable quality condensers at such low prices. No compromise with quality. Made by a leading manufacturer and **GUARANTEED** at rated voltages.

Mfd. Volts DC.	Size	Price
1	1000 5 x 3 3/4 x 1 3/4	\$.59
2	2000 4 3/4 x 3 3/4 x 1 3/4	1.59
8	2000 5 x 3 3/4 x 3 3/4	2.75
4	3000 5 x 3 3/4 x 3 3/4	3.75

This book belongs in every "ham" shack, ready for instant reference. Helps you plan your new rigs, figure costs, learn sizes and specifications before you start construction. NEWARK'S most complete amateur radio parts and equipment guide... contains many more items than we've ever put between the covers of any catalog. Thousands of bargains, sets, parts, accessories, supplies, of best known makes. Hundreds of illustrations. **WRITE FOR YOUR FREE COPY NOW.**

**NEWARK** Electric Company  
325 W. MADISON ST.  
Dept RN CHICAGO, ILL.

→ **CIVILIANS HAVE NO PRIORITY! SAVE BY BUYING NOW! PRICES GOING UP!**

## hallicrafters S-29 ★

**PORTABLE COMMUNICATIONS RECEIVER**

**\$59.50** Complete with Tubes, Battery and Speaker. \$5.95 Down—\$7.10 per Month for 8 Months.



Hallicrafters' Universal Portable Receiver — take it with you — use it at home. Operates on either 115 volts AC — DC, or from self-contained batteries. Tunes from 542 kc. to 30.5 mc. (553 to 9.85 meters). Self-contained antenna. One stage preselection on all bands. Electrical bandspreading.

→ **ORDER YOUR HALLICRAFTERS SET ON NEWARK'S EASY TERMS . . . Today!**

Pick out the receiver you want, and write or print your order plainly. Write name and address plainly, enclose down payment and credit reference. We ship immediately upon credit approval. You pay balance plus carrying charges, in equal monthly payments. Any Hallicrafters receiver may be purchased this easy way if you order it from NEWARK!

→ **SEND AT ONCE FOR THIS FREE BOOK!**

contacts as indicated. When phones are plugged in, the cathode of the 6G6G amplifier is disconnected and the tube will be inoperative. This saves some 13 ma. plate current. Plenty of volume is available through the phones if they are of high impedance. We use the *Trimm* featherweight phones with an impedance of 24,000 ohms.

The receiver originally includes a "stand by" switch to open the cathodes of the mixer and i.f. tube. This is rewired to be in parallel with the relay contacts controlling the B minus so that the receiver may be run when the transmitter is on for frequency checks. The set operates well with any plate voltage between 67½ volts to 135 volts. This model includes four 45 v. *Eveready Mini-Max* batteries in series parallel. This gives more than twice the life of two batteries in series to give 90 volts.

The output circuit requires the most change from its original circuit. The output transformer must be replaced by one having a primary impedance of 12,000 ohms, with a secondary of 3-4 ohms. One of the small midget universal transformers would be well suited for this application. Of prime importance is the removal of R12. If this is left in the circuit it will place a steady drain on the B battery, even when the set is not in operation. *It must be removed.*

Other resistors not required in the converted set are: R13, R14, R16, R17 and R11. These should all be removed. The new cathode resistor for the 6G6G output tube is 450 ohms, ½w. This replaces R11 on the original.

Several condensers may be discon-

nected from the circuit, namely: C3, C14, C17, C18, C15, and C16. None of these will be needed. The line cord is also removed. The original receiver has provision for headphones at the output of the set. This may be eliminated as provision has been made ahead of the output stage for them, with the advantage of saving power. In field day operation, speakers are rarely used. The set was designed, originally, for a.c.-d.c. operation and the antenna coils returned through C3 to the chassis. We shorted this out and returned the antenna circuit directly to ground.

The cabinet is also "floated" above chassis potential. This is also connected directly to the chassis and the entire unit may be grounded. Fortunately, the same socket connections are used on both the original tubes as well as the new substitutes and no trouble should be had in making the change-over. The two leads to the speaker are removed so that longer ones, that will extend into the speaker compartment, may be used.

The above conversion may appear to be a difficult operation. Actually it requires but about two hours time to do the entire job. The added cost, including tubes, is under five dollars. If one were to start from scratch and duplicate the performance of this set, it would require almost the equivalent expenditure and the band-switch assembly would present much difficulty to the average ham or constructor. All of the difficult construction is left undisturbed, which leaves the simpler circuits as the only ones requiring attention.

The set is mounted in the cabinet after removing the four rubber feet. These are used on the new cabinet as a protection to table tops, etc. Holes are drilled through the wood bottom, using the steel bottom cover as a template, and the set is held in place with 1" ⅝ machine screws.

The cabinet is constructed entirely from wood. The framework is made from ½" No. 1 pine, while the two covers are cut from ½" plywood. The compartments are also made from pine and mortise joints are used to strengthen the assembly. The construction is shown clearly in the illustrations. The finished case is carefully sanded and given a coat of white undercoater. After this dries, it is sanded again and a coat of porch and deck enamel is applied of the proper color. This model uses a standard *Army* olive drab which is a pleasing color for outdoor equipment. The case is again sanded to remove the gloss and then a good heavy coat of *Simonize* applied. This makes the rig waterproof, besides giving a professional appearance to the complete station.

All hardware is of brass finish. Corners are used to protect the sharp edges of the case. Two snaps are used on each side of the front cover to hold it in place. A heavy trunk handle, of leather, is bolted—not screwed—to the top of the case. Do not sting on this item as considerable weight must be supported.

Decorative aluminum strips are put in place as shown as a finishing touch to our model. The key, or bug may be screwed to the bottom of the lower compartment or to the removable front cover. Plenty of room is available to house a 130 ft. roll of antenna wire, log, phones, spare tubes and vi-

brator, neon lamp, and small tools.

Two panel lights were added to provide some illumination for night operation. More than once have we used a flashlight—if available—to assist us in making our log entries. A toggle switch is used so that they may be turned off except when actually needed. Don't use them unless absolutely necessary, to conserve battery drain.

Those who build this complete station will have an efficient unit that may be set up, ready for operation, within a few minutes' time at almost any location. It is a pleasure to operate such a unit "on location" where our equipment is conveniently arranged for good operating procedure, where nothing is hay-wired, and where almost any type of antenna may be tossed up to a high limb, the battery cable connected, and—well, let's call CQ.

### As I See It!

(Continued from page 12)

of test equipment within a year. Even today electrical meters are not in abundance. Yes, they are available; but all of us know that the government orders get priority and those manufacturers of complete assemblies intended for the government also get priority over those who are making for non-government sales. Thus the equipment of the character intended for the serviceman, must wait its turn.

Right today there is a shortage of aluminum, isolantite, nickel and other materials. If we project these shortages into the many applications of these materials and the resultant devices, it is simple to see that radio items which employ aluminum will be more and more difficult to get. Materials which use isolantite will be the same way and for that matter this also applies to other insulating materials suitable for high frequency application. As far as electrical meters are concerned, there are many meter manufacturers, but we do not know of a single one who is not rushed so that meters intended for service equipment are hard to get and will be more so later on.

What does this mean to the servicing industry? It means that those servicemen who have any intention of buying test equipment during this year should buy it as soon as they can. If they cannot get immediate delivery, place the orders for what you want and wait your turn—then place your order. Naturally the man who is not interested in any new apparatus, has no concern. Maybe he is fortunate. But the man who feels that some of his apparatus is on its last legs and replacement will soon be necessary so as to be able to continue operations, had better pay heed to what is happening.

Frankly, it would not surprise us if there will be an increase in prices as the year unfolds. After all, the law of supply and demand still holds. If certain materials are hard to get and are essential, a higher price, if asked, is paid. A little more here and a little more there and the net result is a three, four or five dollar increase in the list price of a product.

Then again if certain materials are not available and substitutes must be used, oftentimes these substitutes



## RADIO made EASY

**LEARN AT HOME - IN SPARE TIME!**

**36 VOLUMES in 1 Big Book!**

1. Broadcasting System
2. Sound Speech Music
3. Electron Theory: Electric Current
4. Elec. Units; Ohm's Law
5. Electric Circuits; Batteries
6. Magnetism
7. Electromagnetism
8. Electromagnetic Induction
9. Inductance
10. Capacitance; Condensers
11. A.C. Circuits
12. Filters
13. Measuring Instruments
14. Radio Waves
15. Broadcasting
16. Receiving
17. Vacuum Tube Principles
18. V. T. Characteristics
19. Vacuum Tube Construction
20. V. T. Detector and Amplifier Action
21. Radio Frequency Amplification
22. "Superhets."
23. R.F. Amplifiers; Tuning Coils
24. Audio Amplifiers
25. Loudspeakers
26. Battery Receivers
27. Power-Supply Units
28. Electric Receivers
29. Auto and Aircraft Radio
30. Phono Pick-ups; Public Address
31. Short Waves
32. Photoelectric Cells; Cathode-Ray
33. Television
34. Antennas and Grounds
35. Testing; Servicing
36. Sound Pictures

**Ghirardi's COMPLETE Course will train you QUICKLY**

Here's your BIG CHANCE to get a thorough training in basic RADIO FUNDAMENTALS—quickly, easily, without previous experience or study. Today there are BIG OPPORTUNITIES and lots more jobs for men with radio training—in radio factories in radio service shops—and in all branches of the Army and Navy.

**RADIO, SOUND, TELEVISION —MADE EASY AS A. B. C.**

Ghirardi's famous RADIO PHYSICS COURSE is the quickest short-cut radio training you can find. The most complete and most economical too! His clear explanations, graphic illustrations, and 836 self-testing Review Questions make it as easy to understand as a primer. Thousands of successful radio men got their start with this book, and it's used by more radio schools and students than any other radio text in the world! Get this whole 972-page course today for only \$4—and get started on your own radio career!

**Use It 5 Days —OUR RISK!**

Your money back if not fully satisfied. Don't delay—get started now—mail this coupon at once!

**972 Pages 508 Illus.**

\$ 4

**Only \$4**

**CLIP OUT — AND MAIL!**

Radio & Tech. Publ. Co., Dept. RM-51 49 Astor Pl. N. Y.

Enclosed find \$4 (\$4.50 foreign) for my copy of "RADIO PHYSICS COURSE" with your 5-day Money-Back Guarantee.

Name

Address

City  State

Send me free literature.

cost more than the original. For example a brass panel fabricated to replace an aluminum panel costs more than the aluminum panel, but if the manufacturer must have brass because he cannot get aluminum—brass it must be and the higher tariff must be paid.

Again we say that we are not trying to create fear—for there is no occasion for alarm, but don't be an ostrich and bury your head in the sand. Just because you cannot see what is happening around you, is no reason for saying that nothing is happening. We can speak from experience, as it applies to meters. We require certain additional meters in our laboratory. Five months ago the meters from one particular concern were available within one month from the date of order. Two weeks ago we were told that deliveries could not be made in less than SEVEN MONTHS. Maybe this is an exception—but it is a trend! It also exists in the field of machines used in manufacturing like lathes, drill presses, milling machines, gear cutters.

If you need test equipment or figure that you will need it in the near future—give thought to it today!

They say that it is an ill wind that does not blow somebody some good. Maybe the condition that is developing in the test equipment field may give rise to home-construction of test apparatus, a condition much liked by magazines but even so, certain completed products must still be purchased and that may prove to be the stumbling block.

#### Shortage of Servicemen— Servicemen and National Defense

IT took a war in Europe to create a shortage of servicemen in the United States. Some of you who may be located in places where the *National Defense* activities have not influenced your operations may not realize it, but there exists a shortage of experienced servicemen in every large center of the United States. In fact, in every part of this country where aircraft or electrical equipment manufacturers have plants, they have taken into their folds most of the very good servicemen. The draft has taken the rest who are eligible. The net result is that set jobbers and set dealers are looking for men and offering remuneration far in excess of that which has ever been paid employed servicemen. In fact, in certain areas one organization attempts to entice men from another by offering more pay. But what happens in these groups is not of particular interest to us since the servicemen working for jobbers and dealers are already very well taken care of. Let's look to the independent. An opportunity such as never existed before is developing for this man. He has finally come into his own on a basis which leaves room for no argument that whatever success is achieved is purely one of individual effort. Naturally, he who strives the hardest derives the greatest benefit, but today all independents who are still acting as servicemen find the opportunity of making money. Let's hope they do not miss the opportunity.

This condition is fortified even more strongly by signs which indicate that as the result of the *National Defense Program*, there will be a material reduction in the number of different models and the number of the radio receivers produced for sale for the

public at large. A guess would be that not much more than perhaps 50% of the receivers sold last year to the public will be sold this year. The reason is not reduced interest in broadcast receivers on the part of the public but rather, the utilization of manufacturing facilities to meet government requirements. The net result will be a material reduction in the number of old receivers replaced by new receivers. And since the public interest in radio broadcasting is still at a high pitch and will remain at a high pitch, there cannot help but be a very greatly increased amount of service required upon receivers now in the hands of the public.

There is no doubt of the fact that many new men will come into the

servicing picture but there again it is significant to remember that as a result of the *National Defense Program* the facilities of many schools are being directed towards the preparation of men required by the various communication agencies of the government service. In other words, we doubt if the portion of the student body of the many radio schools, who graduate this year and join the ranks of the servicemen will be as great as those of last year and preceding years.

Considering all of these factors it leads to but one conclusion—successful operation of competent serving organizations is finally a reality.

See RADIO NEWS Ad. Page 60

## BOY OH BOY— IS THIS GIVING IT AWAY!

NOW  
ONLY  
**\$76.95**  
LESS SPEAKER  
—Was \$115.50



## HALLICRAFTERS "TWENTY-THREE"

PRICES cut to the bone on Nationally Known Radio Supplies during this Spring Clearance of Demonstrators, guaranteed 1940 models and brand new surplus stock of Nationally known short wave receivers, ham gear and radio service instruments. Your chance to get highest quality radio needs at practically your own price.

Imagine this famous Hallicrafter 23 that formerly sold for \$115.50 less speaker—now only \$76.95! Current model—guaranteed! Saving of one-third! Complete with tubes and crystal—Speaker \$12.00 extra. Compensated frequency stability, eliminating drift. Accurate reset band spread system. No bandset dial to fuss with. Stations always come in at same place on dial. Shipping weight, 56 lbs.

57VTO8816—Cash Price.....\$76.95  
All these bargains available on Easy Terms—write for details.

Write for our folder showing merchandise and equipment included in this sale. Ask for Folder No. RN6578M. Also get our new Ham and Service Supply Catalog No. RN717M and our complete PA Catalog No. RN732M.

We have a Very Limited Number of National 1940 Model NC-80X and NC-81X Receivers priced low for immediate clearance.



Many items of popular and current model Test Instruments also included in this Bargain Festival. Take advantage of this once-in-a-lifetime opportunity—ACT NOW!

SEARS, ROEBUCK AND CO., CHICAGO, ILL.

## ASSURED STABILITY

WITH

### BLILEY CRYSTAL UNITS

10-20-40-80-160  
METER BANDS



**TYPE B5**—This highly active crystal unit for the 40 meter band has less than 4 cycles/mc/°C drift. Price \$4.80.

**TYPE LD2**—An efficient and powerful low drift crystal unit for the 80 or 160 meter band. Price \$4.80.

**TYPE HF2**—Simplifies the construction of 5-10- and 20-meter transmitters. Drift, 20 meters, 20 C/mc/°C; 10 meters, 43 C/mc/°C. Price, 10 or 20 meters, \$5.75.

**TYPE BC3**—A moderately priced mounted crystal with unusual activity and power output. Drift 23 C/mc/°C. Price, 40, 80 or 160 meters, \$3.35.

**BLILEY ELECTRIC CO. • ERIE, PA.**



DIRECT-COUPLED  
AMPLIFIERS

ENGINEERED BY  
**A. C. SHANEY**

Write For Complete Details

**AMPLIFIER COMPANY of AMERICA**  
17-21 West 20th St. New York, N. Y.

COULD YOU  
QUALIFY AS A  
**FLYING  
CADET?**



**IF** you wanted to become a Flying Cadet and were required to take a mental examination, how would you fare with questions on grammar, composition, history, geography, physics, arithmetic, geometry, algebra, yes, and trigonometry, too? Think you could get a passing grade? See how many questions you can answer in the quiz (a cross-section of a previously held examination) in the May issue of **FLYING AND POPULAR AVIATION**. Test your knowledge and then judge for yourself whether or not the Army is too strict! By all means, don't miss "The Army Wants Them Smart" by Major Roland Birnn.

MAY ISSUE

**FLYING AND**

POPULAR AVIATION

NOW ON SALE AT ALL NEWSSTANDS—25¢

## Correct Receiver Measurements

(Continued from page 16)

lographic method, selectivity measurements may be repeated at as many signal frequencies throughout the range of the receiver as the operator desires or the condition of the set would seem to demand.

### I. F. Gain Tests

**I. F. Gain.** The gain of the intermediate-frequency channel may now be inspected by performing the following operations:

1. With the output meter connected to the receiver, as in the last operations, the signal generator is set to deliver signal voltage at the receiver's intermediate frequency. The "high" lead from the generator is connected to the grid terminal of the first detector and the other lead to ground. The normal circuit connection to the detector grid is left undisturbed,

2. A modulated i.f. signal is applied to the first-detector grid and the attenuator adjusted until the output meter reads the rated undistorted audio power output of the receiver. The microvoltage required to produce this amount of audio output is then read from the attenuator and recorded,

3. The generator "high" lead is then transferred to the grid terminal of the first i.f. tube, the normal grid-circuit wiring of the set being left undisturbed, and the generator output voltage increased by advancing the attenuator until the output meter gives the same reading as before. This microvoltage at this point is also recorded. And the ratio of the last attenuator reading to the first obtained will give information regarding the gain of the first i.f. stage. For example; if the reading obtained from the first detector operation is 10 microvolts and the reading from the second 100 microvolts, the stage gain is 10,

4. The "high" lead is then transferred to the grid terminal of the second i.f. tube and the attenuator advanced to restore the output-meter reading obtained in the previous operations. This new attenuator reading is noted, and the gain of the last i.f. stage determined from this reading and the microvolt reading taken in the previous operation. For example; if the last reading obtained was 500 microvolts, this value is compared with the microvoltage of 100 obtained from the operation immediately preceding. Here the stage gain for the last i.f. would be 5.

### R. F. Gain Tests

**R. F. Gain.** The individual radio-frequency amplifier stages, if these are included in the receiver, may be inspected as follows:

1. The output meter is left connected as in the previous operations,

2. The signal-generator leads are then transferred; the "high" one being connected to the first detector tube's grid terminal and the other to ground. The normal circuit connections to the tube grid are left undisturbed,

3. Both receiver and signal generator are tuned to some desirable frequency, and the attenuator is adjusted until a signal level is reached where the output meter indicates full rated power output. The microvoltage level

of the signal is then read from the attenuator and the reading recorded,

4. The "high" lead from the generator is then transferred to the grid terminal of the second r.f. tube, the normal circuit connection to that tube being left undisturbed, and the attenuator backed down to restore the original reading of the output meter. The reading of the attenuator at this point is likewise noted. And the ratio of the latter reading to the one first obtained will indicate the gain of the 2nd r.f. stage,

5. The "high" lead from the generator is then transferred to the receiver antenna terminal and the attenuator again backed down to restore the original output-meter reading, the microvoltage at this point being noted and compared with that obtained at the 2nd r.f. grid to obtain an expression of the gain of the 1st i.f. stage.

6. These r.f. gain measurements may be repeated at as many frequencies throughout the range of the receiver as the operator may desire or the condition of the set may seem to warrant. A graph may be drawn, plotting arbitrary gain figures against frequencies, to show deficiencies in gain at various settings of the receiver dial.

### Image Ratio Tests

**Image Ratio.** A poor signal-to-image ratio can cause considerable difficulty in superhet reception. Short-wave receivers, in particular, should be checked for this characteristic:

1. With the output meter connected as in previous operations, set both signal generator and receiver to some desirable frequency,

2. Couple the generator to the antenna and ground terminals of the receiver and adjust the attenuator until the modulated input signal causes a full undistorted power-output deflection of the output meter,

3. Now, leaving the receiver dial undisturbed, set the generator to a frequency removed from the original frequency by twice the intermediate frequency of the receiver, and note the reading of the output meter at this point. The two meter readings thus obtained will express the signal-to-image ratio.

### Noise Ratio Tests

**Noise Ratio.** Noise, due largely to shot effect in tubes and electron action in conductors, is generally of negligible level in broadcast receivers but of a high order of magnitude in short-wave sets employing r.f. amplification. However, excessive noise in either type of receiver may be an indication of faulty tubes or circuit components. The noise level with respect to maximum output may be checked in this manner:

1. All connections are made as indicated under the directions for measuring the image ratio,

2. The receiver and signal generator are tuned to some desirable frequency, the attenuator being set so that the receiver delivers maximum undistorted power output to the meter circuit,

3. The generator is then disconnected entirely from the receiver, leaving all settings of the receiver undisturbed, and the reading of the output meter noted. Any reading of the meter will then be due to noise or hum level, as distinguished by a listening test. It will in all probability be nec-

essary to switch to one of the low ranges of the output meter to obtain a satisfactory reading. The voltage or power reading of the meter at maximum signal output and the reading at noise output alone will together give the noise (or hum) ratio.

### Fidelity Tests

**A.F. Channel Fidelity.** The ability of the receiver to reproduce all tones within the range of hearing faithfully may be checked by separate inspections of the audio channel, the i.f. channel, and entire receiver:

1. For a check of the audio channel, the audio oscillator is coupled to the grid of the first audio tube, the output meter being connected as in previous operations,

2. A second a.c. voltmeter must be connected in parallel with the output of the audio oscillator to show the output voltage of that instrument at all times. This meter should have a good frequency characteristic and would preferably be a vacuum-tube voltmeter,

3. At a setting of 1000 cycles on the audio oscillator, the oscillator signal voltage level is adjusted by means of the attenuator on that instrument until the output meter in the receiver circuit reads maximum undistorted power output. The voltage reading of the meter across the oscillator is then noted carefully, since hereafter the oscillator output voltage must be maintained at that constant value,

4. Starting at 20 cycles, the oscillator frequency is then slowly varied through the entire range to 15,000 cycles or higher (keeping its output voltage constant by manipulation of the attenuator) and the receiver output meter readings at a large number of frequencies recorded. These meter readings may then be plotted in a graph against frequencies, to give a response curve. The nearer this curve is to a flat, straight line, the higher is the fidelity of the audio channel.

**Overall Fidelity.** The fidelity of the entire receiver is checked in much the same manner except that the audio oscillator is connected, together with its output-indicating meter, to the external modulation terminals of the signal generator. The receiver and signal generator are then tuned to some desirable frequency "on the nose"; and, keeping the microvolts input to the receiver at the level necessary for maximum undistorted receiver output, the frequency of the audio oscillator is carried from 20 cycles to 15,000 cycles or higher. At each of a number of a.f. settings, the readings of the receiver output meter are noted and data taken for a curve such as shown in figure 4. The voltage delivered by the audio oscillator must be that value recommended by the manufacturer of the signal generator for 30% modulation.

The fidelity of the i.f. channel may also be inspected with an apparatus set-up similar to that just described, but with the signal generator tuned to the intermediate frequency and coupled to the grid terminal of the first-detector tube. Such an inspection will very rapidly show up side-band "slicing" in the i.f. amplifier.

The measurements described in this article are well known to all men who perform engineering tests on communications receivers. They should be added to the knowledge applied daily by the serviceman.

## SERVICEMAN'S CASE HISTORIES

Reprinted with permission, from RADIO Trouble Shooters Handbook. Copyright, 1939, Radio & Technical Publishing Co. Copyright in Canada and Great Britain, and all countries subscribing to the Berne Convention, by Radio & Technical Publishing Co. All rights reserved.

### GENERAL ELECTRIC R-78

(Uses same chassis as the RCA-330 receiver.) See the Case Histories listed for the RCA-330 receiver

### GENERAL ELECTRIC K-79

(Uses same chassis as RCA-331 receiver.) See the Case Histories listed for the RCA-331 receiver

### GENERAL ELECTRIC K-80

(Uses same chassis as RCA-140 and RCA 140-E receivers.) See the Case Histories listed for the RCA-140 and RCA 140-E receivers

### GENERAL ELECTRIC K-80, K-80-X

(Use same chassis as RCA-141 and RCA 141-E receivers.) See the Case Histories listed for the RCA-141 and RCA 141-E receivers

### GENERAL ELECTRIC K-85

(Uses same chassis as RCA-240 receiver.) See the Case Histories listed for the RCA-240 receiver

### GENERAL ELECTRIC K-105

(Uses same chassis as RCA-261 receiver.) See the Case Histories listed for the RCA-261 receiver

### GENERAL ELECTRIC K-106

(Uses same chassis as RCA R-90 receiver.) See the Case Histories listed for the RCA R-90 receiver

### GENERAL ELECTRIC K-107

(Uses same chassis as RCA-260 receiver.) See the Case Histories listed for the RCA-260 receiver

### GENERAL ELECTRIC K-126

(Uses same chassis as RCA-280 receiver.) See the Case Histories listed for the RCA-280 receiver

### GENERAL ELECTRIC KZ-62-P

(Uses same chassis as RCA R-18 receiver.) See the Case Histories listed for the RCA R-18 receiver

### GENERAL ELECTRIC L-50

(Uses same chassis as RCA R-22-S receiver.) See the Case Histories listed for the RCA R-22-S receiver

### GENERAL ELECTRIC M-40

(Uses same chassis as RCA-102 receiver.) See the Case Histories listed for the RCA-102 receiver

### GENERAL ELECTRIC M-49 (Phonograph Motor)

Starting diffi- . . . 1) failure of stator to rotate on the outer bearing, due to spaghetti sleeve sticking in the slot or to the resilient bumper

2) improper lubrication on outer bearing

Noisy motor . . . 1) many noisy M-49 synchronous reactor motors may be easily quieted in the following way: Make a centering jig from a stator assembly (part No. 7653) and a bushing (contained in part No. 7657). Place the turntable on the bench face down, slip the bushing over the shaft and then slip the stator over the bushing. Spacers for centering the rotor can be quickly made from some pieces of celluloid. Loosen the screws holding the rotor to the turntable, place several spacers around the circumference of the stator in the air gap between the stator teeth and the rotor teeth. Turn the stator slowly while tightening the turntable screws, and this should center the turntable. Use care while doing this

### GENERAL ELECTRIC M-50

(Uses same chassis as RCA-117 receiver.) See the Case Histories listed for the RCA-117 receiver

### GENERAL ELECTRIC M-51

(Uses same chassis as RCA-118 receiver.) See the Case Histories listed for the RCA-118 receiver

### GENERAL ELECTRIC M-52

(Uses same chassis as RCA-119 receiver.) See the Case Histories listed for the RCA-119 receiver

### GENERAL ELECTRIC M-55

(Uses same chassis as RCA-214 receiver.) See the Case Histories listed for the RCA-214 receiver

(Please turn the page)

## HOW TO SAVE ON EVERYTHING IN RADIO

**SEND FOR ALLIED'S NEW CATALOG**

**Free!**

**180 PAGES SHOWING EVERYTHING NEW IN RADIO**

**A GREAT BOOK OF RADIO VALUES**

Just off the press! ALLIED'S new Spring Catalog—crammed with amazing values from cover to cover! ALLIED offers you everything new in Radio, real savings and fast service. Dealer, Serviceman, Soundman, Builder, or Amateur—whatever your interest in Radio, you'll find the new ALLIED Catalog a necessity! Send for your FREE copy today.

### NEW RADIO SETS

### VALUES IN P. A.

Every one a Champion—new "Personal" three-way Portables; latest Recorders; Phono-Combinations; Plastic Sets; World-wide Models; new FM-AM receivers; Auto and Farm Radios; Amateur Sets—all at lowest prices that spell Savings and Profits!

25 New Sound Systems! For every Public Address application—7 to 75 watts. Widest selection; finest features. Easy Payment Plan and 15 Day Trial. Dollar when you buy more quality 1941 KNIGHT Sound Equipment.

### FOR THE BUILDER

### 15,000 RADIO PARTS

Count on ALLIED for the latest low-cost kits and for help in building any type of radio circuit. Complete listings of the latest builders' and experimenters' supplies. New diagrams. ALLIED is Headquarters for Radio Builders!

The biggest selection of quality parts in all radio. Every leading make—complete listings for every radio building and servicing requirement. You need this reliable Guide to Everything in Radio at the lowest prices! Mail coupon now!

**ALLIED RADIO**

833 W. Jackson Blvd., Dept. I-E-1  
Chicago, Illinois

Send me your FREE 180 Page 1941 Spring Catalog.

Name.....

Address.....

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

**FREE**

## Do You Have a Low Number?

Well it's not too late to train the Candler Way because the Candler System for over a quarter of a century has taught radio code by an easy, practical method in your own home. The Communications Reserves of the U. S. Navy demand over 5000 expert radio operators. You can easily qualify with the Candler System for this and other increased pay positions. Now is the time to train for the Army, Navy or Commercial Communications field—the Candler System can train you easily and quickly—you owe it to yourself to find out how today!

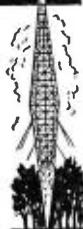
It's Free—drop a postcard today, for Candler Free book of FACTS gives you all the inside tips. This may be your opportunity—Do It Now!



**CANDLER SYSTEM CO.**  
DEPT. N-5  
ASHEVILLE, N. C., U. S. A.

## RADIO ENGINEERING DEGREE IN 2 1/2 YEARS

COMPLETE Radio Engineering Course in 2 1/2 years. Bachelor of Science Degree. Radio (television, talking pictures) and the vast electronic field) offers unusual opportunities for trained radio engineers. Courses also in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering, Business Administration and Accounting. Tuition, living costs low. World famous for technical 2 1/2 year courses. Special preparatory department for those who lack required high school work. Students from all parts of the world. Enter June, Sept., Jan., March.



FOUNDED  
IN  
1884

Write for catalog.

1651 College Ave.

Angola, Ind.

## TRI-STATE COLLEGE



**NEW! 1941 MODEL Pocket Tubes Batteries Radio Plug-in**

DURABLE PLASTIC CABINETS  
Dual Bands—Macleanite—Microdial

Fits your pocket or purse. Wt. 6 oz. Small size for travel. Receives standard & some short wave. PATENTED POWER RECTIFIER. No tubes, batteries. Hi-ratio easy tuning slide. "MICRODIAL" M.L. OF ILL. SAYS: "MIDGET RADIO WORKS FINE!" ONE YEAR SERVICE GUARANTEE!

Sent complete ready to listen with instructions & tiny phone for use in homes, offices, hotels, in bed, etc. SIMPLE TO OPERATE—NO ELECTRICITY NEEDED!  
SEND NO MONEY! Pay postman only \$2.99 plus postage charges on arrival or send \$2.99 (Check, M. O. Cash) and yours will be sent postpaid. A MOST UNUSUAL VALUE! ORDER NOW! FREE! "MAGIC-TENNA"—ELIMINATES OUTSIDE WIRES!  
MIDGET RADIO CO. Dept. HQ-5 Kearney, Nebr.

## FIX ANY RADIO Amazing New Invention

Simplified Radio Servicing by Comparison Method

Repair radios in minutes instead of hours. Revolutionary different Comparison technique permits you to do expert work immediately. Most repairs can be made without test equipment. Simple point-to-point, cross-reference, circuit suggestions locate the fault instantly. Plan copyrighted. Covers every radio set—new and old.

Complete \$1 Training

In Manual form, 8 1/2 x 11 in., 112 pages. Over 1,000 practical service hints. 18 large trouble-shooting blueprints. 114 different tests using only a 5c resistor. Invented by M. N. Beitman, noted engineer.  
Results and Satisfaction Guaranteed. The complete simplified training is yours for only \$1.00, postpaid. Will pay for itself with time saved on the first job. Limited quantity. Money-back guarantee.  
SUPREME PUBLICATIONS, Room 847  
3727 West 13th St., Chicago, Illinois

the Case Histories listed for the RCA-214 receiver

### GENERAL MOTORS "LITTLE GENERAL"

- Fading, . . . . . 1) check all resistors and condensers for change in value, and intermittent "opens" or "shorts"  
Intermittent oscillation 2) ground the variable condenser rotor with a pigtail

### GENERAL MOTORS 50 Series

- Weak reception, 1) leaky or short-circuited r-f Plate voltages low 2) leaky condenser (usually the top one in the three-pile assembly)

### GENERAL MOTORS 110

- Tone "mushy" . . . 1) replace the 250,000-ohm detector load resistor  
Intermittent . . . 1) faulty by-pass condensers in small cans (three to a can) located under the chassis. Replace with individual tubular condensers

### GENERAL MOTORS 120, 130, 140, 150, 160

- Intermittent . . . 1) tighten both top and bottom screws holding stator plates on gang condenser  
(set does not go completely dead) 2) solder a wire between top and bottom stator lugs

- Weak reception, 1) grid-bias on tubes too high. Connect a 200-ohm, 10-watt resistor across the 240-ohm section of the bias voltage divider in order to decrease the grid-bias on the tubes and bring up the sensitivity of the receiver  
Operative, 2) replace the volume control corroded condenser-gang rotor contacts. Solder the r-f filament grid return leads directly to chassis and connect flexible pigtail resistors between the rotors and the tuning condenser frame

- Intermittent reception, 1) replace the 0.25-mfd. metal-cased by-pass condenser connected to the '27 detector cathode  
2) replace the volume control corroded condenser-gang rotor contacts. Solder the r-f filament grid return leads directly to chassis and connect flexible pigtail resistors between the rotors and the tuning condenser frame

- Noisy tuning 2) reduce screen grid voltage by installing 25,000-ohm bleeder resistor between screen lead of third r-f tube and chassis

- Fading, . . . . . 1) open-circuiting 0.01-mfd. audio coupling condenser  
Intermittent reception 2) open-circuiting screen by-pass condenser  
3) broken antenna section of dual volume control

- Poor control of volume 1) replace type '24 tube in r-f stage with '35 tube

- Dial readings . . . 1) re-align receiver  
incorrect 2) re-locate dial scale

- Fuse blows . . . 1) short-circuited or leaky 0.1-mfd. line buffer condensers  
2) replace the 0.1-mfd. condenser located under the a-c terminal strip

- Hum (reception otherwise normal in No. 20 and No. 130 receivers) 2) bond the metal cases of the by-pass condensers to the front and rear of the chassis  
Hum . . . . . 1) short-circuited 0.1-mfd. filter choke "tuning" condenser  
2) defective type '27 tube  
3) temporarily "short" out the power fuse mounted on the chassis. If the hum stops, clean fuse clips. Replace with unmatched '45 output tubes

- Poor tone . . . . . 1) check the output transformer (10 models 120, 130 and 140)  
2) faulty variable resistor in the tone control. Replace with new 500,000-ohm unit

### GENERAL MOTORS 170-E (Aircell)

- Inoperative, . . . 1) if A-voltage reads "zero" volts when tubes are in their sockets, and 2 volts when the tubes are out of their sockets, resolder all filament ck't connections

### GENERAL MOTORS 220

- No control of volume 1) try replacing '27 AVC tube even if it checks O.K. in tube tester

### GENERAL MOTORS 251

- Cross-modulation 1) switch the lead from the ant. coil to the lug next to the coil, using the old antenna coil lug to connect to the oscillator condenser  
2) install a well-shielded lead from the antenna post to the antenna coil

- GENERAL MOTORS 252, 253, 254, 255, 256, 257, 258

- Inoperative, . . . 1) if removal of the AVC tube restores normal volume, check the 2-meg. carbon resistor in the AVC

- Distortion . . . . . 1) faulty 100,000-ohm resistor in the output bias system. This, and another resistor in series with it, are shunted across the speaker field to form a voltage divider. Their

## Servicemen's Legal Advice

(Continued from page 22)

violations. In prohibition times, he often sublet his store to an innocent appearing merchant, only to learn too late that the subtenant was in jail for violation of the Volstead Act, his store was padlocked for a year, but he still had his privilege to pay rent.

Servicemen are warned again that leases, and subleases in particular, can be extremely dangerous, and that it is better to be safe now than sorry later.

## Ringling the Bell

(Continued from page 22)

investing your time wisely. The fellow with the corresponding loss-habit hasn't the faintest conception of how much he expects to make this month or any other month. Like the butterfly, he flits from flower to flower and gives not a thought to his to-morrow. If he does well this month, he has good luck. If he did badly last month, he had bad luck. He is burdened with many loss-habits which eat into his time and return him nothing for his investment. He has no plan to work and he wouldn't work a plan if he had one to work.

Don't be a *business-butterfly*. Watch yourself and develop the profit-habit of *making every minute pay you a profit*. If you have some spare time, and what radio serviceman hasn't spare time once in a while, invest it profitably by studying *not idly turning the pages of your radio magazine*, a good service text book or your service manuals. If you have nothing else to study but a receiver diagram, start at the antenna and ground posts and trace the signal right through to the loudspeaker. Be sure you understand the "why" of every circuit and every part. If you have an inventive turn of mind, spend some time each evening in "thought-building" and actual experimental work. Design a test instrument if you have the desire to do so, but save it for *after-hours entertainment*. You aren't a research engineer and you aren't a test instrument manufacturer. Stick to your job of radio servicing throughout the day and save your "Edison" complex until after you close your shop.

Will these profit-habits help you make more money? Will they actually return to you in cold cash their cost in personal effort to cultivate them?

If you doubt it, read any biography of a successful man. Study the personal habits of a businessman-friend whom you admire. Best of all, give *profit-habits* a real trial yourself and, if you do, you *can't lose!*

There are two things which you must watch out for. The first is that annoying little loss-habit of selling yourself on your own excuses.

"The blankety-blank phone kept ringing today and just shot my nice plan to Hades."

"I just had to be nice to Bill. After all he's my best friend even if he did waste one solid hour of my time talking about the chances of the Yankees to cop the pennant this year."

"Oh well, you *have* to have a let-up once in a while. That fourth cup of coffee didn't take long."

Make *you* your own Boss. Don't accept weak excuses any more than you would expect anyone else to. Bear

down on yourself. Tighten up. Bawl out *you* when *you* start to "back-slide." Cultivate the *profit-habit* of never selling yourself on your own excuses.

The second *loss-habit* has been touched upon previously. It's "putting off starting the plan until to-morrow." Here is one *loss-habit* you can change to a *profit-habit immediately*.

Start planning your work and working your plan NOW. Give the cultivation of *profit-habits* a real trial. Become habit-conscious. Make a list of your *loss-habits* and turn them into *profit-habits*. Make habits work for you instead of *against* you. Don't piddle. Don't waste conversation. Don't loaf. Keep the "pla" out of "plan." Don't get side-tracked—stay on the main line—you are a streamlined limited and there are no "flag-stops" on your schedule. Don't procrastinate. Do it now. Tackle the hardest repair first. Get your rest and get up early. Use the morning hours to best advantage. Don't worry about things you can't change. Make decisions quickly regarding small matters. Invest your time wisely and profitably. Know how much your time is worth and sell it for full value. Don't be a *business-butterfly*. Study in your idle moments. Save "thought building" and "brain storms" until after shop hours. Don't sell yourself on your own excuses. Above all—*start now* on a *profit-habit* building program. *Plan your work, then work your plan!* You'll see more profit than you ever dreamed possible.

### Electronic Maintenance

(Continued from page 38)

portant and should be lived up to in the finished product. This happens to be an auto radio receiver, as we mentioned, but such information is by no means limited to auto radio systems. In fact, since in a sound installation it is oftentimes necessary to create those conditions which are productive of best sound and it is not always possible to treat the walls of the room, hence treatment must be applied to the amplifier, it is imperative to know what the tone control or frequency compensation circuits within the amplifier can do and are doing. What is the sense of having such circuits in a system unless those who install and service the system know what they are supposed to do. By this we do not mean the theory only, but also the practical result.

As this relates to receivers, while it is not our function to criticize, it would be a good thing if more manufacturers would break down the complicated tone control switching circuits contained in such receivers. We note from literature that Rider is doing that to some r.f. circuits in his manual. Maybe he can find time to do that to the a.f. systems. It would be of aid, not only from the angle of components comprising the systems, but also from the viewpoint of testing of the circuits and identification of how the circuit is arranged to accomplish a certain goal; in other words the relationship between the control circuit and the circuit being controlled would become evident.

As we mentioned an issue or two back, maybe someday an audio frequency modulator unit will be avail-

able so that an instantaneous pattern of audio frequency response may show up on the oscillograph. Speaking about oscillographs and digressing for just one moment, but remaining within the scope of this article, it is significant to note the many attempts being made by industry operating in the National Defense Program to adapt the oscillograph to various operations. And the interesting thing about all of this is that the operations are not necessarily electrical. What many companies are trying to do is to interpret conditions relating to their products during manufacture in terms of electrical impulses.

And while we are upon the subject of audio voltages and oscillographs, we trust that those people who wrote in and inquired about the clipper circuit to be used with the audio oscillator to change a sine wave into a square wave, have received their information. Some people have written in and made some inquiries about the cathode-ray oscillograph and we can kill two birds with one stone by answering these questions at this time, for no doubt there are others who may have the same questions in mind.

### The Oscillograph

The oscillograph, while presented as a means of observing various electrical phenomena, has certain limitations, but at the same time also is capable of doing certain things which many people in the servicing industry may not appreciate. Its use as an alignment device, that is response curve indicator with an r.f. or i.f. frequency modulator is quite well known. But as a direct indicator of r.f., i.f. waveform, modulated or unmodulated, the oscillograph as it is commercially sold has limitations. By "as it is sold" we mean with the vertical amplifier contained within the unit. In the older models it was possible to observe r.f. waveform up to about 100 kc. (100,000 cycles) and with the newer television models this range has been increased to about 500 kc. (500,000 cycles), but in both cases, it is essential that the original signal be appreciable because the gain within the vertical amplifier of the oscillograph is not sufficient to enable observation of an i.f. or r.f. signal which is several hundred microvolts at the source.

However, if sufficient signal is available, observation above 500 kc. is possible by going directly to the vertical plates of the oscillograph. But even when this is done, it is still necessary that the horizontal sweep voltage frequency be increased, otherwise the number of cycles which will appear upon the screen will be so many as to create a solid pattern.

What has caused much confusion is the fact that alignment operations may be carried out at i.f. and r.f. frequencies. This has led many to believe that individual cycles of the r.f. wave or the modulated r.f. wave can be observed. It must be remembered that in visual alignment, the voltage applied to the vertical plates of the oscillograph is the rectified voltage which appears across the diode load and the magnitude of this voltage depends upon the amount of voltage built up across the resonant circuit and applied to the diode plate. Hence the frequency is important only as it influences the amount of voltage built up across the resonant circuit and is not influenced by the frequency re-

# Learn at Home to MAKE MORE MONEY



J. E. SMITH, Pres. Nat'l Radio Institute Established 25 Years

I'll train you Quickly for Good Spare Time and Full Time Jobs in **RADIO**

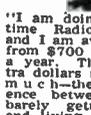
**64 PAGE BOOK FREE MAIL COUPON**



Works for State of Illinois

"If I had not taken your Course I might still be doing odd jobs or digging in ditches. I am working for the State of Illinois operating the 1,000 watt transmitter." R. S. LEWIS, 1901 S. Passfield, Springfield, Ill.

\$15 a Week Extra in Spare Time



"I am doing spare time Radio work, and I am averaging from \$700 to \$850 a year. Those extra dollars mean so much—the difference between just barely getting by and living comfortably." JOHN WASHKO, 97 New Cranberry, Hazelton, Penna.



Makes \$50 to \$60 a Week

"I am making between \$50 and \$60 a week after all expenses are paid, and I am getting all the Radio work I can take care of thanks to N. R. I." H. W. SPANGLER, 126 1/2 S. Gay St., Knoxville, Tenn.

Radio is a young growing field with a future, offering many good pay spare time and full time job opportunities. And you don't have to give up your present job to become a Radio Technician. I train you right at home in your spare time.

**Why Many Radio Technicians Make \$30, \$40, \$50 a Week**

Radio broadcasting stations employ Radio Technicians as operators, installation and maintenance men. Radio manufacturers employ testers, inspectors, servicemen in good-pay jobs. Radio jobbers and dealers employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make \$30, \$40, \$50 a week. Others hold their regular jobs and make \$5 to \$10 a week fixing Radios in spare time. Automobile, police, aviation, commercial Radio, loud-speaker systems, electronic devices are other fields offering opportunities for which N. R. I. gives the required knowledge of Radio. Television promises to open good jobs soon.

**Beginners Quickly Learn to Earn \$5 to \$10 a Week Extra in Spare Time**

The day you enroll, I start sending you Extra Earn Sheets—start showing you how to do Radio repair jobs. Throughout your training I send plans and directions which have helped many make \$5 to \$10 a week in spare time while learning. I send special Radio equipment to conduct experiments and build circuits. My 50-50 training method makes learning at home interesting, fascinating, practical. YOU ALSO GET A MODERN, PROFESSIONAL ALL-WAVE SET SERVICING INSTRUMENT to help you make money fixing Radios while learning and equip you for full time work after you graduate.

**Get Sample Lesson and 64-Page Book FREE**

My sample lesson will prove the N. R. I. Course is clear, practical, easy to understand. My 64-page Book, "Rich Rewards in Radio" points out Radio's spare time and full time opportunities and those coming in Television; tells about my Course in Radio and Television; shows more than 100 letters from men I have trained, telling what they are doing and earning. Read my money back agreement. MAIL COUPON in an envelope or paste on a penny postcard—NOW!

J. E. SMITH, President Dept. 1ER, National Radio Institute Washington, D. C.

Mail this Now **FREE** Get 64-page Book

**RICH REWARDS IN RADIO**

J. E. SMITH, President Dept. 1ER, National Radio Institute, Washington, D. C.

Dear Mr. Smith: Mail me **FREE**, without obligation, a Sample Lesson and your 64-page book, "Rich Rewards in Radio." (No salesman will call. Write plainly.)

AGE.....

NAME.....

ADDRESS.....

CITY..... STATE..... 14X1

**MODERN PARTS for  
MODERN CIRCUITS**  
THAT HAVE BEEN  
*"Designed for  
Application"*  
CATALOG UPON REQUEST

**JAMES MILLEN MFG. CO. INC.**  
150 EXCHANGE ST. MALDEN, MASS.



**RADIO**  
EVERYTHING  
IN RADIO

This one big book serves your entire radio needs. It includes sets, parts and supplies, public address systems, amateur equipment, testers, kits and fluorescent lighting. You'll find the nationally known favorites at the lowest possible prices. Get your copy of this big FREE CATALOG today.

**BIG FREE CATALOG**

**BURSTEIN-APPLEBEE COMPANY**  
1012-14 McGEE STREET, KANSAS CITY, MISSOURI



**LEARN Radio** SERVICING—8 WEEKS  
OPERATING—5 MONTHS  
(INCLUDES SERVICING)

**PREPARE FOR  
BETTER PAYING JOBS**

In Radio Broadcast, Aircraft Radio, Police Radio, Commercial Radio Stations, Ships, Radio Shops. Full training for Radio Operators, Government License Exams. Also practical shop training for Radio Service Opportunities, Sound and Television. **LEARN BY DOING**, not books or lessons. You don't need advanced education or experience to learn Radio by Coyne's modern shop training methods on real Radio Equipment. **FREE EMPLOYMENT SERVICE** for life. Many earn while learning. Hundreds of Coyne graduates are holding good Radio Operating and Servicing jobs after a few short months of practical training in Coyne Shops. I'll finance your tuition. Mail coupon today for free book and payment plan.

**H. C. LEWIS, Pres., COYNE RADIO SCHOOL**  
Dept. 51-3K, 500 S. Paulina St., Chicago, Ill.  
Send free book and full details of easy tuition payment plan.

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_

**EASY TO LEARN CODE**

It is easy to learn or increase speed with an Instructograph Code Teacher. Affords the quickest and most practical method yet developed. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready—no QRM.

**MACHINES FOR RENT OR SALE**  
The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands have used and endorse the Instructograph System. Write today for full particulars and convenient payment and rental plans.



**INSTRUCTOGRAPH COMPANY**  
Dept. NR, 4701 Sheridan Rd., Chicago, Ill.  
Representatives for Canada  
Radio College of Canada, 54 Bloor St. West., Toronto.

**PATENTS, TRADE MARKS  
COPYRIGHTS**  
Protect Your Valuable Assets.  
Expert Service.  
**LESTER L. SARGENT**  
Registered Patent Attorney, 1115 K St.  
Washington, D. C.

sponse characteristic of the oscillograph amplifier.

But for observation of either modulated or unmodulated waveform, the frequency response characteristic of the vertical amplifier in the oscillograph is important and for spreading of the individual cycles of the r.f. or i.f. wave, the frequency range of the horizontal amplifier as well as the frequency of the sweep is important. In addition it is important to realize that the input capacitance of the oscillograph is appreciable, hence placing the input leads across a tuned circuit, will tend to detune the resonant system.

An attempt to note r.f. or i.f. waveform by means of rectification through the use of a non-resonant diode circuit placed upon the plate terminals of an operating receiver is apt to give misleading results for the diode connected across the plate-cathode circuit will rectify whatever a.c. is present in the plate circuit inclusive of hum as well as audio variations which may be present in the plate voltage supply circuit.

As to the uses of the oscillograph, they are too numerous to mention. From the practical viewpoint with respect to our electronic and communication service shop, all voltages of commercial frequency and higher frequencies within the range of the individual instruments may be observed as well as measured if the oscillograph is calibrated. It then becomes a matter of establishing the places in a system where such tests are to be made, that is, if they can be made, considering the limitations set forth above.

Limitations in voltage amplitude at the source can be overcome by the use of a multi-stage resonant amplifier between the oscillograph and the voltage source. Such for example is the r.f. amplifier in the chanalyst, wherein the character of the r.f. or i.f. wave, when modulated is checked by the resultant audio voltage. If the wave is unmodulated and can be passed through the vertical oscillograph, the tuned amplifier between the oscillograph and the source helps provide the required signal voltage to the vertical plates so that an image of suitable proportions appears upon the screen. Anyone who is interested in making r.f. or i.f. observations without rectification can provide connections between the oscillograph and the plate of the r.f., i.f. diode in the chanalyst and simultaneously open the load circuit of the diode.

The oscillograph is of course also an indicator of a.c. voltage level, that is, is an output meter over a wide range of frequencies, from the lowest to the highest which can be passed through the vertical amplifier. As a means of comparison of voltage at different frequencies, it is necessary to check and see over what range of frequencies, the vertical amplifier is flat and just what the variation is over that range of frequencies, where the amplification is not uniform.

As an indicator of phase relationships between input and output circuits over the audio range, it is perfect; the input being applied to the vertical plates and the output being applied to the horizontal plates. In fact this method of rapidly checking the operation of an audio amplifier, so as to note the input levels at which overloading takes place, has been in use for many years. Phase shift in

components, which has so far been of little importance in the service field, that is, in audio circuits can be checked by feeding a square wave into the system and noting the output waveform.

Phase relationships between current and voltage for study or investigation, both of which are destined to become more popular in the servicing field, may require an electronic switching device, which while not new in radio research work, is new to the servicing field, but it is conceivable that it will find its way into the field as the scope of operations of the field advances.

So much for the present installment. For those who may be interested in some of the ideas we have advanced in this issue and would like to do additional reading, if they will drop us a line, we will be pleased to supply a comprehensive list of bibliography references.

In the next installment, we hope to cover the signal generator, the crystal calibrator and the volt-ohmmeter and maybe that will conclude this series.

### QRD? de Gy (Continued from page 32)

news that *Isthmian Line* is building four iron wagons in Tacoma and four in San Francisco. *Alcoa* has seven new wagons on the ways in the Frisco area, a few of which have been launched and will soon be put into service. Assignments last month were mostly to tankers out of San Pedro. A couple went to off-shore and five were to inter-costal. Andy, who is working closely with the other *AFL* unions in the motion picture business is trying to line up the studios to take radiops into the sound departments. As everything in this biz is *AFL*, he may succeed in opening the way to these good paying jobs for men seeking shore billets. This looks like a natural and we sure are plugging for its success. And from observing how Andy gets around, ye ed reckons it won't be long now. Keep your fingers crossed . . . these studio jobs pay \$16.00 per day and up.

**WE'VE** just received notice from Brother Fred Howe of CTU that he needs radiops to fill billets on the many new ships now going into commission. The scarcity of men has caused the draft board to defer all radiops, at least for the present, so he says. Mayhap they figure radiops are just as important aboard ship as they would be in the Army. Youse guys who dislike sleeping in tents should get in touch with CTU at 265 West 14th Street, N'Yoik, or any of their offices in other ports. This is indeed welcome news and we're passing it along, especially for those men who have a six month ticket. So go get it.

**AND** from Brother Charlie Bolvin at Akron we learn that Hal Dinger who many can remember as Chief Instructor at *McKim Tech*, is now working for Uncle Sam at the *Naval Research Lab* in Washn. . . . A couple of hams decided to make radio pay when they glombed onto jobs at the opening of *WAKR* in Akron. They are Don Dayton, W8VO as Chief Engineer, Lowell List, W8QA, Andy Smith, W9LEW, Harry Watson, W8MXL and George Paul, W8CMO. . . . Ralph Jackson's work during the big storm up on the Lakes is still worth mentioning. The storm took out all the land wires from Frankfort, Mich., so Jack handled loads of tlc via the Ham band with W8LA for the local *WU* office, after his eight hour trick at *WFK*. And that's rallyin' 'round, what.

**DURING** a gab-fest with Brother Brownie whose radio store in Hollywood is becoming a habitat of radiops, he reminisced of the good ol' days when he was on the *Pan America*, *KDWZ*, lying in the harbor of Montevideo. At that time it was unthinkable to cover 450 miles with a 1 kw spark job.

So one fine a.m. he heard *WSA* at East Moriches, Long Island, working and decided to give them a yell. Imagine his surprise when they came back right quick over the 7000 mile distance. When he got up off the floor, he sent a msg to his YL in N'York. Then there was the day when the *PanAm* slipped into the coffee port of Santos, Brazil, during the revolution in '23. She was the first vessel to get on the scene and there was a story the *UP* correspondent on board couldn't wait to send. Brownie figured the rebels didn't have any radio equipment, so he shot the story to the *PanAm's* sister ship which was in Buenos Aires. Imagine everyone's surprise when upon their arrival in Rio De Janeiro, they were met by an armed squad all equipped with rifles and bandoleros who promptly marched them all to the hoosegow for transmitting the forbidden news. It took the entire U. S. Legation to get them released. Yes, these were the good ol' days. *Thank Heaven they're gone.*

**A**ND speaking of the good ol' days, where are the fellers who shouted "my country, right or wrong, my country." There was beefing and cussing and ideas and suggestions on how this country should be run but down at the bottom of every man's heart was an inherent pride in this country; a country they'd fight for to the last drop. I believe those men are still around. I believe they just can't step aside and see some guy come along to take a swipe at ol' Uncle Sammy without doing something about it. Did you ever try breaking up a battle between a husband and wife? If you did, you know they'd quit arguing and collectively jump on the interfeerer. So it'll be if something drastic should happen. These fellows who have been listening to new-doctrine haranguers, will forget their petty grievances and fall right into step if and when the whistle blows. Look around, you travelers of the globe, and tell me where there's more freedom of action anywhere in the World. So until next month then and with best 73 . . . ge . . . GY

### Serviceman's Experiences (Continued from page 18)

have wasted time picking up the set, slipping in gratis tubes, and furtively painting fake replacements. You might have repaired the fellow's antenna, or realigned the tuning condensers, or cleaned his speaker, or sold him a spare set, or a pickup, or any one of a hundred other things—*after* you had gained his confidence and good will by taking care of his trouble promptly and competently. The way things are now, you've wasted our time and lost your opportunity. You've outwitted yourself!"

He was jealous, that's what — and the ensuing conversation was extremely unpleasant. I just *couldn't* convince him we had contracted for a profitable deal.

To tell the truth, I did feel a bit guilty when I delivered the set. I took great pains to square myself with my conscience by showing the customer the new condenser he was paying for, and he seemed to be impressed. I installed the chassis and snapped the switch on with a flourish. When I tuned in a station, he admitted it sounded good, and paid me.

"Good day, sir," I said, walking toward the door. I stopped, though, because the set rattled with each step—just as it had done before I worked on it! We stared at each other for a moment. Both our faces were red—his from anger, mine from embarrassment.

"Kind of a weak condenser, isn't it?" he asked sarcastically.

It took me more than an hour to locate the cause of that noise. It wasn't

the detector. As a matter of fact, it wasn't anything in the set. I stamped in every room on the first floor of the building, and the ringing persisted. The guy simply had a noisy house.

Finally I located a long water pipe hanging from the basement ceiling that was crooked against another pipe. It was supported loosely, and it quivered whenever the floor was shaken. I twanged it a couple of times to make sure, and heard the speaker respond each time. The remedy was simple—while the fellow watched me, I wedged a clip of paper matches between the pipes. I was plenty nervous, and wished I had repaired the set in the house during my first call.

The customer didn't say a word until I got to the door.

"Just a moment, there," he called, with an ill will I would have gladly paid five dollars and fifty cents to dissipate, "do I owe you anything for those matches?"

### Relative Field Strength Meter

(Continued from page 20)

wand, the tuning control and test signal are carried toward the 42 mc. direction, the padding condenser being continually readjusted to keep the oscillator in step. Tracking is determined in this manner: The tuning wand is brought near one end of the detector coil; if the iron-slug end increases the signal output, padder-capacity should be decreased; if the brass-slug end increases signal output, padder-capacity should be increased. No increase, but decrease with both ends, indicates detector and oscillator tuning tracking properly.

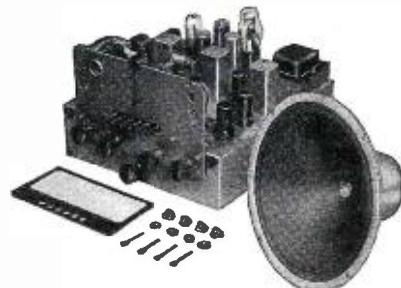
After the first time over the range, the procedure is simplified to setting the trimmer condenser at the high frequency end and the padder condenser at the low end. Use of the tuning wand obviates rocking the tuning condenser on low-frequency tracking adjustment. Of course the high-frequency adjustment should always be rechecked after the padder condenser has been adjusted. The laborious method of "creeping" up the tuning range with the oscillator padder condenser on first adjustment is necessitated by the possibility that the oscillator might be operating on one side of the carrier frequency at the high end of the tuning range and on the other side of the carrier frequency at the low end of the tuning range.

Should it be desired to "slide" the tuning range a little up or down the frequency spectrum, say one or two megacycles, it may be accomplished by respectively spreading or compressing the oscillator coil slightly, and then resetting the trimmer and padding condensers.

If pulling of the oscillator frequency by the detector tuning is suspected, it may be ascertained by tuning in the oscillator output on a wavemeter or another receiver having a signal measuring meter and watching for change in oscillator frequency as the detector tuning is varied. A slight pulling may be tolerated without harmful effect, but it should be minimized as much as possible by thorough isolation of the two circuits.

The R.F. trimmer and oscillator padder condensers are adjusted through small holes without removing the covers on that side since the presence

## Now Available! FAMOUS HOWARD REPLACEMENT CHASSIS



Precision Built By  
America's Oldest  
Radio Manufacturer

Now! The famous HOWARD Radios can be purchased in chassis form for installing in custom built or old cabinets. Outstanding for foreign reception, superb tone and long life. Do your customer a favor by installing a modern HOWARD chassis instead of repairing an obsolete "has been."

#### MODEL 307—5 TUBES

5 tube, AC, 3 band chassis with 6½" Jensen electrodynamic speaker. Has phonograph and television connection and built-on loop. Size: 6½" high, 10" long, 6" wide.

#### MODEL 308—8 TUBES

8 tube, AC, 2 band (Broadcast and Foreign) with 8" or 12" Jensen electrodynamic speaker. Has phonograph and television connection and built-on loop. Size: 6½" high, 10" long, 6" wide.

#### MODEL 718—12 TUBES

12 tube, AC, 3 band chassis with 12" Jensen electrodynamic speaker. Has dual tone control and television and phono input. Has tuned R.F. on broadcast band and two I.F. stages. Size: 9" high, 12" long, 13¼" wide.

#### MODEL 568—RECORDER

10 tube, AC, 3 band recorder chassis with T.R.F. on all bands. Has input for microphone, two inputs for phono pick-ups; mixes mike and radio or mike and phono music. Can be used as P.A. system and for duplicating recordings. Has mute switch on speaker. Size: 7½" high, 14" long, 8" wide.

SEND FOR COMPLETE DETAILS TODAY

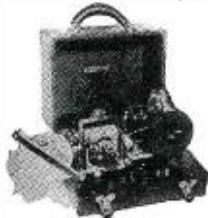
## HOWARD RADIO CO.

1731-35 Belmont Ave., Chicago, Illinois

## LEARN TO SEND AND RECEIVE CODE

Learn to send and receive code signals, like operators on ships at sea, commercial and amateur land stations. Intercept distress signals, news flashes, bulletins, and many other kinds of interesting radio communications. MASTER TELEPLEX teaches you to receive code exactly the way the world's best operators do—by sound. A heavy waxed paper tape, running through a machine, operates an automatic key which sends messages to you, at any speed you desire. As you improve, the machine sends faster, gradually preparing you for top-speed.

With the new all Electric MASTER TELEPLEX you learn to send by sending and the signals you send are repeated back to you, exactly as you sent them, thus enabling you to correct your own errors. We furnish a complete course, and you the improved All Electric MASTER TELEPLEX and give you personal instruction with a MONEY BACK GUARANTEE. Send for our new TELEPLEX FOLDER R N 5 today. IT'S FREE.



TELEPLEX CO. 107 HUDSON ST. JERSEY CITY, N. J.

**SOLAR RED-CAPS**  
Smaller Diameter Dry Electrolytics

**SPEED Servicing**

Write for Catalog



**SOLAR MFG. CORP. Bayonne, New Jersey**

**CANADIAN SERVICEMEN**

can now purchase SUPERIOR Test Equipment direct from **Radio Parts Supply Co., RN4, 962 Bleury St., Montreal, Canada.** They stock our complete line. See inside back cover in this issue.

**SUPERIOR INSTRUMENTS CO.**

**POWER AND LIGHT**

ONAN A.C. ELECTRIC PLANTS supply current for Radios, Transmitters and Receivers, P. A. Systems, Movie Projectors, Sound Truck Apparatus, Tools, Lights, All Appliances. Used as Stand-by Equipment in Schools, Hospitals, Theatres and Public Buildings in case of Power Line Failure due to Storms, Floods, etc. Available in 110 or 220 Volt A.C.—12, 32 and 110 Volt D.C.—Also Dual Voltage A.C.-D.C. Types. Manual, Full-Automatic & Self-Starting. 100 and up. Shipped Ready to Run.

**D. W. ONAN & SONS**  
1455 Royalston Avenue, Minneapolis, Minn.

**for WIRED MUSIC OPERATORS**

Breastplate "Dispatcher" type. Leaves hands free. Handsome dialectic black finish. Adj. neckband. Choice of single or double headset, high or low impedance. Available total of 12 dif. types and imp. Most attractive, lightweight, rugged, practical chest mike yet devised for operators of wired music units. At your dealer or jobber.

**Universal Microphone Co., Ltd.**  
Inglewood, Cal., U. S. A.

**RADIO-TELEVISION**

Oldest, largest Radio-Television school in West trains you for good pay job. Complete instruction including Radio Construction and Service, Broadcast Operating, Sound, Talking Pictures, Television, Public Address, etc. Flexible plan to meet specific needs of those with or without jobs. Transportation allowed to L. A. Earn room and board while learning. Request Free Catalog.

**NATIONAL SCHOOLS** Dept. 5-RN  
Los Angeles

**RADIO ENGINEERING DEGREE IN 2 YEARS**

Intensive, specialized course, including strong basis in mathematics and electrical engineering, advanced Radio Theory and Design. Modern laboratory. Low tuition. Self-help opportunities. Also 2-year courses in Aeronautical, Chemical, Civil, Electrical and Mechanical Engineering. Participation in Civilian Pilot Training Program. Enter June, September, December, March. Catalog.

**INDIANA TECHNICAL COLLEGE**  
751 E. Washington Blvd., Fort Wayne, Ind.

**RADIO TECHNOLOGY**

**RCA** RCA Institutes offer an intensive course of high standard embracing all phases of Radio and Television. Practical training with modern equipment at New York and Chicago schools. Also specialized courses in Aviation Communications, Radio Servicing and Commercial Operating. Catalog Dept. RN-41.

**RCA INSTITUTES, Inc.**  
A Radio Corporation of America Service  
75 Varotk St., New York 1154 Merchandise Mart, Chicago

**LE Correspondence Courses in RADIO and ELECTRICAL ENGINEERING**

**ELECTRICAL ENGINEERING** Get good grasp of wide electrical field. Prepare yourself at Low Cost, or secure future. Modern course. So simplified anyone can understand quickly.

**RADIO ENGINEERING** Extra fine course in radio, public address, photo-electric work. Train you to be super-service man, real vacuum-tube technician. Experimental kits furnished. Diploma on completion.

Either course, only \$25. Deferred payment plan available. Write for free copies of school catalogs, student magazines, full details. **SEND NOW!**

**LOWAS '25**  
LINCOLN ENGINEERING SCHOOL, Box 931-R 29, LINCOLN, Neb.

**RADIO ENGINEERING,**  
broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly. 48 weeks' Engineering course equivalent to 3 years of college radio work. All expenses low. Catalog free. School established 1874.  
**Dodge's Institute, Oak St., Valparaiso, Ind.**

of this cover has considerable effect upon the tuning adjustments.

Inductive coupling is provided for a dipole antenna, and capacitive coupling is provided to allow the use of a shielded lead to a small probe antenna.

The cabinet is formed of 1/16 inch thick aluminum sheet. The chassis is 3/32 inch thick duraluminum. Insofar as possible, component parts were chosen for their small size and light weight. Condenser C<sub>3</sub> is composed of two pieces of hook-up wire twisted together two or three turns to obtain the small coupling capacity. The meter should be well damped to facilitate reading while walking or climbing.

A number of useful applications of this instrument have been made, and in either the research or service fields it will be one of the most often used pieces of equipment.

**The "Aligner Upper"**

(Continued from page 13)

to right, are the magic eye, tuning condenser, and coil socket. Output jacks are directly above the coil socket. The two toggle switches control the heaters and audio oscillator, respectively.

The socket for the 25A7G tube is mounted directly from the top of the box by means of long screws and brass spacers. The socket for the 6G5G tube is mounted on the back of the box in the same manner. Before the 6G5G socket is mounted, the socket should be removed from the mounting ring and the locating pin filed off the ring. In this way, it is possible to rotate the entire assembly, in order properly to line up the pattern of the eye. The 6G5G socket is then mounted by means of angle brackets so that the end of the glass bulb is flush with the panel. An *Amphenol* escutcheon is used to decorate the panel around the "eye."

Wiring is "point to point" and all grounds are made to a common bus insulated from the case. In this manner, the case is "cold" with respect to line voltage. Coil specs are given only for the coil used with i.f. crystals as most servicemen and hams have coils available, that will tune to the frequencies of any other crystals that might be used. This i.f. coil, which will tune from 400 to 500 kc., is wound on a *Hammariund* 1½" form and is composed of a 2" winding of No. 24 p.e. wire, close wound, and shunted by .0005 and .00015 mmf. condensers in parallel mounted inside the form.

**Testing**

After completing the wiring, the unit should be plugged in and switch No. 2 thrown and the tubes allowed to warm up. This will be indicated by the characteristic green shadow on the face of the 6G5G. Plug in a crystal and coil to tune to its frequency and resonate condenser C<sub>2</sub> until oscillation is indicated by "fuzziness" of the "eye." After tuning in this signal on the receiver, turn on the audio oscillator by means of switch No. 1. This should give a 400 cycle note on the carrier. The note can be varied by changing the value of resistor R<sub>3</sub>; increasing it to raise the pitch of the note.

Several methods of introducing the audio modulation to the r.f. oscillator tube were tried without success. Finally, borrowing an idea from the old *Western Electric* aircraft trans-

mitters, screen modulation was tried and proved successful.

When first trying the audio oscillator, it was impossible to obtain any modulation on the carrier, although a pair of phones indicated that the oscillator itself was performing well. Investigation showed that the screen circuit presented too heavy a load and prevented any oscillation in the 6G5G tube. Isolating this circuit by means of resistor R<sub>2</sub> reduced this load sufficiently so that the oscillator "took off." The screen of the 25A7G tube should *not be by-passed to ground* as this will also by-pass the modulation.

Failure of the audio oscillator to operate may be caused by reversal of the leads of the audio transformer. Color coding indicated on the diagram should be followed. If some other make of transformer is used, some experimenting will probably be necessary with the polarity of the leads and value of resistor R<sub>3</sub> to obtain satisfactory oscillation.

The audio oscillator can be used to check audio circuits by taking the output from the screen circuit through a condenser, and using the "cold" output terminal as the other terminal. Also, if desired, a 25,000 ohm variable resistor can be substituted for resistor R<sub>3</sub> and the pitch of the oscillator varied to suit.

-30-

**Police Radio**

(Continued from page 28)

tion to obtain some information, the municipal station may in turn give the message to some other fixed station. Theoretically this is a radio telephone relay, but it may be interpreted as a "specific instance" in which the squad car is a branch of the municipal stations' "network," and would not count as the third station in a relay.

Even though the interpretation of this section becomes complex, we feel that as long as a certain amount of tact is employed, in handling traffic, and that our police emergency station lives up to its name, we will have no fear of any citation from the FCC on Section 10.125.

**UHF Notes**

**T**HE police radio service men would welcome with open arms an inexpensive test oscillator covering only the ultra high frequencies. At present most of the alignment work on UHF receivers must be done by using a transmitter as a source of signal. However, there are times when another transmitter is not always available. There ought to be a ready market in the police field for an accurately calibrated oscillator covering from 30 mc. to 40 mc. or perhaps up to 50 mc. to include the FM broadcast band.

**W**E noticed one of the boys using a handy little device for checking output on mobile transmitters. The equipment he used was a 6.3 volt pilot bulb connected to two short lengths of wire to which alligator clips were attached. By clipping the leads on two different spots on the length of antenna, enough r.f. potential was available to light the bulb, enabling the service man to notice the output while making adjustments on the transmitter. By placing the leads in approximately the same position on all the cars, and observing the brilliancies, an approximate output standard can be maintained.

**I**N several instances trouble has been noticed with 0Z4 rectifier tubes in police receivers. It seems that these tubes do not always start off when starting loads are great, and with the squelch circuit in operation, the officers in the cars cannot always tell whether the receiver is operating. Most of these 0Z4-vibrator power supplies are interchangeable with a 6X5, and for dependa-

bility these 0Z4's should be replaced with a 6X5. It is advisable to wire in the filament in cases where the two tubes are not interchangeable. The 0Z4's do not have to be dispensed with however, as they work very well in vibrator power supply AM mobile transmitters where the load is not applied to the transmitter until the tube filaments are allowed to heat up.

### Chatter

**C**AP. DONALD S. LEONARD, of Michigan State Police and vice-president of IACP, was recently appointed chairman of the Communications Defense Board Group handling state and municipal police radio cooperation. Leonard is certainly well qualified for this work as he is one of the foremost pioneers in the police radio field. It was through his efforts that the FCC allocated frequencies for police use way back in 1929. FCC Chairman Fly made a wise choice in appointing such an able man for this vital job.

Verne Watson, radio engineer for Oak Park, Illinois, is contemplating an increase in power for WQFL. The station now uses 50 watts, however due to the large number of contacts it handles with stations outside of its service area, the power will be raised to 500 watts. Oak Park acts as a key station for many of the municipal and county stations surrounding Chicago taking traffic for the Chicago Police and the Illinois State Police.

### Picking the Proper Speaker

(Continued from page 17)

dynamic speakers. These should be purchased with rather heavy magnets to keep the efficiency up. The cones must be able to withstand climatic changes without warping and the entire unit must be constructed so that water cannot enter into the speaker housing. Another requirement is that the speakers must be able to handle the audio peaks without too much distortion, especially if they are to be used for the reproduction of music.

Another popular speaker is shown mounted within a steel cabinet. This type is well suited for monitoring purposes, for use with communication receivers, for wall mounting in hospitals, offices, factories, etc. The response may often be improved by lining the entire insides with hair felt or some other such sound absorbing material. This will offset the tendency for the metal to vibrate at some frequency within the audio range. Cabinets are available that will accommodate speakers up to 12" in diameter. PM units are now furnished as standard equipment on most models.

Next in order is the units especially designed for directional projection or sound. These are commonly known as "trumpet" speakers. Most of them will find most use in large outdoor installations where a wide area is covered, where crowd noises will have to be offset, and where sound must be projected for several hundred feet. As a rule, the trumpets are arranged in clusters and are mounted above the crowd where they will be in the clear and have sufficient height so that the sound will have chances to reach the remote corners. It is not always practical to scatter speakers all over the area as many peculiar effects will be noticed if the distance between them is incorrect, or if a sudden gust of wind appears. The time-lag in outdoor installations becomes rather serious and

some experimenting will have to be done in order to determine the best distance to use between speakers. These trumpets are also available in waterproof types so that they may be left connected permanently in place for stationary applications. Power-handling capabilities must be considered when purchasing these units. There would be little advantage in buying speakers that could only just "get by" at normal volume levels. We must have sufficient reserve so that the speakers will never be overloaded and cause distortion. Moreover—there is possibility of the cones actually tearing from this overload.

It's really quite a job to climb poles to get at some unit that has "gone west" and a bit of careful spending on speaker units can often prevent that occurrence. Trumpet projectors are rarely used indoors, and their use is not recommended for this purpose. They are better suited for voice frequencies and fidelity will have to be discounted a bit. However, the efficiency of the trumpets is of prime importance, especially in noisy locations and they will solve many a feed-back problem where microphones are used in their proximity.

Finally we come to a brief discussion of the very large units, designed for special applications. One of these is illustrated. It is designed for installation in a large theatre where fidelity as well as efficiency must be considered. The large box type sections are the low-frequency baffles. The smaller units mounted above these are the high-frequency tweeters used to reinforce the high notes. Certain speaker manufacturers have spent considerable amount of time in developing these units. The use of complicated networks has further advanced the art. Special filters are used so that the proper amount of sound is fed to the proper unit. The response of the system is the result of the combined proportion of frequency discrimination.

As a passing thought we would recommend to all interested in sound distribution that they make every effort to witness the performance of *Walt Disney's Fantasia* when it is shown in your vicinity. Here we find a very complex assortment of horns, trumpets, etc., which make up the installation. In fact small wall type speakers are used and these surround the entire auditorium. The various effects produced by the system is the result of much research. The program is projected by two units instead of the conventional one. One projector supplies the action in the usual manner, while the other handles the sound from special film tracks. Four tracks are used, three for the various channels used to feed different speaker networks, and the fourth to take care of the automatic-volume expansion. The action is continually shifting back and forth across the screen, and as this takes place, different channels are cut in to create the illusion of directional hearing. At any rate, we hope to gain much information from similar applications. Some are now being engineered that intend to simplify the system so that the smaller theatres can afford to take advantage of this "third dimension" sound and enjoy a wider latitude in sound distribution.

# GL-807

ONLY  
**\$3.50**



UP TO

**75 WATTS**

**60-MC FM INPUT**  
with  
**1/4-WATT DRIVING POWER**  
**NO NEUTRALIZING**  
**QUICK BAND CHANGE**

Write for . . .

- Complete Ratings of GL-807 (GET-756)
- A Tribute to the Radio Amateur (GEA-3052A)

General Electric, Section 161-13, Schenectady, N. Y.

**GENERAL ELECTRIC**

161-13

**FREE** 16-Page  
Manual on  
Turner Push-Pull  
Vibrators. Get Yours Now!



**TURNER**  
**PUSH**  
**PULL**  
**VIBRATORS**

Get your FREE Manual

It contains a wealth of technical information; tells how Push-Pull means a harder, cleaner contact, better waveform, less R.F. hash, longer life, with extra servicing eliminated.

USE COUPON



The Turner Co.  
908 17th St. NE., Cedar Rapids, Iowa  
Please send me FREE Turner Vibrator Manual for Radio Service Engineers.

Name .....

Address .....

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

# HAM-SWL EXPERIMENTER BARGAINS

## SURPLUS RADIO EQUIPMENT SALE

Our last sale, held in January, 1941, was able to bring to many hams, swl's, and experimenters those radio units they have always wanted, at drastically reduced prices. Many, however, were disappointed because they did not act quick enough. Here's another chance to own a fine piece of custom-built radio equipment at less than the cost of the parts. Every item listed below was built or intended for RADIO NEWS articles by the Staff of RADIO NEWS.

All equipment guaranteed as represented herein. Terms: Cash. All prices are F. O. B. Chicago, crating at buyer's expense.

### TRANSMITTERS

Experimental FM 56 Mc. 50-w. input transmitter, described April, 1941, RADIO NEWS, less tubes, crystal and power supply, but complete with coils.....	\$ 16.00
Mobile Experimental FM-AM transmitter, described December 1940, RADIO NEWS, complete with cabinet, chassis, 30-w. input 56 Mc., 4 meters, control wires, etc., less tubes, Gen-E-Motor, and control box	40.00
The "Private Flyers" 12-w. output, complete with generator, less xtal & mike, can be used for 80M portable from 6 v. storage battery, described in February, 1940, RADIO NEWS .....	40.00
ECO, 60 w. input, band spotting, built-in superhet, complete in cabinet, with four meters; for c.w. only (can be used on phone with external modulator) less tubes & key, described in Feb. 1941, RADIO NEWS .....	70.00
All-Purpose Transmitter, 10 through 160 meters, as is, complete with built-in RME-69 with crystal and noise silencer; unit contains working VOX system; built-in Meissner Signal Shifter with 80 M. coils; 3 power auto-transformers; 15 meters, including a db and 2 voltmeters; including hand mike, switching mike-stand for rapid break-in, etc. Completely described in August, 1939, RADIO NEWS. Less xtals and DC generators. Transmitter needs "pointing up." Receiver is perfect. Must be crated .....	325.00
600 W. fone-c.w., broadcast—gray finished cabinet; highest quality components throughout; tube line-up: 6L6GX; RK39; 812; PFI00TH's; Class B 200Z's modulation, 500 ohm speech input line, no speech amplifier, complete with coils for 20M, tubes, 8-4" meters, less microphone, xtal. Similar to rig described RADIO NEWS, April, 1939. Must be crated .....	400.00
Utah Model 12 with AC power supply; 5-band coverage; plus-in coils for fone-c.w. 15-18 w. input; complete with tubes; meters; coils for 5-bands, less microphone and xtals .....	55.00

### RECEIVERS

56 MC FM-AM superhet; less tubes, power supply and cabinet, described in December, 1940 RADIO NEWS.....	20.00
RME-69 with crystal, in perfect condition, slightly used, in gray cabinet together with speaker as one unit.....	105.00
Sportsman's receiver as described March, 1939, RADIO NEWS, complete with tubes and coils, as is .....	7.00
Advanced Beginners' superhet, described in February, 1941, RADIO NEWS, complete with cabinet; less tubes and "R" meters, with plug-in coils for 160, 40 and 80 M. ....	22.50

### AMPLIFIER & PHONO

Phono radio described March, 1941, RADIO NEWS, complete with tubes, carrying case, etc. Perfect condition.....	20.00
Presto Model 6D 16" professional recorder with Audak H3 magnetic 500 ohm head and Audak microdyne pick-up, original carrying case, dual speed. Described September, December, 1940, and February, April, 1941, RADIO NEWS. Cost \$575.00. Must be crated .....	300.00
Recording amplifier, complete with tubes, meter panel, master clock, etc., described RADIO NEWS, September, December, 1940, February, April, 1941.....	110.00

### MISCELLANEOUS

Collins pi network, 2 Johnson condensers that will handle up to 1 kw. Chassis mounted .....	10.00
Visual frequency monitor, described in February, 1939, RADIO NEWS. Complete with tubes .....	7.00

### RADIO NEWS

Engineering Dept. RN5  
608 S. Dearborn St., Chicago, Illinois

### Bench Notes

(Continued from page 23)

probable causes of obscure troubles found in receivers; therefore the inquiry was rather unusual, in that our correspondent was more concerned about his relations with the customer. He should be complimented for his early recognition of a factor that is probably of more importance than extensive technical ability. As some of the questions brought up are ones that every young service man will encounter sooner or later, some discussion of this young man's case may be of interest.

A dead receiver was brought in for repair, and after operation was restored he decided to use it a while instead of his own set. After about two hours the signals began to fade, which provoked a number of interesting questions. "Should the set have been delivered as soon as the repair was made, with the probability that the customer would return it next day—or take it elsewhere for service?" This question almost answers itself. When a repaired receiver is delivered to a customer it is tacitly understood that the serviceman has completed the necessary service, and the bill will be paid on that basis. In a case such as this the service was not completed, and when the signals fade away the first evening the customer has the set at home, the outcome will not be at all to the serviceman's credit. Such an occurrence will not always cause the loss of a customer, but it will certainly do little to build up the customer's confidence in the repair man's ability. Merely restoring a dead receiver to operation does not by any means guarantee that the serviceman's job is complete. More often than not, it will be found that the customer has operated the set for months in poor condition, and the serviceman is not called until the set is completely inoperative. In other words, there are usually several defects present other than the trouble for which the serviceman was called.

Sets that "bounce back" are one of the major afflictions of the repairman's life, and some precautions must be taken to reduce their number. In many shops it is the custom to allow a receiver to continue in operation for an hour or so, after operation has been restored, at the end of which time the receiver is turned off and allowed to cool. Then if possible, the receiver is turned on again and allowed to run for another period before delivery is made. This procedure will effect a considerable reduction in the number of those exasperating cases where a set is returned as defective the day following delivery. This does not require the serviceman to sit beside the receiver during the testing period, as the set is merely placed to one side, while other work is taken care of.

Operation under such conditions will tend to show up the most probable trouble makers in the way of oscillation, fading, intermittent cutout and distortion, due to faulty condensers, resistors and tubes. It is not unusual to find gassy tubes that require a half-hour or more of operation to develop noticeable trouble in reception. Our young correspondent does not feel that it is practical to "run each set for two or three hours," but a few unpleasant

interviews with disgruntled customers, who call a few hours after the receiver was returned, will be more convincing than any amount of general advice, as to the necessity of making some sort of a final operating test.

### What to Charge?

AS might be expected, the subject of proper charges is also one of prime importance to the budding radio man. A number of excellent articles have been published on this subject, in which the cost of doing business has been analyzed, and forms the basis for establishing a profitable hourly rate for labor charges. It is apparent, however, that the schedules apply to the maintenance of a store or shop as a place of business, and the overhead includes charges for shop rent, test equipment, truck or car operation, telephone, advertising, and other items; and the resulting charge for labor and overhead is around \$1.50 to \$2.00 per hour which is well justified under such conditions.

While we should be among the last to advocate cut-price service, or doing business at a loss, at the same time we do not believe that such hard and fast rules can be applied without discrimination by the average young man who is just breaking into radio service work, and hopes to build up a full-time business. When a minimum hourly rate is set up, certain conditions are implied, and certain obligations to the customer assumed. A professional rate implies that professional service will be rendered—and such charges include competent expert service work, the purchase and maintenance of an adequate stock and test equipment, and other necessary facilities for turning out first-class work.

As a general thing the average beginner and part-time worker operates under entirely different conditions, and for that reason we do not feel that a fixed hourly rate can be fairly and successfully applied by him. This does not necessarily mean that business will be done at a loss. Often the beginner does his work in his parents' home, hence is not plagued by the monthly bills for rent, heat, light, telephone, etc. As a rule, too, the beginner seldom has any great investment in equipment, and this lack of time-saving equipment coupled with an imperfect technique and limited experience are all good reasons why the beginner should not be unduly concerned about the maintenance of a fixed hourly rate. There is nothing particularly altruistic about this statement, but the view is taken that the average beginner hopes to build up his radio work to a full time permanent business, which cannot be done if his charges are consistently excessive.

The beginner can and often does take three or four times as long as the experienced man to run down and correct trouble, but it is not reasonable that any one can seriously say he should receive three or four times as much for the job. A simple case may be cited in illustration of this point. A customer brought in a small set stating that a young man in the neighborhood has spent two hours "checking" it without finding the trouble, probably on account of inexperience and lack of proper equipment. The trouble was due to a defective coupling condenser which was located and replaced in a few minutes, with a very reason-

able charge to the customer, and certainly at no loss to the shop. If the other fellow had finally corrected the defect, it can hardly be fairly said that the customer should be penalized for the repairman's incompetence, by a charge of \$3.00 for the two hours spent.

What the beginner should charge is a question not so easily answered. As a general statement it may be said that service charges in such cases should be what the job is worth, i.e., the charge should be consistent with the actual service rendered the customer. Taking the above mentioned case again as an example, the bill was for a minimum checking charge of \$1.00, plus the list price of a condenser, which was all the job was worth, as no pickup or delivery was involved; therefore the beginner would hardly be justified in charging much more than this amount, regardless of the time spent by him.

Some men may be inclined to feel that such a policy would be equivalent to "giving away" their time—but a little unbiased stock taking would be advisable. The beginner must acquire the necessary training, and pay for it one way or another—whether in cash to some school, or in time spent in actual practice. The radio man willingly spends much time studying books or magazines without expecting any direct pay for such time, and there is no good reason why he should expect customers to pay him for continuing these studies with their sets on the bench. On the other hand, the beginner should by no means swing to the other extreme and charge merely nominal prices for service work, in order to get the experience. Such mistaken young fellows are sometimes encountered, who will spend half a day "working" on a set, and charge 50c or so for service. This policy is apt to lead nowhere, as it marks a man as a neighborhood tinker, and inspires small confidence in his ability. A few customers may be attracted by the prospect of cheap service, but as a rule their business is not worth having, as work can seldom be done cheap enough to satisfy them.

Radio service is a highly specialized trade, and there is no skilled trade that the beginner may enter and receive top rates from the start. For a while at least, the young radio man should devote himself to acquiring a sound knowledge of theory, plus a systematic testing technique and, above all, some practical knowledge of customer reactions. When he has worked up to an active full-time business, the questions of overhead and hourly rates will be due for more careful consideration, and will have largely solved themselves.

### Aviation Radio (Continued from page 38)

mic and noise). multi range voltohmmeter, wide range crystal harmonic oscillator, etc., the aircraft radio shop should contain the following: r.f. ammeter with suitable range for general usage (0-10 anps.); dummy antennae of various load characteristics; a good cathode ray oscillograph (not usually found in the average shop); a vacuum tube voltmeter; variable testing voltages (low—6 to 12 volts d.c.—high-0-1000 volts d.c.) stand; a heavy duty, 500 or 600-watt, 3/8" tip soldering iron for work around bonding and shielding; conduit tools (swaging machine); and the usual supply of nuts, bolts, washers (lock and flat), aircraft specifications wire, etc.

Unless the serviceman performs work on a dozen or more "assigned" aircraft frequently, it would be folly to suggest what parts he should have on hand, because it is seldom that two sets will exhibit the same symptoms and require the same replacement parts. Also, aircraft radio parts usually have more than the usual amount of "specificational tolerance," and those parts found in nearly every radio shop are not all designed with the "safety factor" in mind. If the serviceman follows *Civil Aeronautics Administration's* part specifications, he'll never go wrong.

To date, there exists no known aircraft radio service manual published in "RIDER" form. However, if you do service aircraft radio equipment, you may obtain "service and installation booklets" from any aircraft radio manufacturer who will be glad to send them to you; if you request specific data.

If you are one of the many servicemen working in "town" and you are desirous of entering the aircraft radio end of servicing, by all means obtain your 2nd Class Radiotelephone License first; then contact your local airport manager, obtain the names of those owning aircraft; contact them, sell them your services.

There are very few servicemen who can readily qualify as aircraft radio technicians "grandiose scale," because they are hindered by one of the following: lack of systematic training in this work; no accumulated experiences; not licensed; no proper equipment; and no available time for proper pursuit.

If there is no steady technician available at your airport for installing, maintaining, and adjusting the aircraft radio equipment there, and the number of aircraft does not warrant your "putting up shop" at the field, have signs painted to be hung in hangar or hangars giving your phone number, address, etc.; these will do much toward establishing your identity and your business.

### New W. E. Safety Switch

**A**N emergency in the air can cause great concern to the pilot and bring equally great danger to the plane. Any device designed to reduce the possibility of emergency is a "must" for plane owners.

The *Western Electric Safety Switch* cuts off all power during an emergency in the air. It also operates while the plane rests on the ground for servicing. The 705B switch is double-pole, single throw, providing simultaneous opening of the storage battery circuit and the battery charging generator field circuit. It is essential that the latter circuit be opened in the event of a landing emergency, otherwise the charging generator, with the field circuit energized, would supply power to the storage battery and present a very definite hazard. The switch can be mounted anywhere in the airplane, but it should be mounted as near to the storage battery as possible. It can be manipulated either by a flexible cord or by a rod terminated near the pilot. The switch has *Breeze* fittings which allow for attachment either to rigid or flexible conduit.

Some aircraft have automatic switches. However, in an emergency, manual operation is to be desired.

### Radio Jobs

**T**ODAY, we hear more about jobs in the fields of radio operating, servicing, factory work, etc., than ever before. Defense orders for all types of aviation radio equipment have "poured" in and now are "pouring" out; in many instances via 24 hour shifts. We also hear much about UHF aids to flying, and with the UHF radio installations for use of the aviation services being installed between Chicago and New York, the airlines have ordered UHF equipment for preliminary tests early this coming summer over the new ranges. More about this later.

The Airlines need men, the Army needs experienced radio men, the various Governmental Agencies need men, and after it's all over with, then, "whither the men go?" No problem for this writer!

The United States Army Air Corps and other branches of the Armed Forces are turning out radio operators, repairers, etc.; teletype men, weather forecasters, electrical technicians, etc. (all allies of aviation) and

## Here's the New BUD CODE Practice Oscillator



Learn code this easy way! CPO-124 has a clear, pleasant note. Variable volume and pitch controls. Use the built-in magnetic speaker, or connect up to twenty earphones. Any number of keys may be connected for group practice. 110 volts A.C. or D.C. Your price, complete with tube, only \$7.95 net.

Write for illustrated circular

**BUD**  
**BUD RADIO, Inc.**  
CLEVELAND, OHIO

FROM THE WORLD'S  
LARGEST RADIO  
SUPPLY HOUSE!

**FREE**  
*Complete*  
RADIO  
CATALOG

196 PAGES  
OF  
TYPICAL  
LAFAYETTE  
VALUES

The index alone takes 2 full pages! — just to give you an idea of the thousands of radio values in this big book . . . Radios and radio-phonographs including FM . . . PA systems . . . Amateur transmitters, receivers, kits, thousands of parts. Whatever the job calls for *Lafayette has it!*

**MAIL THE COUPON RIGHT NOW.**  
*we'll rush your free Lafayette Catalog!*

*Lafayette*  
**FOR RADIO VALUE**

Lafayette Radio Corp. Dept. 2E1—  
100 Sixth Ave., New York, N.Y. or  
901 W. Jackson Blvd., Chicago, Ill.

★ Rush Free Catalog.

NEW YORK, N. Y.  
100 Sixth Ave.  
CHICAGO, ILL.  
901 W. Jackson Blvd.  
ATLANTA, GA.  
245 Peachtree Street  
BOSTON, MASS.  
BRONX, N. Y.  
NEWARK, N. J.  
JAMAICA, L. I.

Name .....

Address .....

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

still, they need more qualified students. For those who do not have the price for a complete aviation radio course and who desire to help Defense may obtain courses in the subjects just mentioned at no cost whatever to them. Those who finish any one of the courses will not only benefit themselves, but they will benefit our preparations for National Defense as well, because they will be able to do a specific job well!

The qualifications are general but exacting and they cover: high school education, a sound body, a clear mind, and the will to do!

### Odds 'n Ends

**T**HOSE light planes often seen around the average airport, which are usually classified in the "light plane" classes, and which contain radio equipment, need not be shielded as well as their "big brothers," in order to eliminate radiated interference. It has been found that spark plug shields placed over unshielded plugs, and braided shielding placed over high tension leads from the magneto to the plugs, will eliminate 98% of the interference encountered. It is to be remembered, however, that each plane presents its own problem. Shielding and bonding the electrical installations (low and high tension) in the *Ryan*, *Aeronca*, and *Cub*, is not altogether similar. By utilizing the probe antenna (discussed some time ago), it is possible to track down interference right to the source on these small jobs, because the propeller wash is not so strong that it requires "up-rights" for holding the antenna steady.

Conducted interference from constant speed propellers (Curtiss-Wright) has been encountered by the average aircraft radio serviceman at one time or another. This interference can be eliminated by installing 50 microhenry chokes in the low feeder inputs (battery and propeller circuits) and bypassing these to ground. (Choke input to propeller circuit with condenser input to battery through second choke.) The values of

the condensers: 1 to 2 microfarads.

Those of you who are having trouble with UHF marker beacon receiver operation, are reminded that vibration is the largest contributing "bug-a-boo." Even though internal tuning elements are "locked" externally by the technician, vibration will cause "off-second" tuning, resulting in mal-operation. Due to the fact that these receivers operate in the 75 mc. channel their tuning is critical.

Some receivers are adjusted for 3000 foot operation, some for 4000 and still others are adjusted for 6000 foot operation. It takes about five minutes to check the ordinary marker receiver if a reliable frequency meter and output meter are used. If a "split wire" antenna is used as a part of the system, it would be wise to check insulator suspension, transmission line connections, and power input. Sometimes, a pilot will report the receiver "out," but in reality he was "out." He was either flying too high (usually the case) or didn't look at his facility chart for the purpose of determining his position with respect to the marker transmitter.

Each marker receiver should be flight test checked at least once a week. Tubes should be tested every 60 hours or every sixty days, depending upon which comes first.

Many letters have been coming into the column requesting information; they have all been answered. Readers are reminded that this column will endeavor to obtain the information they desire if they enclose a stamped, self-addressed envelope.

### Video Reporter

(Continued from page 28)

the demonstration time was given over to a plea for a 625-line standard. So much attention was put into propaganda for this high-definition picture that little initiative was evident in exhibiting the qualities of *Du Mont's* television receiver. The time was consumed in a talk (seen and heard on the

video screen) by a *Du Mont* engineer and by a separate motion picture demonstration. The lack of showmanship in showing the *Du Mont* apparatus was realized a few days later when widespread invitations were sent out asking the guests back for another visit to see a more complete and revealing test of the method.

Next stop on the FCC television tour was *Radio City* where was revealed the latest home-model receiver which projects the cathode-ray image on a translucent screen measuring 18 by 13½ inches. This demonstration was followed by an *RCA* test of a theatre-sized television method at the *New Yorker Theatre*. Both the home-model and theatre systems were effectively demonstrated and the tests were further enhanced by multiple television relays which showed great promise for future video networking. The theatre-sized television picture was accomplished by a huge steel-barreled projector on the theatre-balcony.

The *Bell Telephone Laboratories* later in the day showed the FCC tests of its coaxial cable by having television impulses routed to Philadelphia and back to New York over a total of 180 miles of coaxial wire.

The following morning, the two-day FCC television show prepared by the *NTSC* came to a close with a demonstration of another television method and *Scophony's* theatre-sized television system.

So, once again, all the facts relative to television's status are in the hands of the FCC and it is anticipated that an early Spring hearing will be followed by a delay—perhaps until Fall—when the *Commission* will have some definite plans formulated for the next step television may take.

And, it is our view that the next step should be the sanctioning of commercial tele-casting!

**I**NCLUSION of a *Scophony* demonstration in the *NTSC* series of tests for the FCC was a sort of added attraction that was not announced until the guests were gathered at

# We're Not Fooling, Mr. Serviceman!

→ NATIONAL DUES IN THE RSA  
→ ARE ACTUALLY ONLY \$1.00 A YEAR



Yes—it seemed amazing . . . incredible . . . but Servicemen found it was true. Now hundreds of applications are pouring in from all parts of the country! Just think—a full year membership in the National RSA for only \$1.00 (that's less than 2c a week).

You get the RSA Membership Certificate and the RSA House Organ. You have access to RSA Technical Helps Bureau, and you can participate in all the other functions and benefits RSA offers.

## RADIO SERVICEMEN OF AMERICA, INC.

"Reliable Service Assured"

JOE MARTY, JR., EXECUTIVE SECRETARY  
304 S. DEARBORN ST., CHICAGO, ILLINOIS

### Get the RSA Push-Button Changeover Plan

Are you ready to get your share of the Push-Button Changeover business? Join the RSA now and get the complete plan available to RSA members.

Protected territories will be established as rapidly as local chapters are formed. Applicants in present chapter areas will be referred to the local chapter.

It's your big opportunity. Fill out the coupon, attach a \$1.00 bill and mail it in today.

RADIO SERVICEMEN OF AMERICA, INC.  
304 S. Dearborn Street, Chicago, Illinois  
\$1.00 enclosed for 1941 National Dues in RSA.

Name .....

Address .....

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

Radio News—May

the last scheduled stop on the television tour. But just a short time before, *Scophony Limited*—a British firm now maintaining New York offices—had given a press demonstration that was well attended.

We heard a lot about *Scophony's* progress abroad and looked forward eagerly to the New York demonstration. It was fairly impressive in size and detail but somewhat lacking in illumination. Perhaps this can be easily overcome. But, at any rate, the demonstration was far below the standards of the RCA theatre-sized television show.

**T**HE television lads have been going to town in the manner in which they've been conducting color video demonstrations in recent months. The head men worked out a sort of basic script that served, with amendments and alterations, for the press, the *Federal Communications Commission*, the *National Television Systems Committee*, and the *Institute of Radio Engineers* and various other groups.

The basic theme of each demonstration was a systematic display of fabrics, a revolving globe, a color chart, a chemistry experiment, and other simple pick-ups that can be achieved in a small camera range. These flashes, accompanied by intelligent narration, served as good exemplary illustrations of what has been achieved. There is more interest and sparkle to film pickups in color. Of course, there's less of a thrill to the television in seeing a canned program, which the film represents, than in witnessing an actual event while it is taking place. But a filmed color television show that can give the home look-and-listener a wide theatre of action instead of just head-and-shoulder stuff is a lot better than a spinning globe or a woman's hands trying on gloves.

The *Video Reporter* asked one of the television aides when big live scenes in color could be picked up. He replied that it's practical "right now" but that the studio space was too limited to move the camera back sufficiently to pick-up the larger scene.

We couldn't help but think that the reason was a poor one. Certainly with all the facilities at the command of the networks and the readiness with which it expands in many, many directions, there couldn't be a great problem involved in getting deeper studio space to pick-up larger color scenes.

Further, one network is constantly presenting arguments in favor of color. Yet, the *Video Reporter*, while personally agreeing that true-life colors can enhance the entertainment value of a television program, cannot locate a television enthusiast who sees the practicability of color pickups in a work-a-day role until they can offer something other than films in a manner more adequate than has been shown to date. The mechanical disk the set requires is not as awful a bogey as some critics think. But the return to mechanized television must be compensated for by much better program potentialities than has been able either to be implied or produced.

**MR. JOHN LOGIE BAIRD**, too, has been tinkering with color television of late. Word comes from London, that, despite the suspension of telecasting, laboratory progress is being made with all tests and demonstrations conducted over wire lines. And Mr. Baird, an early color television follower, has shown a home model television receiver (combined with a radio and phonograph) that can receive color on a screen measuring two-and-a-half by two feet, utilizing a 600-line scanning method.

Mr. Baird uses mirror reflection to magnify the image to those dimensions and his receiver employs a two-color disk instead of a three-color one as in use here. The Baird set's lenses, mounted in a whirling wheel in front of the cathode-ray receiving tube are blue-green and orange-red.

**T**ELEVISION has been showing progress in Schenectady, New York, home of the famous *General Electric* laboratories.

W2XB, the G.E. video station, has taken over a large clubhouse as a television studio building. The new main television studio, upon completion, will be 70 feet long, 46 feet wide and 18 feet high. With great strides in video pick-up technique, this large chamber can be utilized as a miniature Hollywood, with many changes in sets possible.

Great thought has been given to video illumination problems and the use of three-phase water-cooled mercury lights will provide 1000 foot-candles of illumination at any desired program-originating point of the studio.

**T**HERE will be a great new demand for two-colored typewriter ribbons when the new field of television continuity writing is further developed. We base this premise on the sample television scripts distributed to the FCC and press attending the recent NTSC demonstration. It seems as if the second color comes in mighty handy to distinguish the cues and acting directions from the spoken lines.

Incidentally, there's a tremendous new field for writing in television. We hear that many participants are anxious to look over new program ideas and scripts well in advance of commercialization. The main obstacle to this quest for material is that television is not yet able to pay adequate fees for program brainstorms.

### Technical Review

(Continued from page 41)

"hams," amateur operators of short wave radio, have formed in the past few years an unofficial network of communications all over the world. Here is the first book which tells of their amazing adventures on the air waves, of the heroic part they play in maintaining communications during fires, floods, disasters, and all sorts of emergencies, when other means of communication have failed. The book makes interesting reading not only for the amateur or prospective amateur, but for anyone interested in non-technical aspects of amateur radio. Price \$2.00.

### Manufacturers' Literature

(Continued from page 40)

complete selection of phonograph and recording accessories.

Twenty-five 1941 KNIGHT Sound Systems are listed in the big rotogravure Public Address section. These systems make use of the most recent developments in P.A. design and are available in ranges from 7 to 75 watts for every type of application. A sensational and exclusive feature is incorporated in two major groups of KNIGHT systems. Details have been withheld, but *Allied* engineers have explained that the new development is a practical and effective design for reducing feedback.

For the Serviceman there are over 100 pages devoted to all the latest in test equipment and over 15,000 quality parts from the country's leading manufacturers. Fluorescent lighting comes into its own with a strikingly modern presentation in rotogravure. Of special interest also are the big Bargain Merchandise sections, the Photo Cell Equipment listing and the pages of books and manuals on every subject in radio and electronics.

A big Amateur Section, including 8 pages of rotogravure, covers a large selection of Communication Receivers and Transmitters, tubes, keys, transformers, and complete parts and accessories for every Amateur purpose. A special time payment arrangement

**SPRAYBERRY TRAINS YOU**  
for **GOOD PAY!**  
**STEADY WORK!**  
**ADVANCEMENT!**  
in **RADIO and TELEVISION**



**DON'T WAIT! START NOW!**

**You Can Make Money Almost At Once**  
You'll be quickly shown how to get and do neighborhood Radio Service jobs for practices and profits. You easily learn Television, Frequency Modulation, Signal Tracing, Mobile Radio (Auto-Tank), Aviation Radio, Electronics, Facsimile Radio, Radio Set Repair and Installation Work. I'll Prepare You Quickly In Spare Time

**At Home Or At Camp**  
SPRAYBERRY Training does not interfere with your present work. You will receive personal coaching service all the way. You'll be fitted to hold down a good paying job in Radio or to have a Radio business of your own.  
**You Get Professional Test Equipment**  
... Plus Experimental Outfits  
Includes 146 RADIO PARTS (to build complete Radio Receiver), RADIO TOOLS and a TESTER-ANALYZER. MY EXPERIMENTAL OUTFITS enable you to conduct actual experiments with your own hands.

**NO EXPERIENCE NEEDED**  
It makes no difference what your education has been. I can see you to become a real RADIO TECHNICIAN. Your success is my full responsibility.

**THE SPRAYBERRY COURSE IS SOLD UNDER MONEY-BACK AGREEMENT**

**RUSH COUPON for BIG FREE BOOK**

**SPRAYBERRY ACADEMY OF RADIO**  
F. L. Sprayberry, President  
425 E. University Place, N. W.  
Washington, D. C.

Please rush my FREE copy of "HOW TO MAKE MONEY IN RADIO."

Name..... Age.....  
Address.....  
City..... State.....  
(Mail in envelope or paste coupon on penny postcard)

## RADIO DIAGRAMS

**MOST-OFTEN-NEEDED**



**ALL MAKES 1926-1938**

In this one low-priced manual you have all the circuits you really need. 427 diagrams of most-often serviced radios is the help you want for easier, faster, and better repairs. You will find 4 out of 5 diagrams needed in this manual. 244 pages, large 8½x11 in. size. Special Price... **\$1.95**



**HOW TO SAVE TIME**

Service hints, diagrams, alignment data, test charts, and parts lists included will prove time-savers and money-makers for you. Get these handy "on-the-job" handbooks. No need to work blind-folded. The time saved in two days will more than pay for these manuals.



**1939-1940 DIAGRAMS**

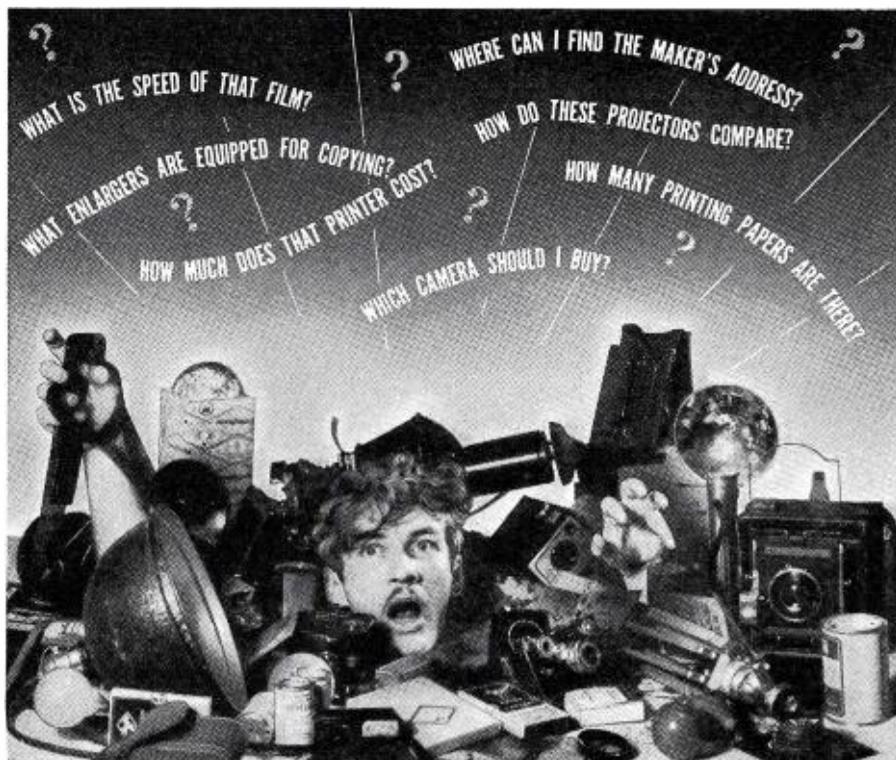
This single manual will give you over 80% of all 1939-40 circuits ever needed, acquaint you with recent radio developments, and teach you how to service quickly millions of sets sold last year. Models of 43 manufacturers. 212 large pages, 8½x11 inches. **\$1.50**  
Limited quantity at.....

**FREE EXAMINATION**

**SUPREME PUBLICATIONS, Room 344**  
3727 W. 13th St., Chicago, Illinois  
Ship the manuals checked. I must be satisfied or you will refund my money in full.  
 Most Often-Needed Diagrams, 1926-1938 @ \$1.95  
 Most Popular 1940 Radio Diagrams @ \$1.50  
 I am enclosing \$..... send postpaid.  
 Send C.O.D. I will pay the mailman.

NAME.....  
(Write address below and send this corner)

# The 1941 Directory of Photographic Equipment



**BRINGS YOU ALL THE ANSWERS**

**THIS INVALUABLE BUYING GUIDE OF PHOTOGRAPHIC EQUIPMENT COMES AS AN EXTRA FEATURE OF THE GIANT MAY ISSUE AT NO EXTRA COST TO YOU! IT'S COMPLETE, RELIABLE, ILLUSTRATED!**

Camera fans! *Now* you can forget doubts and questions in selecting your photographic equipment! *Now*, right at your very fingertips, you can have the most *comprehensive* buying guide of cameras and supplies ever assembled. Yes, POPULAR PHOTOGRAPHY'S *new* 1941 Directory of Photographic Equipment, *bigger and better than ever*, makes it *easy* for you to compare similar products of all the different manufacturers.

#### DESCRIBES ALL KINDS OF EQUIPMENT!

You'll be *amazed* to see how many cameras are on the market, as compared with just a few years ago. You'll be *surprised* to learn about the number of gadgets that are *now* being made to help the photographer obtain results with greater ease. But this valuable Directory is not confined to cameras and gadgets . . . it extends to films, filters, flashbulbs, etc. (Note complete listing to the right.)

#### AS HANDY TO USE AS THE TELEPHONE BOOK!

Imagine what a help this *illustrated* Directory can be to *you!* Each type of equipment—cameras, projectors, enlargers, etc.—is *classified together*. In the case of items such as films all the characteristics and speed ratings are given. In the camera listing you will find the trade name and model, film dimensions, lens equipment, shutter speeds, available accessories, and other pertinent information. Retail prices are also quoted for each item together with the name and address of the maker or distributor. And what's more, the convenient

*alphabetized* index enables you to find, *instantly*, the exact item you are looking for. Yes, with this illustrated Directory you can sit in your armchair at home and "inspect" all of the photographic equipment that would take days in a camera department to see!

#### MAKE SURE OF YOUR DIRECTORY ISSUE NOW!

Remember, this *invaluable* buying guide of photographic equipment comes as an *extra* feature of the *giant* May POPULAR PHOTOGRAPHY at *no extra cost!* The print order of this spectacular Directory issue is *limited*, however, so don't get shut out. Act *promptly!* Go to your favorite newsstand or camera store *today* and get *your* copy!

### COMPLETE DIRECTORIES ON THESE SUBJECTS

Cameras, Movie	Movie Editing and
Cameras, Still	Titling Equipment
Enlargers	Print Dryers
Enlarging Easels	Printers
Exposure Meters	Printing Exposure
Films, Movie	Meters
Films, Still	Printing Papers
Filters	Projector Screens
Flashbulbs	Projectors, Movie
Flash Synchronizers	Projectors, Still
Front Lenses	Rangefinders
Lenses, New	Spotlights

**GIANT DIRECTORY ISSUE**

**Popular  
Photography**

**NOW ON SALE AT ALL NEWSSTANDS AND CAMERA STORES! 25c**

has been made available to the Amateur.

For the Builder and Experimenter there is a wide variety of kits employing from one to six tubes, accessories, projects, diagrams and all necessary builders' tools and supplies.

This new 180-page Spring Radio Catalog may be had free of charge from *Allied Radio Corporation*, 833 West Jackson Boulevard, Chicago, Illinois.

**HOW TO MAKE GOOD RECORDINGS.** Hundreds of recordists in every phase of the art of sound reproduction have asked for a book on this subject. Home recordists, teachers, musicians, even sound engineers who already have a wide acquaintance with disc recording, will find that the information it contains fills gaps in their knowledge.

To those uninitiated in the pleasures of the art, this book gives valuable advice. The subject matter, written in a non-technical manner, covers every

phase of instantaneous disc recording from choosing the right equipment to having fun recording dramatic shows. A convenient glossary explains common recording terms.

An ideal gift for the recording enthusiast, this book is profusely illustrated with scores of photographs, charts, and drawings.

Among the points covered are how a recorder works, how to choose a recorder, the requirements of a recording disc, cutting and playing needles, determining correct recording volume, controlling the thread, putting together a show, making a radio recording, mike technique, recording singers and instruments, turntable drives, recording sound-effects, the candid recording approach, recording from scripts, recording at parties, recording children, teaching by recording, recording for home movies, making copies, common difficulties and their remedies. Price \$1.25. *Audio Devices, Inc.*, 1600 Broadway, New York, N. Y.

## Classified

Rate 15c per word. Minimum, 10 words.

### CORRESPONDENCE COURSES

**AMATEUR** Radio licenses, training in code and theory. Resident and home study courses. Hundreds of licensed students. *American Radio Institute*, 1123 Broadway, New York.

**USED** Correspondence Courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 bargains. (Courses Bought.) *Lee Mountain, Pisgah, Alabama.*

**CORRESPONDENCE** courses and educational books, slightly used. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. *Nelson Company*, 500 Sherman, Dept. E-237, Chicago.

### ELECTRICAL FIXTURES

**FLUORESCENT** Lighting. Buy direct. Factory prices. All types. 100% General Electric parts. Catalog Free. *McGee Radio*, F-2133, Kansas City, Mo.

### PATENT ATTORNEYS

**PATENTS**—Advice and booklet free. Highest references. Best results. Promptness assured. *Watson E. Coleman, Patent Lawyer*, 724 9th Street, Washington, D. C.

**PATENTS** secured. Two valuable booklets sent free. Write immediately. *Victor J. Evans & Company*, 429-E Victor Bldg., Washington, D. C.

**INVENTORS**—Before disclosing your invention to any one send for Form "Evidence of Conception": "Schedule of Government and Attorneys' Fees" and instructions. Sent free. *Lancaster, Allwine & Rommel*, 414 Bowen Building, Washington, D. C.

### PHONOGRAPH RECORDS

**PHONOGRAPH** Records 10c. Catalogue. Paramount, FF-358 East Market, Wilkes-Barre, Pennsylvania.

### PHOTO FINISHING

**ROLLS DEVELOPED**, two prints each and two free enlargement coupons. 25c. reprints, 2c each; 100 or more, 1c. *Summers Studio*, Unionville, Mo.

### RADIO ENGINEERING

**RADIO** Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. *Dodge's Institute*, Elm St., Valparaiso, Ind.

**RADIO** Kits—\$3.95 up. Single band; all wave. 5-10 tubes. Fluorescent lighting. Save 50%. Radio-parts catalog—FREE. *McGee Radio*, P-2075, K. C. Mo.

### MALE HELP WANTED

**FACTORY** establishes local dealers in own business. Pays advance profits. No "down" payments, capital, or experience necessary. *Winona Monument*, Winona, Minn.

## Ham Chatter

(Continued from page 32)

**Y.M.C.A. Bldg.** The President has a plan in mind to work in accordance with the National Defense Program and promote radio Amateur activity more so than in the past. This method will be to instruct as many SWL's as possible in theory and code so that they may become Licensed Operators.

**W3AYZ** past Pres. of G.C.A.R.A. is leaving Camden and will settle down in Indianapolis with an Engineering position. He will probably be on the air with a FB sig on 20 meter fone.

**W3BYK** purchased a fone xmtr and sold it after a short time then he sold his *DR-90* and *RME-69* now Stan has a *5X-28* and a 160 meter fone Xmtr with 200 W.Inp.

**W3BYK** and **yl** Lee attended the Rochester Hamfest and had a fb time.

**W3DJR** is doing some rushing work at Cramps Shipyard Phila.

**W8OHT** is on 160 meter fone and works *W3CZN* on 80 cw via crossband.

**W3FZF** is a member of the NCR.

**W3IWF** another member of 3CZN's code class is at last on the air on 44 cw.

**W3FWK** has a 1/2 KW on 10 meter fone.

**W3IOF** is working at Radio Condenser and is on 2 1/2 meter fone.

**W8QBK** is an Ensign now in the NCR.

The members of the Phila Electric Co. Radio Club have organized an emergency network and consists of: *W3CAF — W3EWK — W3CKQ — W3CGK — W3ACB — W3CZN — W3CAA — W3BKU — W3TU — W3NA — W3FUS — W3GOK — W3HWK — W3ER — W3EML — W3GPB.* The frequencies used are both fone and cw from 10 to 160 meters. The network covers locally nine different towns and three states.

**W3CJJ** is Lieut. at Fort Dix with the 44 Div. 73 dc *N3CZN.*

**OUR** new 4th Dist. reporter, **W4GFF**, says:

**W8KJR** at Swainsboro, Ga. was a visitor in Cordele this past week and the local hams sure enjoyed having him.

**W4FDE**, **Chuck** Sears, has moved to Jacksonville, Fla. and is now connected with U. S. Navy station there. He does put out a good signal on 160 M on 1925 kc.

**W4GZW** has been sick for the past week and has not been heard on the air.

The Georgia 160 metr Radio Phone net of the Army Amateur radio system has been divided into two districts. **W4GBT** at Valdosta has charge of the south Georgia net and **W4GGW** of Atlanta has charge of the north Ga. net. **W4FDJ** at Lyons, Ga. is the big boss of them all. And Pop is really doing a fine job.

**W4EQB** at Montezuma, Ga. was a recent visitor in Cordele, Ga.

**W4FFI** **Bob** Williams just likes putting up his Sky wire and then he will again be on the air on 160.

**W4GRU** and the Valdosta gang were recent visitors at Fender and at the station of **W4FOO.**

**W4HFB** is on the air again at Tifton, Ga.

**W4FCW** at Ft. Jackson, S. C., puts out a good signal but it seems we can not contact the doctor.

**W4AUI** formerly of Macon, Ga. is also located at Fort Jackson, S. C.

**W4CCV** **Guy** White of Macon is also back on 160 after getting married and being off the air for a long while.

**W4ALH** is now connected with **WMGA** in Moultrie, Ga. He was formerly connected with



E. H. Rietzke  
Pres. CREI

## Put Your Radio Experience To Profitable Use!

Your Own Experience plus CREI Technical Training Prepares You For A Good-Paying Radio Job

Wake up—to the new opportunities that Radio has to offer competently qualified men. You have "a jump" on the other fellow, because your present experience is a valuable asset, if supplemented by CREI training in Practical Radio and Television Engineering.

Our training brings results! That is why so many of our men are holding important jobs in aviation radio, manufacturing, operating—and why there are CREI men in more than 350 broadcasting stations. Our job is to train ambitious men for these good-paying positions—your job is to do something about it!

### WRITE US TODAY

If you are a professional radio-man and want to make more money—let us prove we have the answer to your problem. Our free booklet gives complete details—without obligation. To help us intelligently answer your inquiry—please state briefly your education, radio experience and present position.



Free Booklet Sent

## CAPITOL RADIO ENGINEERING INSTITUTE

Dept. RN-5, 3224-16TH ST. N. W., WASH., D. C.

## FREE! RADOLEK'S

NEW 1941 RADIO PROFIT GUIDE

Bargains! Galore Like This.

PROFESSIONAL TYPE 10" RECORDING DISCS

only 19¢

Made by foremost manufacturer. Proven equal or superior to any discs of this type regardless of cost. These blanks have very slight imperfections but guaranteed to make perfect recordings or your money back. Coated on both sides—heavy metal base—non-inflammable. Big savings!



6" Discs—10c. 8"—14c. 10"—19c. 1c less in 25 lots. Send no money—shipped C.O.D. plus postage.



**EVERYTHING NEW IN RADIO AT BARGAIN PRICES!**

Shows hundreds and hundreds of up-to-the-minute radio parts, sets, accessories, ham gear, electric appliances and supplies indispensable to every amateur, experimenter, set builder, sound engineer and service man. Keep up with radio and all its phases—send for the big FREE Radolek Profit Guide now! DON'T WAIT—SAVE MONEY AT RADOLEK.

**SEND TODAY! PASTE ON A POST CARD**

**RADOLEK CO., Dept. B-54**  
601 W. Randolph St., Chicago, Ill.

Send FREE Catalog  
 Ship \_\_\_\_\_ Discs Size \_\_\_\_\_ inches. C.O.D. Plus Postage  
Name \_\_\_\_\_  
Address \_\_\_\_\_ Dealer?.....  
Experimenter?..... Serviceman?..... Amateur?.....

Big enough  
to last...



Dry section in aluminum can. Inverted screw mounting. Two color-coded leads for each section. Slightly over actual size, 450 v. 4 mfd.

Of course those midget metal-can electrolytics are O.K. So are card-board case electrolytics. But honestly, if you want an electrolytic that will last a mighty LONG LONG time, by all means spend a bit more and use an AEROVOX GL. It's BIG ENOUGH to LAST and LAST and LAST.

**AEROVOX TYPE GL ELECTROLYTICS**  
**Single Section:**  
 800 v. Surge Pk.—600 v. D.C.W. 4 and 8 mfd., \$1.11 and \$1.56, your net.  
 600 v. Surge Pk.—475 v. D.C.W. 4, 8, 12 and 16 mfd., \$0.75 to \$1.38, your net.  
 525 v. Surge Pk.—450 v. D.C.W. 4 to 80 mfd., \$0.51 to \$2.55, your net.  
**Double Section:**  
 600 v. Surge Pk.—475 v. D.C.W. 8-8 mfd., \$1.44, your net.  
 525 v. Surge Pk.—450 v. D.C.W. 4-4 to 20-20 mfd., \$0.78 to \$1.65, your net.  
**Triple Section:**  
 525 v. Surge Pk.—450 v. D.C.W. 4-4-4 to 10-10-10 mfd., \$1.14 to \$1.59, your net.  
 300 v. Surge Pk.—250 v. D.C.W. 8-8-8 to 8-16-16 mfd., \$1.26 to \$1.56, your net.  
**Type GL 45025,**  
 10-10 x 450 + 20 x 25, \$1.59, your net.

**Ask Your Jobber . . .**

- Ask to see these popular GL electrolytics. Be sure to use them in building or servicing assemblies that must stand up under hard and steady going. Ask for catalog . . . or write direct.

**AEROVOX**  
 CORPORATION  
 NEW BEDFORD, MASS.  
 IN CANADA: AEROVOX CANADA Limited, Hamilton, Ont.

WKEU in Griffin, Ga. He bears the handle of James Wilder.  
 W4FRF at Damascus, Ga. is back on the air with high power.  
 So is W4GHW.  
 W4AZK is now located at Ocala, Fla.  
 Also Willard Wing but we forgot his call.  
 W4GIR, "Ole Bert," is back on 160 at Montgomery, Ala., with his brother W4FXN.  
 W4GFF at Cordele, Ga. Your 4th dist. reporter would like to hear from the Miami, Fla. gang and those other place in Alabama, Tenn., South Carolina, etc. So fellows if you want to get in the here drop me a line of your activities. Pictures too.  
 The Georgia Army Net, is going to use a new procedure on roll call in near future.  
 W4GKQ formerly of Lexington, Ga. is still at Ft. Bragg.  
 W4GRU of Valdosta is staying up all night to see how many stations he can work.  
 W4GRP, Geo. Corley, has changed his QTH.  
 W4ERS, Al Driggers, is in Gainsville, Fla.  
 W4FCZ, "Ole Mac," has been pinch hitting for Pop on roll call of the AARS for the last two weeks. It seems as if the line noise at his shack was R9 plus every time.

**B**OSTON'S W1JOM blasts in wid:  
 W1BDM sez tt W1PA has added a nw piece of equip to the rig, it's called an "Automatic Hum Producer" (oo in plain language a bit in hum). When we hrd Wes last it must be wrking at peak efficiency. Hi hi.  
 W1LW of Norwich, Conn. is on 10 fone running 200 wts to a pr of T-40's. Norman is a commercial photographer by trade. [How's fer some hampr? Ed.]

W1LEU has bn keeping skeds wid W8ADT, 8ADY, 2QF, & several other 2cd district stations on Sun. AMs on 10 fone, wrking them on his groundwave.

Quite a bit of the publicity which the local EG has bn getting in the newspapers in regard to skeds wid W1LDR at Camp Hulen, Tex. has bn due to W1IYG who wrks fer the *Botson Globe*.

W1LSN of N. H. has bn cuming thru on 5 fone into Boston almost every nite.  
 The last dx hrd arnd these prts dwn on 10 meters was KB4HBZ, K7HMM and also 2 KA's on cw on abt 28,200.

Ham's Paradise: 1000 watts input to 806's, modulated by 805's wid a 3 el rot beam & *Meissner Sig Shifter*, plus a *Hammurund Pro.* All owned by W1IXL. (& no DX to be wrked, tch. tch.)

W1KXX of Waltham eg to increase pwr on his 10 fone rig. Will use *KK-20A's* insted of *KK-39's*.

When W5IRO was up in Boston for Xmas to visit his family, he sez tt he sat on the radiator all during his stay except for the time he ran out to get a timetable to get back to Texas.

W1JFF of Newport, R. I. is on 10 meters. Fred is in the radio service & sales biz.

W1MRK recenly changed QTH.  
 W1HTA is wid Eastern Radio in the service division.

W1KSA wrked W1BGA of R. I. on 5 fone for his 1st out of the state contact on the band.

W1NBM & W1NGE when last hrd were feuding abt who was causing the BCL in the neighborhood. Mebee it's a 50-50 proposition!!

Speaking abt W1NBM, he sez he don't believe we write this stuff, so tell him ED. Tnx. [He do!!! Ed.]

W1DXD of Malden hails from gd ole Roxbury, Mass.

W1MMH when not playing arnd on 2 1/2 & 10 meters, fixes those red fire & Police boxes on the corner.

W1NGF is a nw ham arnd these parts.  
 W1AZ's XYL is studying the code fer her ham ticket. The OM is a ship's radio op.

Another nw ham arnd town is W1NBM of Matapan. Eddie is running 100 wts to a pr of 800's, mod wid HY-25's in class B. Rcvr is a deluxe 13 tube homebilt super. Eddie at present is attending *Hude Park High*.

W1LL is wrking 20 fone nw & is running 180 wts to a 200T & TZ-40's in the mod. He has a real fine sounding sig arnd the bnd.

W1BDM while testing his mod wid an oscilloscope got wires twisted & put sum voltage thru his xtal mike. Nw Joe is using a single button. Hi! Joe will shortly be on 75 fone wid a pr of 809's in the fnl.

W1AJA recenly sold his rig. If we know George he'll be on the bnd agn before the yrs up.

W1BDM usta be old W1CEL. He is holding the call reserved until the XYL gets the code dwn pat.

W1HXE of Lawrence & W1JFS of Danvers hve bn cuming in on 10 meters into Boston wid gd sigs.

W1IHF wrks fer a local BC sta. It's WBZ dwn Hull.

W1EAU is *Defense Coordinator* for his home town of Weymouth. Ed, you remember, is an old Army Net roofer.

W1MIG is nw living up in Portland & cums dwn to Boston once a month to get his haircut at the Ham's Barber W1KSA.

W2MIW is wrking portable W1 at Cambridge on 2 1/2 wid a xtal rig.

Speaking abt mobile rigs, we hr tt W1KSA is gg mobile this summer & wl have a separate rig for both 2 1/2 and 5 meters. Rcvr he is gg to use is a *SX-27*. Wonder if is Joe's gg to drag along a port kitchen also.

W1DPI is running fm on 5 meters. The whole rig uses only 3 tubes & sounds real gd.

W1WV has a nw ECO. The sig shifter employs 8 tubes. (Yes just the oscillator.)

Coincidence: W1AHD is being transferred to the Far East to take up his nw post in the Army. The ship tt carried AHD was the *USS Grant*, & none other than Boston's own W1IUY was the ship's radio op. No doubt most of Al's

Printed in the U.S.A.

time was spent dwn the radio room. Al wl be stationed at either Shanghai, Hongkong or Manila. (?) He expects wid the help of IUY to set up a rombic beam pointed at the gd ole USA, as sn as he gets things set.

W1AKD gg mobile wid a pr of HK-24's on 2 1/2 running close to 35 wts.

W1EVM on 10 cw. Contacts must be few & far between.

W1GG usta be W1IZK. Is nw located in Belmont, usta be in Salem.

A nw network has started up on 10 meters tt is called the *Rain-barrel Net*. Sum of the net members r: EKG, NBM, MMH, GOU, LZW and urs truly JOM. The net is open to local hams only. The net is just for the purpose of gd old fashioned roundtable QSO's.

W1KCP, APV & MMH recenly pd a visit to Smokey Joe, W1JQA, of N. Randolph.

W1FMQ is nw active on 10 fone frm Malden. Frank has bn a Morse code op wid the railway for the past 37 yrs. His son is also a ham op & wrks on 20 cw. By the way Frank is a member of the *O.R.T.*

W1BKE tt "big kw engineer" of Lynn wrked JGN abt 5 yrs back fer one of JGN's 1st contacts. BKE after a long absence came back on the air & JGN looking back in the log read back sum very vy complimentary notes abt the QSO. Pete (BKE) by the way has recenly bn pensioned.

W1JDE has bilt a new 10 meter rig tt wrks fb.

W1LZW of 2 1/2 meter fame is nw up on 10 but having a little trouble wid harmonics.

W1MKW's rig is completely band switch controlled.

W1FMQ is using an EImac 50T tt has bn in the same final stage fer 8 yrs. Tts sum performance record!

W1DLY of Gilbertville, is on 10 meters.

W1DQ & FMP r boasting fans besides radio enthusiasts. Wow.

W1LW nw has a 3rd op.

W1LEU was trying to wrk Conn. & R. I. one nite on 10 but ng. But the next day got a SWL frm N. Y. which sd his sigs were 5-8. Tts 10 fone fer u.

It's too cold to type any more of this so 73.

**J**OE W9BZT Farneti hits us wid:

W9GZN, Murney, Wilmette, Ill., has upped his power to half a KW on 160 and has worked himself a K7, in Alaska already. His daughter Edna, W91KN is going great guns too.

W9EQE (Earthquake Expert) Bill also of Wilmette actually sells that type insurance and has he the dope on earthquakes? Ask him if you doubt, but remember, you were warned. Hi.

W9CGX, Glenn, St. Catherines Hospital, Kenosha, Wisc., has upped his power to 750 watts. Not only that but it's variable from 7 1/2 to the full 750 and everything else works along with it. No foolin'. He also got hisself a class A ticket and is going to town.

W9ES, George, Niles, Ill., is running a whole KW to an 85 foot vertical antenna and really drills a hole in "ole one sissie." He's Chief Op for WBBM too.

W9RTV, Gene, Ravinia, Ill., a newcomer on this band and on the air, is slowly getting a f. b. sig out. A bit tougher than it seemed, ain't it, Gene.

W9QBJ, Jeff, Glencoe, Ill., is trying out Army life in the *Signal Corps* for a year (or so) and claims that previous accounts were a bit premature. Good luck, Jeff.

W9MFP, Wally (Many Fine Policemen) is actually one and spends his time directing the various Squad Cars about the city of Chicago, then comes home and gasses on 160. He really gets out too.

W9VH, Fred, Naperville, Ill., upped his rig to a KW lately, using cathode modulation, and he really works out.

That "owl network" on 1882 composed of first, second and third district boys is sure being read in fine shape out here.

W9FIY, Smilin' Jack, Wheaton, Ill., is still experimenting and (as usual) rebuilding. May soon be on with half a KW using his pet series cathode modulation.

W9GM, Jerry, Hagerstown, Ind., is still under doctor's orders and leaves the air promptly at midnite, no later. He is much better and will soon be able to sit in the old round tables agn.

That fb sig emanating from W9LSQ, Glenn, Chicago is the result of eight watts and a darn swell antenna. He's going to town with it.

W8RHZ, Harry (es wife Winnie) Cleveland Heights, Ohio, are gonna move out to their newly acquired farm one day soon to (Harry sez) raise antenna poles. Better get your orders in, fellas.

Wonder just what W8ATT, Virda, and his wife Garnette (W8RFT) have up their sleeves? They now have their antenna strung between two mountains and it's a quarter wave above ground too, yeh he does raise heck on the west coast. Thinking of leaving it, folks?

W9GUE, Harold, Green Bay, Wisc., now has ham radio working for him claims W9FDV, Windy Bill of Chicago. He's supposed to be using water cooled tubes and not wasting a drop of hot water. When did they start making T200's water cooled, Bill?

W4FTS, Andy of Greensboro, together with W4AIIH of Selma, Alabama, sure put a swell sig the other a.m. worked themselves a W6 and a W7 too.

W4FMN, All Miami Fla., has sold out and is gonna help Uncle Sam peel spuds for a year or so, well maybe he's gonna be in the Signal dept., then. Don't forget to keep in touch with us, Al.

W9YIX, George, Oak Park, Ill., is another who is leaving us for a spell but not to peel spuds, no sir, he's gonna boss the guy what bosses the guy that tells the spud peelers to start. Yep George is a Major.

# BUY DIRECT FROM THE MANUFACTURER AND SAVE

WE KNOW OUR PRICES ARE VERY LOW and expect a certain amount of skepticism from servicemen who have never purchased the SUPERIOR way, but five years of sticking to our way of doing business has convinced us and many thousands of servicemen who have purchased from us that it is a practical and mutually profitable way of doing business. We know that the average income of the Radio Serviceman prohibits his purchasing high-priced equipment, and yet the very nature of his work makes it necessary for him to use accurate, dependable and up-to-date equipment. We know we have solved the problem for him and our continually expanding business proves that servicemen recognize this claim to be true.

BESIDES THE THOUSANDS OF SERVICEMEN AND TECHNICIANS, THE FOLLOWING WELL-KNOWN NAMES ARE LISTED AMONG SUPERIOR INSTRUMENT PURCHASERS: Standard Oil Company of New Jersey; U. S. Dept. of Agriculture; U. S. Dept. of Commerce; U. S. War Department; C.C.C. Camps; National Youth Administration; Goodyear Tire and Rubber Co.; E. I. duPont de Nemours & Co.; University of Nebraska; Leland Stanford Junior University; Westminster College; Oberlin College; University of Michigan; Boston College; Pomona College; Board of Education, Remus, Michigan; Board of Education, City of New York; Board of Vocational Education, State of Illinois; City of Bartow, Florida; Florida State Dept. of Education; Educational Dept., Custer, North Dakota.



## The New Model 1220 POCKET LABORATORY

★ WEIGHS ONLY 28 OUNCES!!  
★ USES a 2% ACCURATE 0-200 MICROAMMETER—ENABLING MEASUREMENTS AT

5000 OHMS PER VOLT

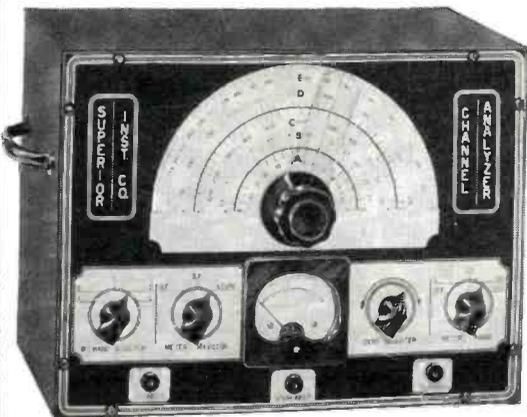
SPECIFICATIONS

- ★ 6 D.C. Voltage Ranges: 0-3-10-50-250-500-5,000 volts.
- ★ 3 A.C. Voltage Ranges: 0-15-150-1500 volts.
- ★ 4 Resistance Ranges: 0-3000 ohms, with 15 ohm center, direct reading to 0.2 ohm; foregoing base range multiplied by 10, by 100 and by 1,000, to read up to 3 Meg. with self-contained 3 V. flashlight battery.
- ★ D.C. Current Ranges: 0-200 microamperes; 0-2-20-200 Milliampères, using wire-wound shunts.
- ★ 3 Output Meter Ranges: Same as A.C. Voltage Ranges.
- ★ 3 Decibel Ranges: From -2 to +58 D.B., based on .006 watt in 500 ohms.

Model 1220 comes complete with cover, self-contained battery, test leads and instructions. ONLY

**\$10<sup>45</sup>**

## THE NEW CHANNEL-ANALYZER



FOLLOWS THE SIGNAL

FROM ANTENNA TO SPEAKER OF ANY SET

The well-established and authentic SIGNAL TRACING METHOD of locating the very circuit in which there is trouble, and the very component that causes the trouble, is now for the first time available at a price any radio serviceman can afford.

### THE CHANNEL-ANALYZER WILL

- ★ Follow the signal from antenna to speaker through all stages of any receiver ever made.
- ★ Instantly track down exact cause of intermittent operation.
- ★ Measure both Automatic-Volume-Control and Automatic-Frequency-Control, voltages and circuits without appreciably loading the circuit, using built-in highly sensitive Vacuum-Tube Voltmeter.
- ★ Check exact gain of every individual stage in receiver.
- ★ Track down and locate cause of distortion in R.F., I.F., and A.F. amplifier.
- ★ Check exact operating voltage of each tube.
- ★ Locate leaky condensers and all high-resistance shorts, also show opens.
- ★ Measure exact frequencies, amount of drift and comparative output of oscillators in superhets.
- ★ Track down exact cause of noise.

The Superior Channel-Analyzer comes housed in shielded cabinet and features an attractive etched aluminum panel. Supplied complete with tubes, three specially engineered shielded input cables, each identified as to its purpose. Also full operating instructions. Size 13" x 10" x 6". Shipping weight 19 pounds. Only...

**\$19<sup>75</sup>**

## The New Model 1240 TUBE TESTER

Instantaneous snap switches reduce actual testing time to absolute minimum. Tests all tubes 1.4 to 117 volts.

Sockets for all tubes—

No adapters.

### SPECIFICATIONS:

- ★ Tests all tubes, 1.4 to 117 volts, including 4, 5, 6, 7, 7L, octals, octals, Bantam, Jr., Peanut, single ended, floating filament, Mercury Vapor Rectifiers, the new S series, in fact every tube designed to date.
- ★ Spare socket included on front panel for any future tubes.
- ★ Tests by the well-established emission method for tube quality, directly read on the GOOD ? BAD scale of the meter.
- ★ Jewel protected neon.
- ★ Tests shorts and leakages up to 2 megohms in all tubes.
- ★ Tests leakages and shorts in all elements AGAINST all elements in all tubes.
- ★ Tests BOTH plates in rectifiers.
- ★ Tests individual sections such as diodes, triodes, pentodes, etc., in multi-purpose tubes.
- ★ Latest type voltage regulator.
- ★ Features an attractive etched aluminum panel.
- ★ Works on 90 to 125 volts 60 cycles A.C.

Model 1240 comes complete with instructions and tabular data for every known type of receiving tube. Shipping weight 12 pounds. Size 6" x 7½" x 10¾".

**\$11<sup>85</sup>**

PORTABLE COVER \$1.00 ADDITIONAL

## MODEL 1230 SIGNAL GENERATOR



WITH FIVE STEPS OF SINE-WAVE AUDIO

### SPECIFICATIONS:

1. Combination R.F. and A.F. Signal Generator, R.F.—100 K.C. to 90 Megacycles, A.F.—200 to 7500 cycles; Sine-Wave, WITH OUTPUT OF OVER 1 VOLT. All direct reading, all by front panel switch manipulation.
2. R.F. and A.F. output independently obtainable, alone or with A.F. (any frequency) modulating R.F.

3. Latest design full-range attenuator used for controlling either the pure or modulated R.F.
4. Accuracy is within 1% on I.F. and broadcast bands; 2% on higher frequencies.
5. Giant dial etched directly on front panel, using a new mechanically perfected drive for perfect vernier control.
6. Operates on 90 to 130 V. A.C. or D.C. (any frequency).

The Model 1230 comes complete with tubes, shielded cables, molded carrying handle and instructions. Size 14" x 6" x 11". Shipping weight 15 pounds. Only....

**\$12<sup>85</sup>**

# SUPERIOR INSTRUMENTS CO.

136 Liberty St., Dept. RN5  
New York, N. Y.

# RE-SET PUSH BUTTONS THE *Rapid* WAY!



## RCA Station Allocator

Covers all push-button setting and alignment work. Operates from either self-contained batteries or a-c. **\$17.50**  
Stock No. 171—Price

The RCA Station Allocator is an indispensable instrument for the service dealer who really plans to "cash in" on his greatest business-building opportunity in years. With it, you can handle more push button receiver re-tuning jobs in less time, with less effort and at greater profits. Moreover, it will serve as a useful shop instrument long after the present re-allocation is forgotten.

The Allocator is speedy, accurate, portable. Eight push buttons can quickly be set up to desired frequencies. Operation is with or without modulation. It then serves as an oscillator for rapid identification of desired stations during the re-tuning of receivers. Two buttons can be tuned to i-f frequencies if desired, thus providing remarkable flexibility for all alignment as well as push-button setting work. The Allocator operates from either a-c or self-contained batteries.

Only one adjustment is required for each frequency. What's more, thanks to the Allocator's magnetite core inductances and polystyrene condensers, these adjustments *stay put*. Weight is only 5½ lbs. with batteries. Size is 5" high, 8¾" long and 3⅝" deep.

See the Allocator at your RCA Test Equipment Distributor's today. Prepare now for faster work and bigger profits!

### SPECIFICATIONS

**PUSH-BUTTON RANGES:**  
Buttons 1 and 2 . . . . . (approximately) 405-825 kc.  
Buttons 3, 4, and 5 . . . . . " 600-1185 kc.  
Buttons 6, 7, and 8 . . . . . " 820-1700 kc.

**TUBE COMPLEMENT:**  
1 RCA-1R5 as r-f oscillator, 1 RCA-6H6 for a-c rectification, 1 neon tube for a-f oscillator and pilot lamp.

### Another RCA Time-Saving Money-Maker

## RCA Junior VOLT OHMYST

Costing only a little more than an ordinary volt-ohmmeter, the RCA Junior VoltOhmyst gives you electronic push-pull operation with all the time and money-saving features of the famous Rider VoltOhmyst circuits plus

the addition of an isolated rectifier-type a-c voltmeter! Special protective features guard against meter burn-out for d-c volts and ohms measurements. It is an instrument no wide-awake technician can afford to miss!

Price, Complete **\$34.95** Stock No. 165



# Test Equipment

YOUR KEY TO SYSTEMATIC  
SERVICING FOR GREATER PROFITS

RCA MANUFACTURING CO., Inc., Camden, N. J. • A Service of the Radio Corporation of America  
In Canada: RCA VICTOR COMPANY, Ltd., Montreal

