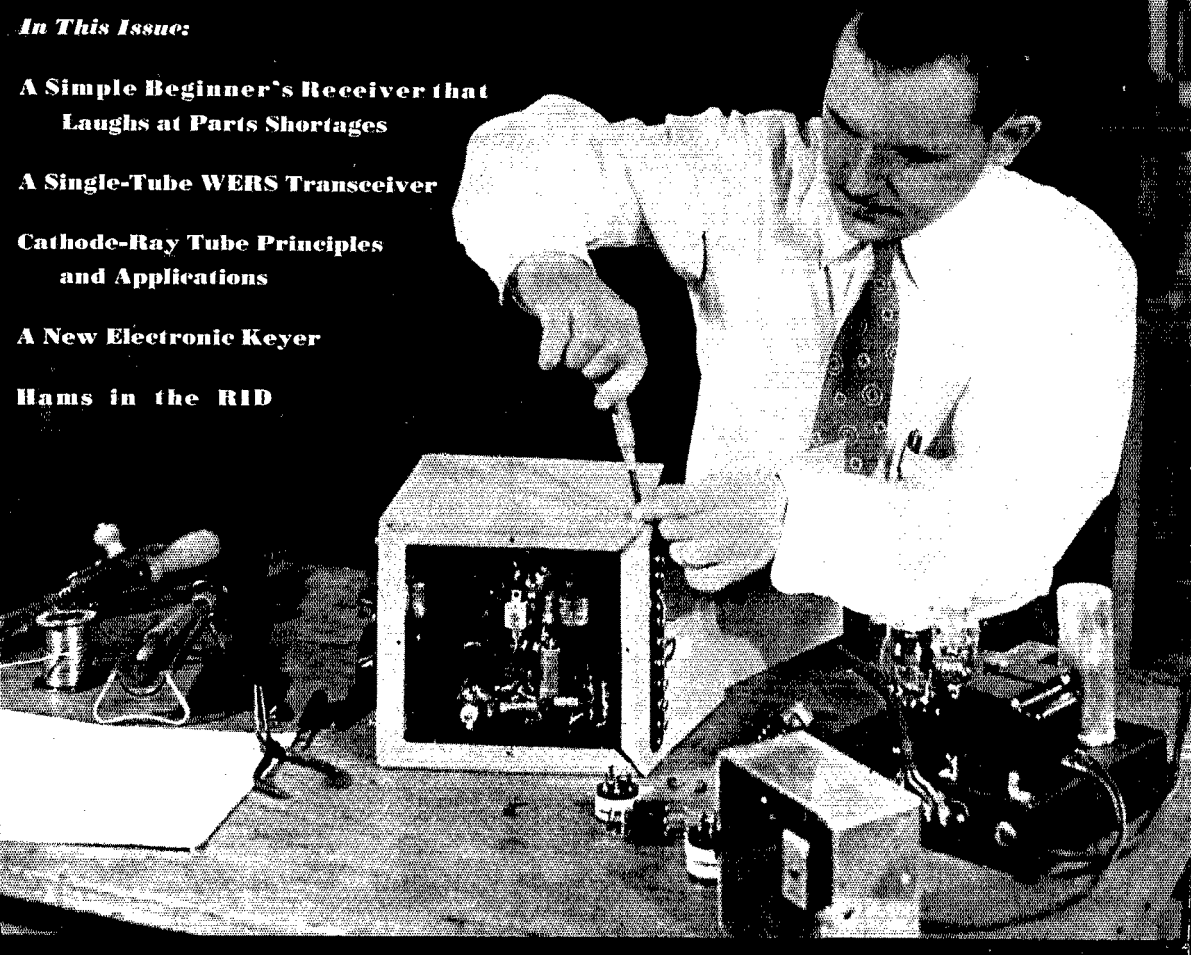
QST

october, 1944
25 cents
35c in Canada

devoted entirely to

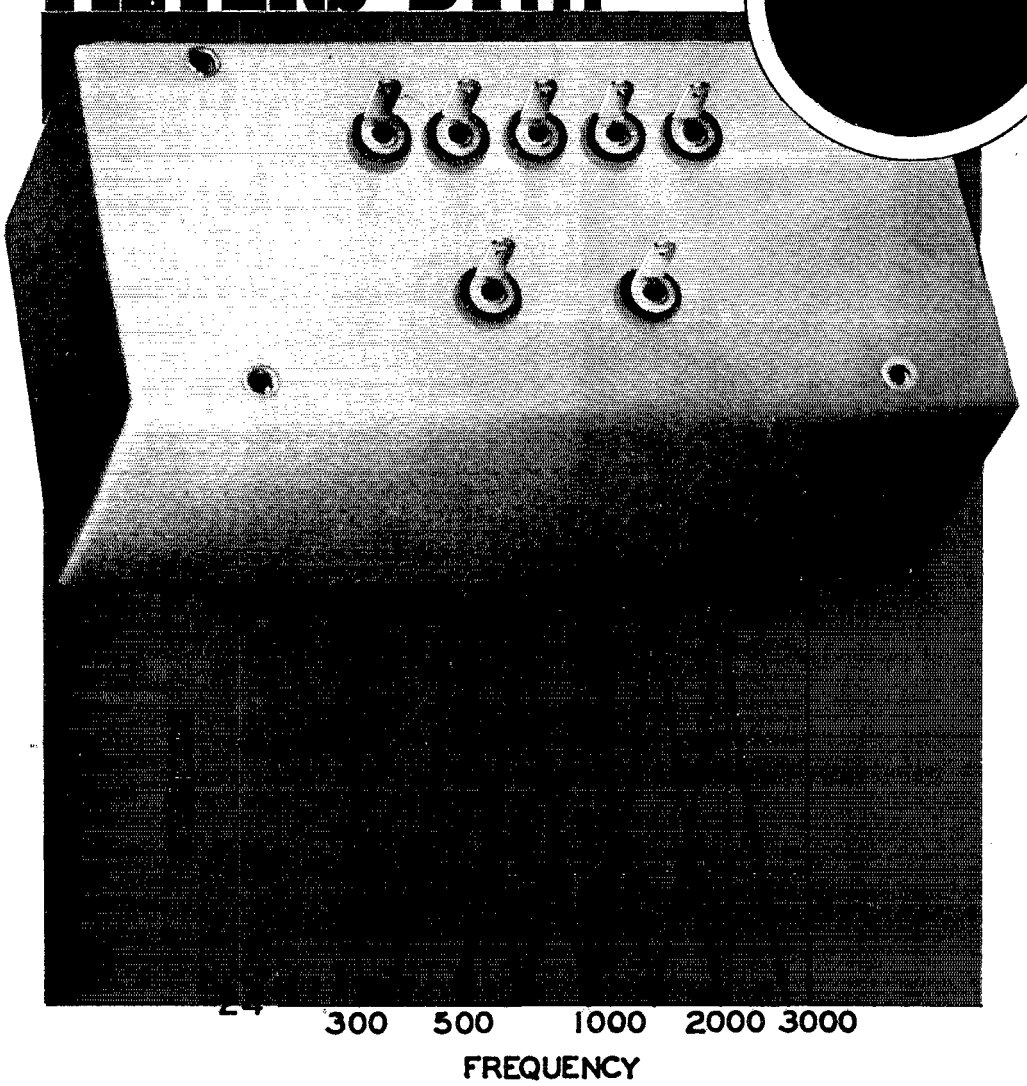
amateur radio

In This Issue:



PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

MULTI-CHANNEL FILTERS BY...



Multi-Channel Filters lend themselves to remote control apparatus employing frequency selection. The unit illustrated is a five channel band pass filter of the interstage type with the inputs in parallel and 5 separate output channels designed to feed into open grids. This circuit arrangement provides a 2:1 stepup ratio, with a band pass attenuation of approximately 30 DB per half octave. The dimensions of this unit in its hermetically sealed case are 2½" x 3" x 6". Filters of this type can be supplied for any group of band pass frequencies from 200 to 7000 cycles.

May we cooperate with you on design savings for your application . . . war or postwar?

150 VARICK STREET **NEW YORK 13, N. Y.**

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"What about post war plans at Hallicrafters?"

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After all, it was the ham, the amateur enthusiast who helped us get short wave out of the attic, out of the shack and into the battle line. And it was the ham who went into the service and into the labs to keep working with short wave until it became what it is now, a prime battle instrument, a life saver.

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William J. Halligan

hallicrafters RADIO

THE HALLICRAFTERS COMPANY, MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U. S. A.

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Hallicrafters will give $200.00 for the best letters received during each of the six months of September, October, November, December, 1944, January, and February, 1945. (Deadline: Your letter must be received by midnight, the last day of each month.)

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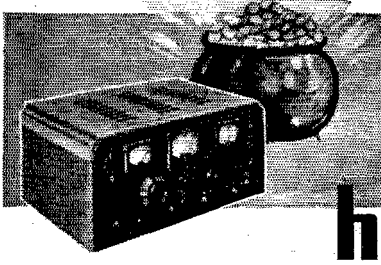
Open to servicemen around the world. Wherever you are, whenever you see this ad, drop us a line. Monthly winners will be notified immediately upon judging.



There's gold here at the end of the rainbow in Hallicrafters great letter contest—and there's a great and exciting future ahead for short wave enthusiasts. In peace time Hallicrafters will continue to build "the radio man's radio"—and that means the best that can be made. There will be a set for you in our postwar line.

BUY A WAR BOND TODAY!

hallicrafters RADIO

THE HALLICRAFTERS COMPANY, MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U.S.A.

OCTOBER 1944

VOLUME XXVIII

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★

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OFFICES

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West Hartford 7, Connecticut

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QST *devoted entirely to*

AMATEUR RADIO

PUBLISHED, MONTHLY, AS ITS OFFICIAL ORGAN; BY THE AMERICAN RADIO RELAY LEAGUE, INC., AT WEST HARTFORD, CONN., U. S. A.; OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

CONTENTS

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Section Communications Managers of the A.R.R.L. Communications Department

Reports Invited. All amateurs, especially League members, are invited to report communications activities, training plans, code classes, theory-discussion groups, civilian-defense building or planning each mid-month (16th of the month for the last 30 days) direct to the SCM, the administrative official of ARRL elected by members in each Section whose address is given below. Radio Club reports and Emergency Coördinator reports representing community organized work and plans and progress are especially desired by SCMs for inclusion in *QST*. **ARRL Field Organization appointments,** with the exception of the Emergency Coördinator and Emergency Corps posts, are suspended for the present and no new appointments or cancellations, with the exception named, will be made. This is to permit full efforts of all in Emergency Corps plans.

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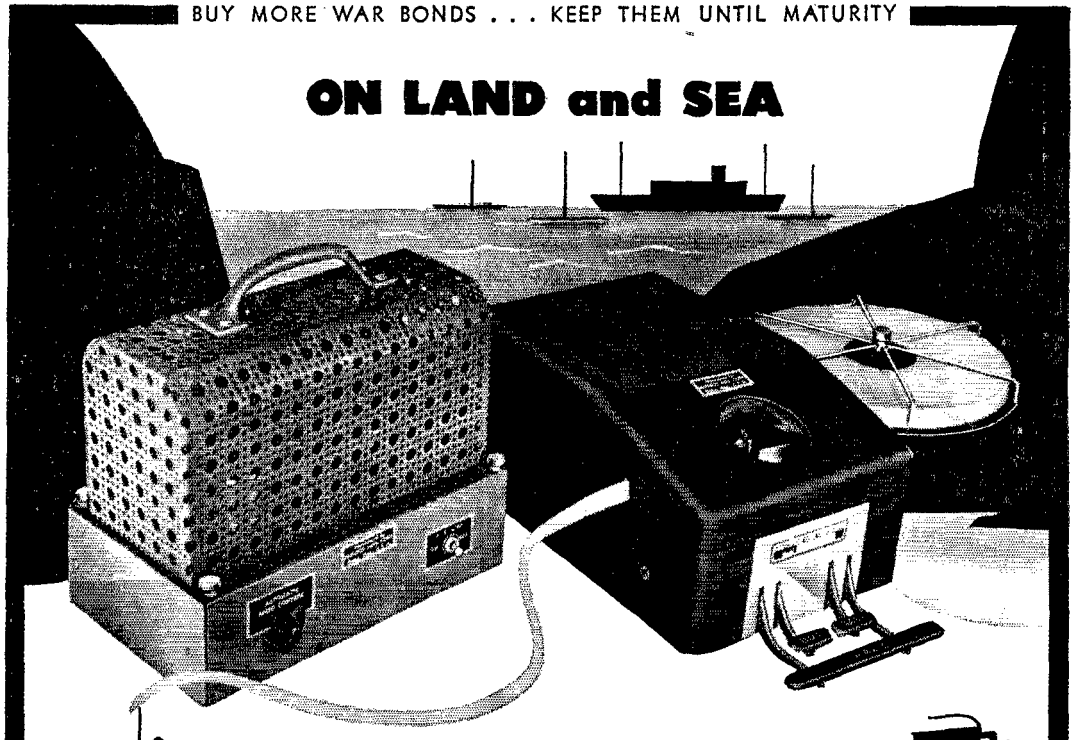

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is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

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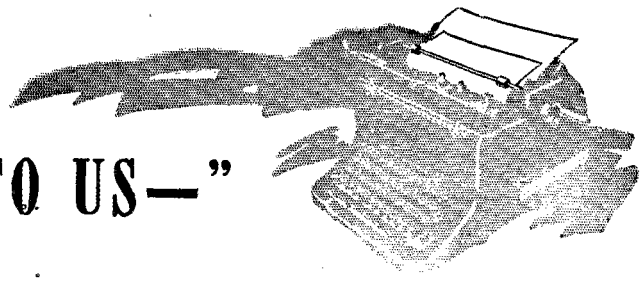


"IT SEEMS TO US—"

TEMPUS FIDGITS

TIME is curved, they say. Frequently it seems to us, with Alice, that it takes all the running we can do to stay in the same place. But we guess time is a circle, after all, because we can see that, bit by bit, we are edging our way back to the starting point, the start of a new cycle in amateur radio.

We've just been writing our monthly installment of the column "In *QST* 25 Years Ago This Month." Pawing through the old issues, we were struck by the remarkable general similarity of events then and now. Just a quarter of a century ago this month amateur radio was restored to the ether after the first world war. In the simpler ways of a less complex era, we had helped to win a war, had had an agonizing wait, had finally fought our way back on to the air, were resuming operation with our prewar stations while we meanwhile speculated on the application of the new war-born techniques of that day.

Time for us today has not yet swung full circle but, fellow hams, it's on its way! It's the same old history writing itself anew, this time in infinitely more complicated pattern. The war is being won, the radio world busily plans its amazing postwar life, and we can now look ahead to the day when we shall resume operation. We have a very important period immediately ahead of us, in the postwar allocation planning, as we report in another column in this issue, but we can now have every confidence in an eventual happy outcome.

Incidentally, everywhere we go we run into the most amazing — and unfounded — rumors concerning the postwar status of amateur radio. We don't know where these distressing rumors come from; there must be a war of nerves on somewhere in the radio picture or perhaps amateurs are naturally jittery because radio means so precious much to them. Let us answer this stuff once and for all: forget it; *of course* there is going to be amateur radio again, and with adequate allocations.

OK on that? Then let's look ahead a little.

It is going to be a congested and complicated radio world, and the technical standards are going to be tougher than they used to be. We used to get away with transmitters that were not all they should be but we won't be able to when we go back on the air. Harmonics and splatter in somebody else's band won't be tolerated, nor shall we want, in our own bands, to put up with chirps, clicks, mush and snaky signals that won't stand still long enough to be copied. It is time we began thinking about the overhauling of our rigs. If you have a transmitter that puts out a stable reliable signal with a pure d.c. note and substantially free of spurious radiations, you have all that's needed. But have you? If you're not sure you have, we suggest that it is time to plan rebuilding. We don't mean, of course, the building of brand-new transmitters; many components aren't available. But the diseases of a bad transmitter are almost all capable of cure by a rebuilding job with the same parts. The set ought to be built over so that it accords with modern engineering principles. Such conformity does not necessarily mean complexity but it does mean some careful planning to avoid overloaded tubes, overheated parts, stray couplings that generate troubles, insulation leaks that ruin notes and waste power, haywire that promotes unreliability. How were your key-clicks back in 1941? Did you possess means for knowing when you were over-modulating? Would your carrier stand still when keyed? Plenty of stations had none of these troubles, you know. If you had any of them, they were the results of either defective design or defective construction and are entirely remediable by a little study and work. The good days begin to approach, OM, so it's time to start your thinking.

We want also to address a word to the holders of restricted radiotelephone operator permits in WERS. A great many of you have said that you want to get into amateur radio after the war. Many of you have much aptitude for it and will be welcome. But you can't do it on a restricted permit; you must have an amateur operator's license. That means that it is time for you to begin to learn the code and to start your study of technical and regulatory matters in preparation for the amateur examination. Even if your chief interest is in voice operation, code knowledge is necessary. It's an essential part of amateur radio, properly required by the international treaties, and it always will be so. Besides, there are many things you can do on c.w. that you can't do on 'phone. It will be a good thing to have your operator license already in hand, ahead of the big rush that is sure to come. But it will take you a few months

of spare-time study to get up code speed and bone up for the rest of the exam. It's worth doing. In your work in WERS you have had only a very small smell of what amateur radio is like. Its many fascinating possibilities await you but you'll have to work for them by qualifying as an amateur operator, as all the rest of us have done. So, it seems to us, you'd be smart to make a start on it soon.

K.B.W.

★ SPLATTER ★

OUR COVER

LESS frequently than of yore the lab at ARRL Hq. rings long and late with the cacophonous screech of the band saw, and the spasmodic drone of the drill press as new pieces of gear are started on their way toward appearance in *QST* or the *Handbook* — but things are picking up again. On the cover this month we see the finishing touches being put on his receiver (described on page 9) by Walt Bradley, W1FWH, of ARRL's Technical Information Service.

•••—

FOOTNOTES

FIRST of all, we have a little catching up to do. Since Splatter was crowded out of September *QST*, we present here the authors whose articles appeared in that issue.

Henry B. O. Davis, W4HZI–ex-W5BAZ-W9GGB-W7IBV, whose discussion of volt-amperes vs. watts appeared on page 60, has this to say about himself:

"My radio growth was stunted in 1928 due to being late for the license exam. Seeing everyone ready for the code test, I grabbed some paper and started copying. It was the fastest ten words I had ever run into. After copying two pages of the stuff I decided I might as well give up as die trying so, with a heavy heart, I turned in my paper. When the inspector asked if I was taking the amateur or commercial exam I felt a bit better. . . . My amateur career was rudely interrupted, but not extinguished, while I battled for an A.B. degree. Then, discovering I still didn't know much, I persuaded V.P.I. to come across with a B.S. in E.E. after several years of pressure. Since no one would give me a job in radio (because nine years as an amateur added up to no experience), I got into designing and building REA lines. Then to the transmission design squad at TVA. When the war came on the Army or Navy wouldn't have me so I went with the Signal Corps as a civilian. Thinking some commercial tickets might help, I took the examination for radiotelephone first-class and radiotelegraph second-class licenses one day. The licenses came through but the raise didn't. Instead I went to school again for some 'hush-hush' education; then to the field for installation and maintenance of some very interesting devices. At present I'm rated as an assistant radio engineer."

All the rest of the September authors were old-timers as far as *QST* contributions are concerned. Included were, on p. 54, **Dawkins Espy, W6UBT,** (Splatter Dec., 1942, p. 10); on p. 65, **Edward M. Noll, ex-W3FQJ** (Splatter, Oct., 1943, p. 8), and, on p. 57, **Paul J. Palmer, W8UGR** (Splatter, Jan., 1943, p. 16).

The last issue accounted for, we'll now introduce those contributors who are making an initial appearance on *QST*'s pages (at least with full-fledged articles) in this issue. **Gurdon R. Abell, jr., W2IXK** (p. 30), tell us that he was first nibbled by the radio bug in 1927, bitten for keeps in 1930, and spent so much time on the hobby that he decided to make it a career. He therefore entered Harvard for communications instead of M.I.T. for aeronautics. Wangled a Class B in 1935 and an A.B. in 1937, and did a two-year P.G. stretch. His health going back on him, he returned home where he started to putter around and invent; "Gamma Laboratories" being the cat that grew out of the kitten. He likes to cook up small, simple electronic (not "radionic") devices. At the time of Pearl Harbor he held a shiny new Class A ticket, and was in the local emergency radio corps. The ticket collecting dust and corps having evaporated, he now teaches radio to "young squirts." To which W2IXK adds: "And that's about all there is — at least it won't take up much of *QST*'s rationed paper". . .

Fred A. Chevillot, W8SWI (p. 37), entered the ham game back in the days of 200 meters, honeycomb coils and the UV200 series tubes, with the organization of a high school radio club, 8.W. Following the completion of high school he constructed superheterodyne receivers until competition with commercial manufacturers proved to be too great. In 1925 he became affiliated with a financial institution — which was far removed from radio — and it was not until 1935, shortly after his marriage, that he obtained a radio receiver with a short-wave band and once again

(*Continued on page 96*)

APOLOGY

We regret that circumstances beyond our control, resulting from the specialized material therein, delayed the production and mailing of the September issue of *QST*. To those of you who — judging by the volume of "where is my *QST*" correspondence received — spent sleepless nights awaiting their copies, our apologies. However, we beg your tolerance. Despite wartime production complications this has been the first issue in a number of years to be delayed beyond the scheduled publication date.

A Versatile Two-Tube Regenerative Receiver

Parts Shortages Are Small Handicap in Constructing this Adaptable Beginner's Design

BY WALTER E. BRADLEY,* W1FWH

The two-tube regenerative receiver has been a stand-by for beginners for years. The one described here has provision for general-coverage as well as bandspread tuning and covers a total frequency range of 550 kc. to 32 Mc. In contrast to *most receivers of this type, the entire* broadcast band is included within the tuning range of a single coil. Provision has been made for the interchangeable use of a.c. and battery tubes, while the audio output is great enough to operate a small loudspeaker.

THE would-be amateur need not necessarily know the fundamentals of radio to build a successful first receiver. If it is successful, however, during the process of construction and operation it is certain that he will absorb some of the principles involved in receiver design. For that reason alone, experimental construction is worth while. After all, the true importance of radio theory lies in its practical application; the theory alone is of slight value.

The amateur's know-how of radio has earned high respect because it is based on actual experience with the construction and operation of radio apparatus. This experience in practically all cases has begun with a receiver, the simplest of which is the regenerative type here described.

Circuit

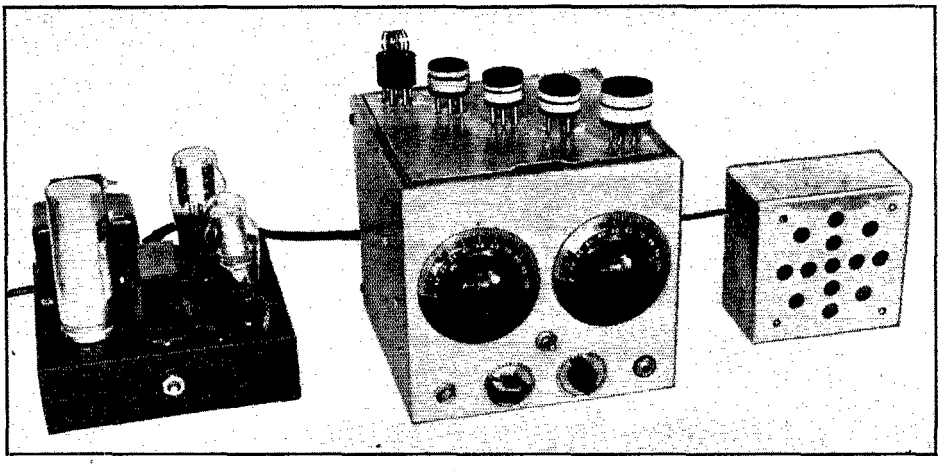
The wiring diagram appears in Fig. 1. It shows an ordinary regenerative pentode detector impedance-coupled to a pentode audio amplifier. A pentode tube is superior to a triode as the detector because of its greater amplification of incoming signals and consequent better sensitivity. Although a triode would have been suitable for the audio amplifier if headphone operation alone were contemplated, a power pentode was considered preferable, first because loudspeaker output is incorporated in the design, and second, because such a tube requires less driving voltage for the same power output.

*Technical Information Service, ARRL

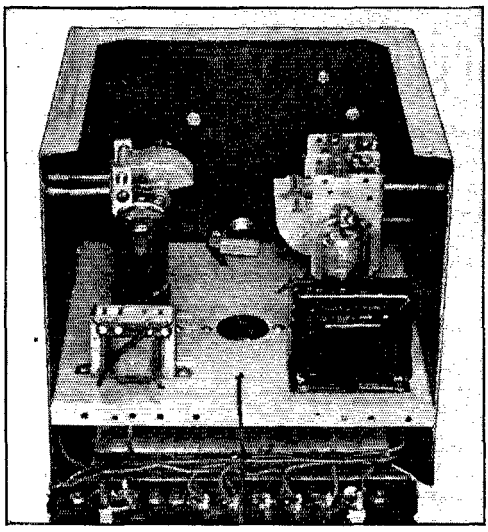
Tuning System

Most short-wave-receiver builders are familiar with the tuning system shown in Fig. 1. A total frequency range of 550 kc. to 32 Mc. is covered by a set of five plug-in coils in conjunction with a pair of tuning condensers, C_2 and C_5. C_2 is connected across the entire coil to provide general coverage, while C_5 is connected to a tap on the coil which is so placed that essentially full-dial bandspread is obtained on each of the amateur bands. C_2 serves also as the band-set condenser to locate the band over which the bandspread condenser will operate. C_5 may, of course, be used for bandspread tuning at any point within the range of the receiver.

Experience has shown that the majority of those who build a beginner's receiver want some-



The beginner's receiver, complete with power supply, cabinet, coils and loudspeaker. The stand-by switch is at the lower left on the receiver panel. Regeneration and volume controls are in the center at the bottom, with the heater-filament switch centered above them. The 'phone jack is at the extreme right. Both main and bandspread tuning dials are of the vernier type.



Rear view of the receiver with back panel of cabinet opened. Terminal strips on lower edge of back panel can be seen at the bottom of the photograph. The wire coming from the center of the chassis is the antenna lead to the rear-panel binding post. The speaker output transformer is mounted behind the power tube, and the audio choke behind the detector tube. The coil socket is between the tubes, and the heater-filament switch is on the front panel. The dual band-set condenser at the right is not necessary if a single-section is available.

thing which will cover the broadcast band as well as the amateur bands. In the past it has been common practice to attempt to meet this requirement by the use of at least two plug-in coils which must be changed in covering the entire band with the small tuning condensers around which most h.f. receivers are designed. To avoid this inconvenience, a standard 365-$\mu\mu$fd. b.c. tuning condenser is used as the band-set or general-coverage condenser. A 100-$\mu\mu$fd. condenser was chosen for the bandspread condenser since this is the smallest size which will cover the 1.75-Mc. band, the "widest" of the amateur bands.

L_2 is the tickler winding which provides the necessary feed-back from plate to grid to provide oscillation for c.w. signals or regeneration on modulation. The amount of feed-back is controlled by R_1 which varies the by-passing effect of C_3.

For smooth control, which means having the receiver come into regeneration with a soft rushing noise and not a sudden click, the value of R_1 should be as low as possible. Its maximum value must be sufficient to wash out regeneration, and thus may vary with different tubes. This resistor should be of the carbon type for minimum noise, although the wire-wound type also is satisfactory if a carbon unit is not available.

The capacity of C_3 is purposely large so that the number of necessary turns on the tickler coil will be kept to a minimum. Additional factors influencing the tickler turns are the plate voltage on the detector and the type of tube used, more turns being required for the filament-type tubes and less for the higher plate voltages usually associated with a.c. tubes.

No d.c. plate current flows through the tickler coil in this parallel-feed arrangement.

The small variable condenser, C_1, controls the coupling between the antenna and the input of the detector, an increase in capacity resulting in closer coupling between the two circuits. In general the longer the antenna the smaller the capacity necessary for optimum performance.

Audio System

The audio system of this receiver starts in the detector tube itself, for it is a grid-leak type of detector in which detection of the incoming signal takes place in the grid circuit of the tube. The first audio signals to appear are developed across the grid-leak, R_2, and fed along with the radio-frequency signals selected by the tuning circuit to the grid for amplification. Thus the grid-leak detector serves also as an audio amplifier.

The value chosen for R_2 must be a compromise from the considerations of stability and sensitivity. The higher the resistance, the greater will be

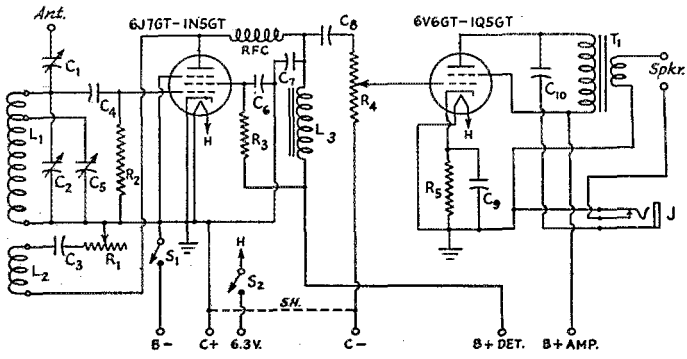


Fig. 1 — Receiver wiring diagram and parts list.

C_1 — 3-30-$\mu\mu$fd. mica trimmer.
C_2 — 365-$\mu\mu$fd. variable (in the unit pictured, one section of a dual), b.c. replacement variable (Meissner 21-5214).
C_3 — 0.001-μfd. mica.
C_4 — 250-$\mu\mu$fd. mica.
C_5 — 100-$\mu\mu$fd. midget variable (National EX-100).
C_6, C_8 — 0.01-μfd., 400-volt paper.
C_7 — 50-$\mu\mu$fd. mica.
C_9 — 10-μfd., 25-volt electrolytic
C_{10} — 0.1-μfd., 400-volt paper.
R_1 — 5000-ohm variable. (See text.)
R_2 — 1-megohm, ½-watt carbon.
R_3 — 50,000-ohm, 1-watt carbon.
R_4 — 500,000-ohm variable potentiometer.
R_5 — 250-ohm, 1-watt carbon.
RFC — 15-mh. r.f. choke.
L_1, L_2 — See coil table.
L_3 — 15-30-henry standard replacement filter choke or high-inductance audio-coupling choke. (See text.)
T — Pentode output-to-speaker transformer, universal type.
S_1, S_2 — Single-throw, single-pole toggle switches.
J — Closed-circuit jack (insulated from chassis).
SH — Wire shunt connection across "C"-bias terminals (for use with 6.3-volt tubes only).

the amount of audio voltage developed, but the operation will be less stable. Since audio frequencies are present across R_2, the grid-blocking condenser, C_4, cannot be made too large, otherwise the audio will be washed out or partially attenuated. The capacity of this condenser is chosen to present a low impedance to r.f., but a very high impedance to a.f. The same is true for the values of condensers C_3 and C_7, for they would by-pass the audio output of the detector if these capacities were made too large.

Since amplified audio and radio frequencies are both present in the plate circuit of the detector and they must be made to go their separate paths, the r.f. choke, *RFC*, is inserted between the audio choke, L_3, and the plate to stop the radio frequencies from mixing with the audio. Any stray r.f. that may get by this choke is invited to stay out of the audio choke by the r.f. by-pass condenser, C_7. This combination of an r.f. choke and by-pass condenser is known as an r.f. filter.

Since the plate resistance of the pentode detector tube is very high, maximum audio output is obtained with a high value of plate load impedance. This impedance is provided by the audio choke, L_3. A fixed resistor could just as readily be used if there were nothing but high load impedance involved in the matter of optimum set performance. However, smooth regeneration control requires as nearly perfect detector plate-voltage regulation as possible and this cannot be obtained with changing plate current through a high d.c. resistance. The use of the choke provides a means of securing a high plate load impedance for audio frequencies with low d.c. resistance.

Audio chokes with inductances up to 1000 henries were available in prewar days and are to be recommended if and when available. However, even the 15-henry substitute used gives better performance than a resistor. The highest inductance value available should be used.

Volume Control

The audio voltages developed across the audio choke are passed to the grid of the audio amplifier through the coupling condenser, C_8, and the volume control, R_4. The volume control, while not essential, will be found useful for cutting down the output level when using headphones.

Output System

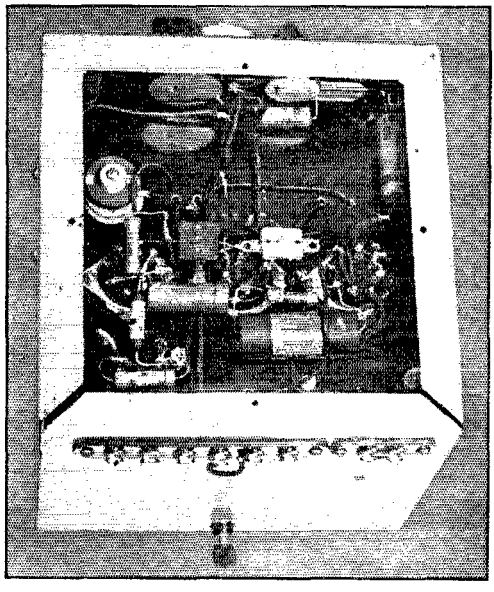
The loudspeaker is silenced in this receiver when headphones are plugged into the closed-circuit jack, *J*. This is accomplished by connecting the closed-circuit section of the jack in series with the voice-coil circuit of the output transformer, T_1, and the speaker. When the headphone plug is inserted, the closed-circuit switch in the jack is opened, breaking the voice-coil circuit. Audio signals are passed to the headphones via the coupling condenser, C_{10}, which also isolates the 'phones from the d.c. plate voltage. The jack must be insulated from the chassis, for a short circuit of the audio frequencies in the output transformer would otherwise occur via C_{10} to ground through the jack.

Grid Bias

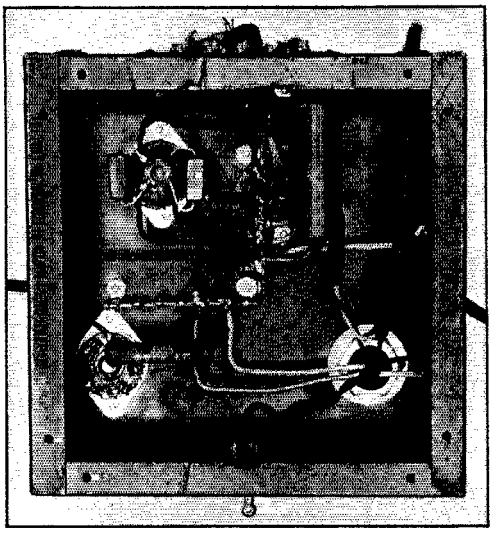
Some vacuum tubes require no external bias source for Class-A operation, and a very few require positive bias, but by far the majority must have negative voltage applied to their grids. The negative voltage required to bias the grid of the 6V6GT is 12.5 volts for Class-A operation. This is obtained by inserting the proper value of resistance in the cathode circuit. This resistor, R_5, is known as the cathode resistor.

To calculate the value of the cathode resistor necessary for other types of tubes simply divide the bias voltage specified for the tube by the manufacturer by the sum of the plate and screen currents in decimal parts of an ampere. These values may be found in the vacuum-tube characteristics tables in the *Handbook*. The wattage rating of the cathode resistor must at least equal the bias voltage times the sum of plate and screen current in decimal parts of an ampere.

The cathode-biasing method is not practical for filament-type tubes such as the 1Q5GT. This tube requires 4.5 volts of negative bias which is best provided by a battery, called the "C" battery. The terminals, −C and +C, make it possible to switch from cathode bias for the heater-type tube in the audio amplifier stage to battery bias for the filament type. A short shunting wire, labeled "SH" in the diagram, is connected between these terminals when 6.3-volt tubes are used. This shunt is removed and replaced by the 4.5-volt "C" battery when the 1.5-volt tubes are used.



Bottom view of the two-tube receiver showing parts layout and wiring. The rear-panel binding post and terminal strips also are shown. The sockets, from left to right are: detector tube, coil, and power tube. The right-hand supporting bolt for the detector socket holds several soldering lugs to which all ground (chassis) connections are made.



Bottom view of the power supply. The rectifier-tube socket is at the upper left, the voltage-regulator-tube socket at the lower left, and the dual filter condenser at the lower right. Special hum-reducing condensers are soldered directly to the rectifier-tube socket.

There are two single-pole, single-throw toggle switches, S_1 and S_2. S_1 is the stand-by switch which, in breaking the negative side of the "B" supply, silences the set, but puts it back instantly into operation the moment it is turned on. S_2 is connected in series with one side of the heater circuit of the 6.3-volt tubes and is automatically in one side of the filament circuit when 1.4-volt tubes are in service. It need be used only when the set is battery operated; turning it off turns off the whole receiver and prevents any current drain from the batteries.

Power Supply

The power-supply wiring diagram is shown in Fig. 2. S is the on-off switch which breaks the 115-volt input to the primary of the power transformer, T, when in the "Off" position. The transformer may be any replacement power transformer having a high-voltage winding delivering approximately 300 volts each side of the center tap and capable of supplying 70 ma. d.c. under continuous load, a 5-volt filament winding at 3 amperes to accommodate any full-wave rectifier tube listed later, and a 6.3-volt filament winding at 2 amperes. (This is more than the 0.6 ampere drawn by the tubes in the receiver, but is standard for most transformers.) Filter condensers, C_3, C_4, and C_5, should be at least 8 μfd. at 450-volt ratings. A dual condenser may be used for C_3 and C_4 if desired. The filter choke, L, must have a 70-ma. rating, but it may be any standard replacement type with a rated inductance of from 15 to 30 henries.

The 1000-volt mica by-pass condensers, C_1 and C_2, connected from each plate of the rectifier tube to its filament, effectively squelch the tunable hum that would otherwise be bothersome at 7 mc. and higher.

To stabilize further the action of the detector tube, a VR75 voltage-regulator tube is incorporated in the power supply. It gives continuous 75-volt output regardless of the rise and fall of the 115-volt power-line excursions or changes in plate current drawn by the detector. Since the current drawn by the set when a.c. operated is approximately 50 ma., and the VR75 takes 17.5 ma., the power transformer and filter choke must have at least a 67.5-ma. rating. The 70-ma. rating of the power transformer and choke specified gives a little margin of safety.

If no voltage regulator tube is obtainable, a 100,000-ohm, one-watt dropping resistor should be substituted for R. The filter condenser, C_5, should be retained in either case to maintain a low hum level in the receiver.

Battery Supply

Preferably 90 volts from two 45-volt "B" batteries should be employed when using any of the filament-tube combinations suggested later in the article. Proper operating voltages for any of these types will be found in the *Handbook*. Three batteries are needed, an "A" battery for filament supply, a "B" battery for plate voltage and a "C" battery for grid bias. When operating from batteries, the two "B" + terminals should be connected together. It should be borne in mind that whatever the filament voltage of the detector tube chosen, the filament voltage of the audio power tube selected should match it. This applies also to heater-type-tube combinations.

Construction and Layout

The receiver is built into a steel cabinet, $7\frac{1}{2} \times 7\frac{1}{2} \times 7$ inches (National type C-SRR) which has a lid opening at the top and a removable back panel and chassis. The power supply is mounted on a $7 \times 7 \times 2$-inch metal chassis. The final layout for both receiver and power supply

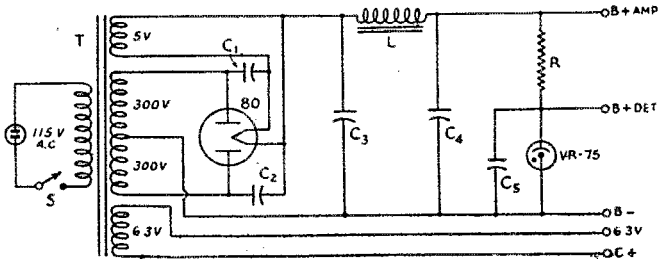
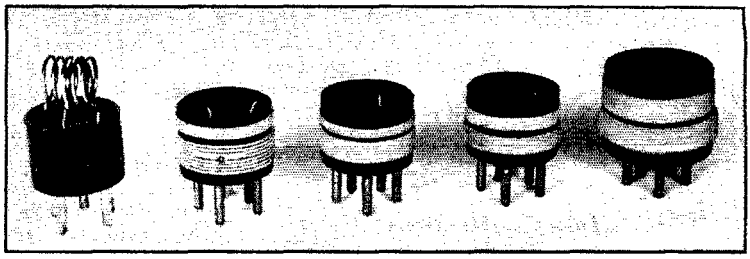


Fig. 2 — Power-supply wiring diagram and parts list.

C_1, C_2 — 0.001-μfd. 1,000-volt mica. (See text.)
C_3, C_4, C_5 — 8-μfd., 450-volt electrolytic.
R_1 — 10,000-ohm, 10-watt wire-wound. (See text.)
T — Standard replacement-type power transformer with 6.3-volt, 5-volt, and 600-volt center-tapped windings, 70 ma. d.c. output rating.
L — Standard replacement-type filter choke, 15–30 henries at 70 ma.



A close-up view of the tube-base coils. Band-spread taps are required on only the two highest-frequency coils. A special air-wound coil is necessary to cover the highest-frequency range.

was decided upon by placing the various parts in their respective positions and arranging them for good appearance as well as short connections and operating convenience.

While still in their temporary positions, the necessary mounting holes and wiring holes should be marked for drilling and punching, not forgetting a special one near the back and center of the chassis for the antenna lead which runs from the antenna binding post at the top center of the back panel to the antenna coupling condenser underneath. The cabinet is then disassembled and the various holes punched and drilled.

The main- and bandspread-tuning condensers had to be mounted on the sides of the cabinet with bolts and stand-off bushings in order to bring their tuning dials (Velvet Verniers) into symmetrical positions on the front panel. It is well to mount these two parts and to solder connecting wire leads to them before bolting the panel back in place. The general layout is shown in the photographs.

Binding posts at the bottom of the back panel are mounted on a six-position terminal strip for the power leads and a two-terminal strip for the speaker connections. The power supply uses a five-contact terminal strip, since the "C"-connection is not needed for a.c. operation. Soldering the receiver connections to its power terminals should be left as the last operation.

Coil Winding

Specifications for the tube-base plug-in coils are given in the coil table, but the method of winding the bank-wound broadcast- and 1.7-Mc. band coils needs explaining. The first few grid turns are close wound in the conventional manner. The next turn, however, is started at a small angle back across the parallel turns already wound. The angle should be made such that the wire reaches the other side of this winding exactly one half turn later. It should then be turned back at the same angle to terminate at the starting point. The second "lapped-turn," as it might be called, follows along the leading side of the first turn and moves over to the leading side of the "come-back" turn. The termination of the second turn will be the thickness of the wire ahead of the termination of the first turn. This continues until the top layer of windings appear to be crossing a lower layer at cross-angles to each other. Incidentally, each "turn-back" should not be allowed to extend beyond the edges of the "foundation" winding.

Without reverting to this method, it would be impossible to wind the number of turns required for the b.c. and 1.7-Mc. bands on the tube-base forms. Conventional winding calls for over 90 turns on the broadcast coil, for example, but this type of winding reduces the required number of turns to 65.

Difficulty was encountered in winding a coil for the highest frequencies (12.8 to 32 Mc.) that would produce regeneration or oscillation over the entire range. Numerous attempts at changing the wire size, the spacing and the number of tickler turns definitely proved that such a coil was impractical if wound on the bakelite tube base. The self-supporting air-core coil of No. 18 enamel wire, previously wound around the shank end of a ½-inch drill and then spaced by slipping a small screwdriver between and around its turns, did the job very satisfactorily when a tickler coil of No. 24 wire was inserted near the ground side of the coil. The 6-turn tickler coil was fastened in permanent position with Duco cement. Special low-loss coil dope would have been better, but any cellulose-acetate cement such as airplane dope will do the job satisfactorily. The cement also should be spread over the other coil forms after they are finished.

Particular attention should be paid to the direction of the tickler winding on each of the coils. It should begin at the pin indicated in Fig. 3 as going to C_3, and go in the same direction as the wire coming from the pin which connects to C_4, as indicated by the two arrows.

Tubes

A 6J7G or 6J7GT is the preferred type of 6.3-volt detector tube to use, although a 6K7G or GT does very well. For battery operation either a 1N5G or GT, or the 1P5G or GT may be used. The suppressor grid in the heater-type tubes must be externally connected to ground as shown in the circuit diagram, but this connection is made internally in the battery types. Since the pin on the base of the 1.4-volt tubes where the suppressor connection is made on the 6.3-volt tubes has no internal connection, the grounding of this pin at the tube socket for the heater tubes will not affect the operation of the set when the battery tubes are in service.

In order that the proper cathode-biasing resistor, R_5, may be computed as previously explained, the grid bias and total plate and screen currents are included with the list of tubes that may be employed in the second or audio power stage of

the receiver. This list is as follows: 6F6G, −16.5 volts, 40.5 ma.; 6K6G or GT, −18 volts, 37.5 ma.; 6V6G or GT, −12.5 volts, 49.5 ma. Inasmuch as bias for the filament-type power tubes that may be used is obtained from batteries, the plate and screen currents of these tubes need not be considered. A 1A5G or 1Q5/GT requires 4.5 volts for bias; a 1C5G, 7.5 volts.

Tube Combinations

It is perfectly satisfactory to mix a loctal-type detector tube with an octal-type power tube, or vice versa, so long as the heater or filament voltages match, but heater-type and filament-type tubes, of course, will not work together. For example, the detector could be a 1LN5 and the power tube a 1Q5, or the detector a 1N5GT and the power tube a 1LA4. However, to match the first combination with 6-3-volt heater tubes it is necessary to choose the heater tubes whose socket connections, with the exception of cathode, correspond to those of the filament tubes, in order that the two types may be interchanged without involving changes in receiver wiring. The 6.3-volt alternate for a 1LN5 is the 7H7, for the 1Q5 a 6V6G, for the 1N5GT a 6J7GT, and for the 1LA4 a 7C5LT. Socket connections for all tubes are given in the tube-data section of the *Handbook*.

An indication of the versatility of this receiver is the extended list of possible tube choices which follows:

Detector filament-type tubes — 1N5G/GT, 1LN5, 1E5GP, 1D5GT, 1A4P, 1P5GT.

Dectector heater-type tubes — 6C6, 6D7, 6E7, 6SG7, 6SJ7G/GT, 6SK7G/GT, 6SS7, 6U7G, 7H7, 7C7, 77, 78, 57, 58.

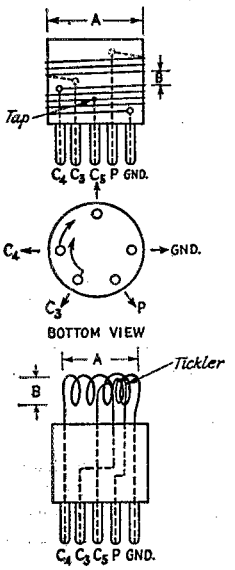


Fig. 3 — Arrangement of coil connections. The coil dimensions are given in the table at the top of the facing page.

Power tube, filament-type — 1F4G, 1F5G, 1G5G, 1J5G, 1T5GT, 1LA4, 1LB5, 3Q4, 3Q5-GT.

Power tube, heater-type — 7C5LT, 7C5, 7B5LT, 7B5, 7A5, 6A4, 6G6G, 6V6GT, 2A5.

These are additions to those already mentioned and must be properly matched as already stated.

Either an 80, 5Y3G, or 5Y4G is recommended as the rectifier tube for the power supply. However, the following heavier-duty tubes may be substituted: 5U4G, 5V4G, or 5X4G.

Choice of Parts

Included in the coil table are dimensions for either tube-base or standard 1½-inch-diameter coil forms which permits a choice. The highest-frequency coil (Coil No. 5), however, should be self-supporting in either case. Although a permanent-magnet 5-inch speaker is suggested, any reasonable size will do as well. Headphones should be of the high-impedance type, anywhere from 2000 to 7000 ohms, the higher the better.

Midget- or standard-size regeneration (R_1) and volume (R_4) controls may be used.

As previously mentioned, the audio choke, L_3, may be anything available from 15 henries all the way to 1000 henries. Even the primary or secondary winding of an old interstage audio transformer, or the two windings properly connected in series, will work.

A steel cabinet has its advantages, but an open chassis and panel will do very well.

Wattage ratings on the resistors shown in the table of parts under Fig. 1 are minimum; units with higher power ratings may be substituted.

If a 10-μfd., 25-volt electrolytic condenser for the cathode by-pass condenser, C_9, is unavailable, any 16- or 8-μfd., condenser will do as well. The value of the grid blocking condenser, C_4, may be anywhere between 0.0001 and 0.00025 μfd. The mica type is preferred, but paper will do. The audio coupling condenser, C_8, between the two stages may have any value between 0.005 and 0.1 μfd. The same is true of the headphone coupling condenser. C_{10}.

The r.f. choke, *RFC*, may have an inductance as low as 2.5 mh.; 2.5 mh. is better than nothing.

Receiver Operation

When the receiver has been completed and every connection indicated in the diagram has been made, connect only the heater or filament voltage first. Snap on the heater-filament switch, S_2, and make sure that the tubes light. If they light up with the switch on and go out when it is turned off, the heater-filament circuits have been properly connected.

Next, connect the "B" voltage momentarily. With the headphones inserted in the jack, J, a sharp click should be heard when the stand-by switch, S_1, is snapped on. The volume control, R_4, must be turned on full, of course. This sharp click is a favorable indication, but for further proof that all is in order, a finger may be touched to the grid on the top of the detector tube. If this produces a squeal in the 'phones, it is a reassuring sign that probably all wiring has been correctly done. Next, slowly turn the regeneration control, R_1, listening carefully for a rushing sound or sudden thump which will serve to indicate that the detector is regenerating satisfactorily.

For best reception an antenna some 50 to 100 feet in length is recommended. The horizontal portion should be well in the clear and as high as possible. The lead-in section should be kept away from metallic objects, such as gutter pipes and water pipes, and may be rubber covered or otherwise insulated if desirable. Connect the lead-in to the antenna binding post on the rear of the set.

The next step is to adjust the antenna coupling condenser, C_1, to the maximum capacity permissi-

COIL TABLE

No.	Range Mc.	Amateur Band Mc.	Dimensions (inches) A	Dimensions (inches) B	Turns L_1	Turns L_2	Bandspread Tap
1	0.55– 1.6		1⅜	⅛	65½ [1] (No. 32 d.c.c.)	16¼ (No. 32 d.c.c.)	
			1⅜	⅛	90½ "	20¾ "	
2	1.2 – 3.35	1.75	1⅜	⅛	29½ [2] "	9¾ "	
			1⅜	⅛	32½ "	10¾ "	
3	2.7 – 7.7	3.5	1⅜	⅛	14½ "	5¾ "	
			1⅜	⅛	10½ [3] "	5¾ "	
4	5.35–14.6	7.0	1⅜	⅛	7½ [4] (No. 24 d.c.c.)	5¾ "	4¼
			1⅜	⅛	6½ [4] "	5¾ "	3½
5	12.8 –32	14–28	⅝	⅛	5 [5] (No. 18 d.c.c.)	6 (No. 28 d.c.c.)	2½

Coil dimensions and socket connections. Specifications for standard 1½" diameter coil forms are also shown. Direction of winding is the same for all coils. All windings are close wound unless otherwise indicated. Taps are counted from the ground end of the coil.

[1] First layer, 18 turns; second layer 47½ turns (see text).
[2] First layer, 12 turns; second layer 17½ turns (see text).
[3] Spaced to cover ¼".
[4] Spaced to cover ⅜".
[5] Self-supporting (see text).

ble with the length of antenna employed. Turn the main tuning condenser, C_2, to its maximum capacity and the regeneration control to the point of oscillation as indicated by a sudden thump or the cessation of the rushing noise that precedes oscillation. Then increase the capacity until turning the regeneration control to the "full-on" position will not produce oscillation. Leaving the regeneration control full on, decrease the capacity of C_1 until oscillation is again restored. This is the point of optimum antenna coupling.

To copy c.w. (code) it is necessary that the detector be in an oscillating condition. All stations, whether voice or code, will then come in with a squeal whose pitch may be adjusted to suit the operator by tuning slightly to one side or the other. If the sound is a continuous tone, the chances are it is a 'phone station. To hear such a station properly the regeneration control should be backed off slowly until the station comes in clearly. But changing the regeneration control, as previously pointed out, has a detuning effect that must be compensated for by following the station carefully on the tuning dial as the control is adjusted. With little practice the operator becomes expert at this simultaneous manipulation of regeneration and tuning controls.

When listening to stations in the broadcast band, it is imperative that no squeal be heard when the tuning condenser is swung to either side of the tune-in point on the dial. Be sure to back off the regeneration control until this condition is obtained.

Difficulty may be encountered in separating a strong local broadcast station from out-of-town stations located close to it on the dial. Putting the receiver close to the oscillation point and using the volume control for adjusting to comfortable volume level improves the selectivity so much that their separation may be made possible. If further selectivity is required, reducing the capacity of the antenna-coupling condenser or shortening the length of the antenna wire will do the trick. Try reducing antenna-condenser capacity before cutting the antenna, since the longer the antenna the better reception will be.

The coils of this receiver are designed to provide a decent L/C ratio at the various amateur bands covered, which means that considerable overlap between coils is unavoidable and, also, that each position of the main-dial setting for bandspread coverage is different for each band. On a tuning dial calibrated from 0 to 100 (100 on the scale being *minimum* capacity), for the 1.7-Mc. band the main dial is set at approximately 52, the 3.5-Mc. band at 39, the 7-Mc. band at 34, the 14-Mc. band at 14, and the 28-Mc. band at 93. Both the 14- and 28-Mc. bands, incidentally, are covered with the fifth and smallest coil.

The tuning range of the coils as indicated in the coil tables does not include the capacity of the bandspread condenser, which was left at minimum capacity for each calibration. Where no coil tap is indicated, the bandspread condenser is connected in parallel with the main condenser.

If difficulty with fringe howl appears when the regeneration control is advanced, connect a 75,000-ohm resistor across the detector audio choke, L_3. This trouble is not encountered with the better-type chokes.

Dead spots, or portions of the dial that prevent regeneration or oscillation of the detector, indicate antenna resonance. They may be eliminated by changing the length of the antenna or by adjusting the antenna-coupling condenser. A good ground connection to the chassis from a water pipe or other earth contact enhances the receiver's performance and reduces the background hum level.

Receiver Performance

The loudspeaker output from this receiver is sufficient on local b.c. stations to require turning the volume control half-way down for comfortable reception. Foreign short-wave stations were picked up at good loudspeaker volume. Naturally, the signal strength with the battery tubes is not so great as with the a.c. tubes, but the same signals are still there. After it was built, how we wished we had this set along on that mountain-climbing expedition we made earlier in the summer!

New Schematic Symbols

With this issue of *QST*, use of the new standardized schematic symbols promulgated by the American Standards Association is being inaugurated.

These new standardized symbols have been adopted primarily at the behest of the armed services as a wartime measure in the interest of alleviating confusion and contradiction, particularly as between the conflicting usages of the radio and power groups which have been a troublesome source of annoyance in the past. Before the war, the long-standing conflicts in electrical graphical symbols between the fields of electrical communications, power control and measurement were not considered serious because the fields of application rarely overlapped. The war has accelerated the overlapping of these fields and the resulting confusion, notably in the aircraft industry and in industrial electronics, has become serious for the industries affected.

Consequently, after study of the problem, a representative group headed by the Chairman of the Sectional Committee on Standardization of Graphical Symbols and Abbreviations for Use on Drawings requested that steps be taken under the ASA War Procedure to coördinate the differences in symbols and submitted a proposal to this end.

Upon authorization of the project, a conference was held in New York on January 22, 1944, to which representatives of technical societies, trade associations, the War and Navy Departments, the Aeronautical Board, the National Aircraft Standards Committee and of various other interested agencies, including ARRL, were invited.

After a series of meetings, during the course of which a wide range of proposals was introduced and considered, a preliminary draft of the final standards was adopted as of April, 1944. With substantial approval having been achieved, general conversion to the new standards is now under way.

While, necessarily, the resulting compromise is not wholly in accordance with the previous practices of either the radio or power groups, the new symbols do have definite merits. Apart from eliminating long-standing conflicts, in practice they seem to be somewhat simpler to draw, both from the standpoint of formal drafting (by employing a uniform weight of line throughout) and of freehand sketching. Nor are the changes between the new and the conventionalized symbols of the past sufficiently drastic to make the new schematics unintelligible even to the veteran wireless man who learned to read circuit diagrams back in the days when a coil was represented by a zigzag line like a resistor — as, in the power field, it has been (for iron-core inductors) until this day.

Basis of Symbols

Quoting from the committee report, entitled "American Standards for Graphical Symbols for Telephone, Telegraph, and Radio Use":

Only basic symbols which seem to have widespread use and application are given.

These basic symbols ypify generic types of apparatus. To differentiate between examples of a generic type, expanded or alternate symbols should be used. These should be selected either from the list shown or by the creation of new expanded or alternate symbols through the combination of basic and/or component symbols. . . . Cases where the basic symbols cannot be applied, either singly or by expansion, should be depicted by the general symbol and the name of the apparatus entered therein. It is not intended to show all possible symbols or combinations of symbols but to show such examples as are needed to indicate how to build up from those given such specific symbols as are required. For example . . . a multitude of combinations of relay windings and spring pile-ups can be made from the examples given.

Graphical symbols are intended primarily to indicate electrical function only. However, where symbols have long standing and precedent demands, or where their respective physical patterns are markedly more distinctive than their electrical function, the mechanical features have been characterized.

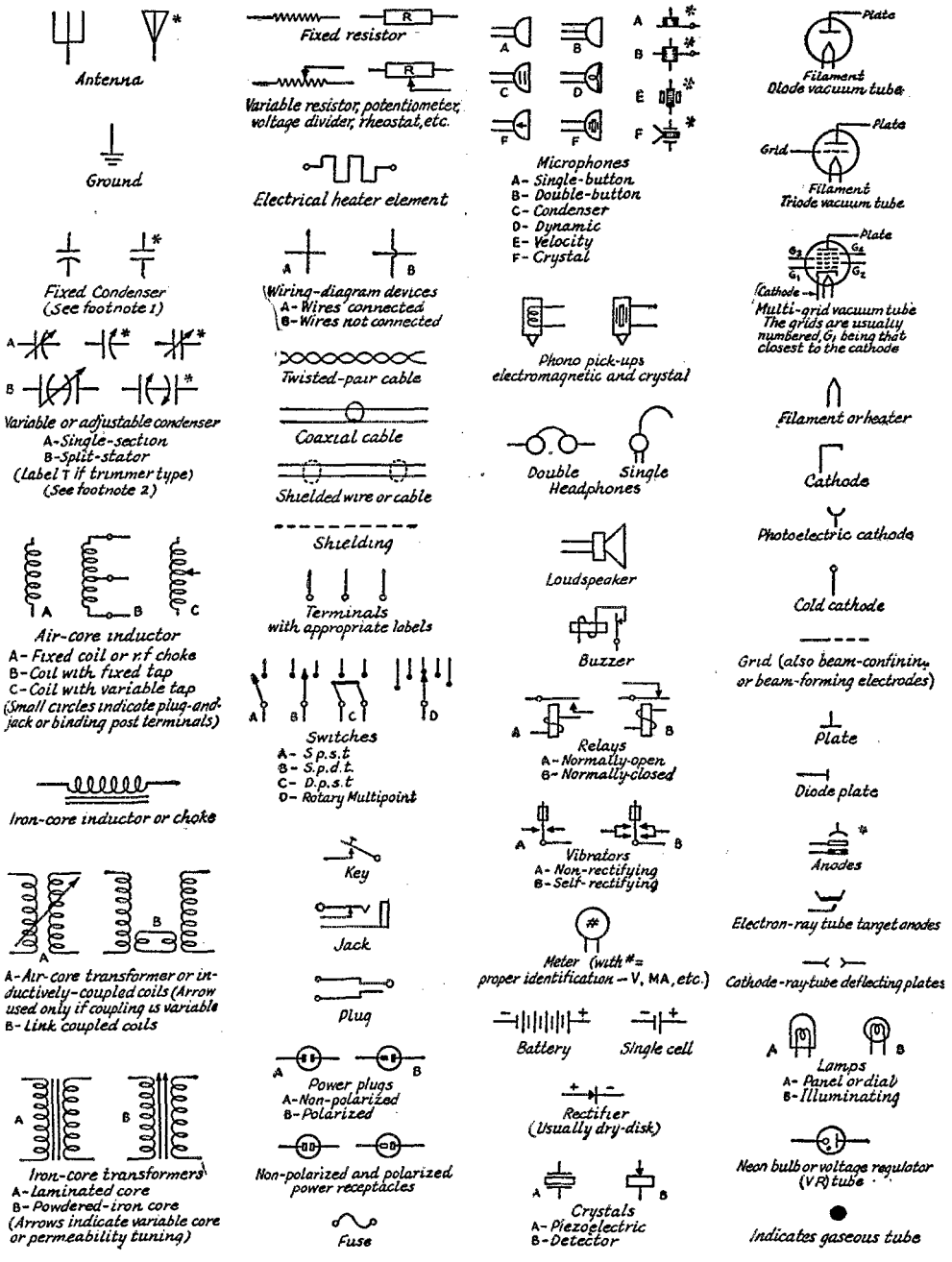
The component parts of each piece of apparatus symbolized have been shown in approximate physical relation as far as possible without unduly complicating the symbol. In most cases the symbol as a whole may be rotated to facilitate its application in any position on the drawing. Exceptions are cases where definite position must be maintained to identify top, bottom, left, or right. Similarly certain symbols may be reversed; e.g., relay contacts shown on the right of the relay core may be shown on the left, etc.

Symbols do not represent values, and the latter must be added when and as required.

The small circle is used to indicate a terminal or a pivot point. In general, terminals are indicated only when they require identification by the addition of designations. Exceptions are such items as fuse, gang plug, switchboard plug, and telegraph key contact, where the small circle is required to emphasize properly a symbol which would otherwise be too obscure, or where it has been added because long usage or precedent demands.

Symbol sizes and line widths as depicted have been reduced for publication purposes. For average hand-drawn diagrams, the symbols normally will be made about twice their present size. While the sizes and line widths can be altered, as required, it is recommended that the sizes shown be followed as far as possible. The lines at the extremities of certain of the symbols are not part of the latter but are electrical connections thereto. Wires need not be brought into the symbols as shown but can be varied as required to simplify the wiring pattern of the particular drawing.

New Standard Schematic Symbols



* Alternative symbols marked with an asterisk are the conventional radio forms previously used. These are included for reference information in instances where the original symbol has undergone appreciable change under the ASA standardization program.

[1] In the new symbol for fixed condensers, where it is necessary or desirable to identify the capacitor electrodes, the curved element represents the *outside* electrode (marked "outside foil," "ground," etc.) in fixed paper- and ceramic-dielectric condensers, and the *negative* electrode in electrolytic condensers.

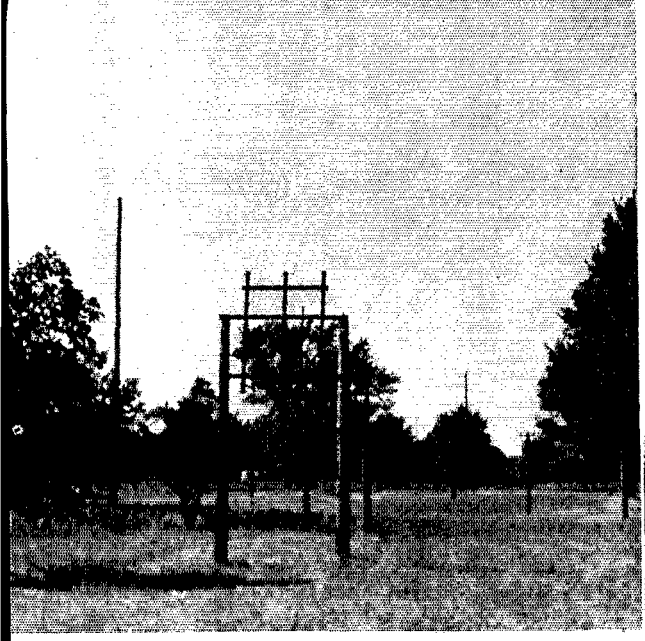
[2] In the new symbol, the curved line indicates the moving element (rotor plates) in variable and adjustable air- or mica-dielectric condensers. When it is desired to especially distinguish trimmer capacitors, the letter "T" should appear adjacent to the symbol.

In the case of switches, jacks, relays, etc., only the basic elementary combinations are shown. Any combination of these symbols may be assembled as required, following the form shown.

Hams in the RID

The FCC's Radio Intelligence Division in Action

BY OLIVER READ,* W9ETI



Left — Antenna and transmission-line poles spread out to the north of the main building at the primary station of the Great Lakes Monitoring Area near Allegan, Mich. The short poles support rhombic feeders, the long ones hold special folded dipoles.

ONE of the most important contributions being made by radio amateurs during this war is the job they are doing as members of the Radio Intelligence Division of the FCC, headed by George Sterling, W3DF, and his assistants, Charles Ellert, W3LO, and Stacy Norman, W7OK — all prominent amateurs. Up to the present time, their activities have not been widely publicized. However, the records show that among some three hundred RID employees over 70 per cent are licensed radio hams. Most of them are ARRL members.

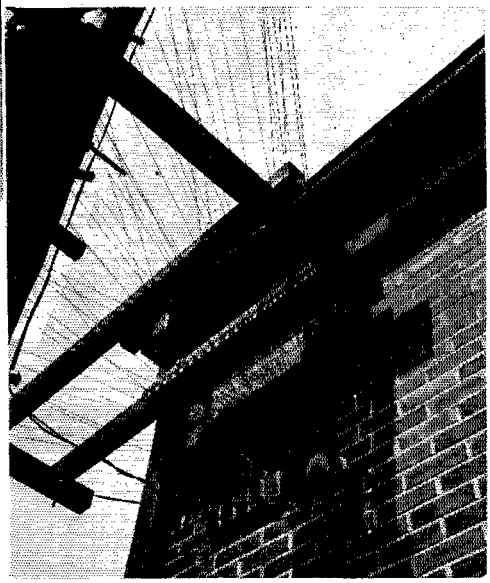
We were accorded the rare privilege of visiting the primary station of the Great Lakes Monitoring Area near Allegan, Mich., to gather first-hand information on the RID at work. Located on a 200-acre tract of land, this installation is typical of the twelve primary monitoring stations strategically located throughout the U.S.A., its territories and possessions.

Amateurs at Allegan

Supervisor of the RID at Allegan is William J. Hoffert, W5HVB. Bill has contributed his engineering skill to the development of important electronic equipment now in use at this and other RID stations. His assistant, Kenneth W. Miller, W5AOC, has been at Allegan for the past two years and has seen the growth of this important station from its original location in a small country schoolhouse to its present site.

Both the Radio Intelligence Division and the FCC Field Division's Monitoring Station are located within the same building. There are four monitoring officers at the Allegan station: Edward Atems, W8CLL; Harry Hayman, W2FYW; Alex A. Polityka, W8FLA, and Walter A. Drier. The twelve operators at the station are Russell V. Anderson, W9SXX; Gerald Beetley, W8SAY-W9CWS; Paul J. Beringer, W9NQI; Irving

*540 N. Michigan Ave., Chicago 11, Ill.



Above — The terminal point for the directional antennas that are located several miles from the main station. They connect to a selector switch in the cruising room. Upon hearing a signal the operator can then determine the general direction of the transmitter.

L. Filderman, W2EAZ; Sevetus L. Gladfetter, W8RKD; Lawrence Hopp, W8ENP; Edgar A. Jefferson, W8EH; Francis Locatelli, ex-W9OZM; Sam Read, W8HUQ; Harold Richardson; Paul Snyder, W8GLW, and Raymond Whited, W9QUC. We found that 90 per cent of the personnel at this station were licensed hams. Experience has shown that amateur operators were ideally suited to the exacting work required — and if ever we saw a "ham's paradise," this is it!

Hams Spot the "Hot Ones"

We heard much praise from the supervisors on the proficiency of these amateurs. Each, for example, is an expert in identifying stations over the entire radio spectrum. They hear signals clearly that the average amateur would not even notice. It is their job to monitor weak signals even when they are almost completely buried under heavy static and QRM. They know every

call letter, procedure and other characteristic and are able to identify almost any signal by listening to just a brief part of a transmission. By knowing the characteristics of legitimate stations they can spot a "hot one" in a hurry.

We saw plenty of action at Allegan. While we were visiting the cruising room an LOP alert came in (lost aircraft). The entire operating staff immediately concentrated on the signal. When a plane is lost it transmits the letters "MO" continuously, so that the primary stations may take their bearings. A typical "case history" of such an operation will be described later.

At Allegan alone about six requests are received daily for bearings on lost planes. Hundreds of lives and millions of dollars worth of equipment have been saved by the skill of these hams of the RID.

Specialized Equipment

Many highly refined "gadgets" are used in conjunction with the receivers, and many of them have been developed by personnel of the RID. For example, Bill Hoffert demonstrated a fast acting "peak clipper" used in conjunction with the Boehme tape recorder. Complete details cannot be given for reasons of military security.

A mechanical recorder, such as the Boehme, requires a certain amount of energy to actuate the recording stylus. Impulses of very short duration, even though of considerable amplitude, do not have enough average energy to actuate the recording stylus unless the amplitude is several times that of a sustained signal.

The special "electronic clipper" designed by W5HVB has made it possible to record signals of low amplitudes on the ink recorder. A filter is incorporated in a band-pass type of amplifier which is capable of maintaining a constant output over signal ranges of 100 to 1. The filter itself is automatically variable on band pass. It also is automatically variable with signal strength. For high signal levels the band pass is very broad. In fact, its response is almost flat. But for low signal levels the band pass is on the peak of 500 cycles. Strong signals do not require such filtering. The filter is designed so that it will oscillate with the selectivity control fully advanced. It then produces a ringing noise. The operator can then automatically tune the signal until it matches that ring.

Here is another "case history" of a wartime service in which amateur radio operators are performing one of the most important tasks involving the radio art — the saving of human lives. Auxiliary functions of the RID include policing the airways, tracking down illegal radio stations and trapping enemy spies.

Above — In one corner of the sound-proofed intercept room, a high-speed code signal is being tuned in for recording on a Boehme inked-tape recorder. Memovox disc recorders and Telecord wax cylinder recorders also are used in this section. Seven receivers are used in the intercept room. The one pictured at the right is an SSR-202 (a Hallicrafters SX-28 with an additional i.f. channel). A network of feeders is shown entering the room at the top. Feeder spacing is designed to accurately match the inputs.

Below — An unidentified signal is heard in the cruising room. The operator (center) checks accurately the wavelength of the signal. This information is transmitted to the operator of the direction finding antennas and enables him to locate the same station. Confirmations are exchanged and the direction finder is adjusted to take an accurate bearing. At the same time information as to the correct frequency, type of emission (A1, A2, etc.), type of keying and other identifying characteristics, and a letter-by-letter transcription of the transmission is sent over the teletypewriter to all other stations in the network. Like bloodhounds they pick up the "scent." Reports are transmitted by teletype to the intelligence center in Washington where the several bearings taken on the transmitter are projected on special maps and a "fix" is established. Soon another clandestine radio station is on its way to extinction.

Other developments are equally as intriguing. For example, two signals, one from Germany and the other from South America, were almost at zero beat with one another. Regular tuning

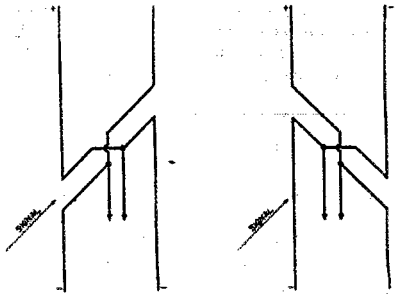


Diagram of the Adcock antenna found most useful by FCC for d/f because the two spaced vertical antennas, while in other respects similar to a single-turn loop, are not susceptible to horizontally polarized waves and thus are more effective on the higher frequencies.

technique and the use of crystal filters, etc., failed to bring either signal to the point where it could be copied.

Hoffert then demonstrated one of the selective sideband receivers (an SX-28 with an additional i.f. channel). The incoming signal is split at the first detector into two i.f. channels — one of them 5 kc. above the normal i.f., the other 5 kc. below the normal i.f. These channels are very selective and have a very sharp cut-off. If one sideband is distorted, the alternate sideband is utilized for clear reception. We predict that after the war, when full constructional details can be given, this refinement will come into universal use in the stations of most hams.

Teletype Network

The RID stations employ an elaborate teletype network covering the country — a continuous private line teletypewriter service. All of the teletype machines throughout the entire network operate simultaneously. Everything which appears on one machine will automatically appear on the rest.

If for any reason the teletype circuit should be disrupted, the RID at Allegan is able to communicate immediately with all of the other stations by the use of three 200-watt transmitters. Six transmitting frequencies are in "stand-by" at all times. The RCA transmitters are located in a small frame building at one of the far corners of the tract. They are operated by remote control from the cruising room. Here again every precaution has been taken so that vital communications will not be interrupted should the regular power line fail. An Onan 5-kw. a.c. gasoline-driven generator supplies emergency power for the transmitters. They may be placed in operation at a moment's notice.

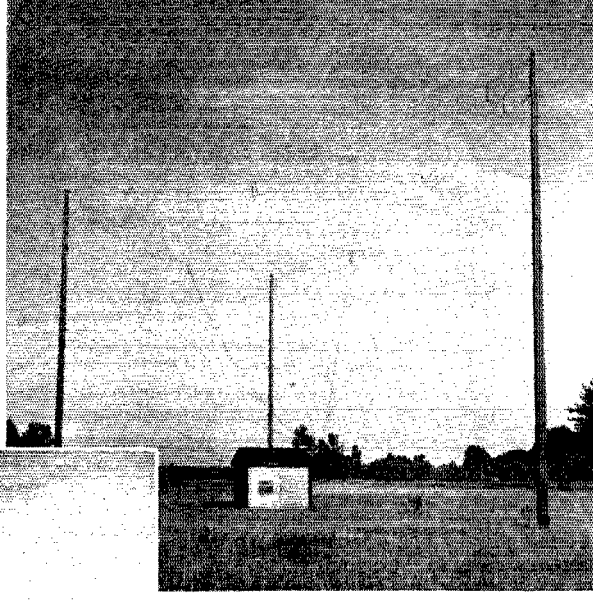
Below — A view of the Adcock direction finder, showing the 20-foot dipoles. The spacing between the two dipoles also is 20 feet. This antenna is known as a balanced "H" type. The Adcock direction finder is so sensitive that it is necessary to shield and bury the a.c. line supplying its power 15 feet underground. Elaborate power-line filters, used as an additional precaution, are installed in a box directly beneath the cabin.

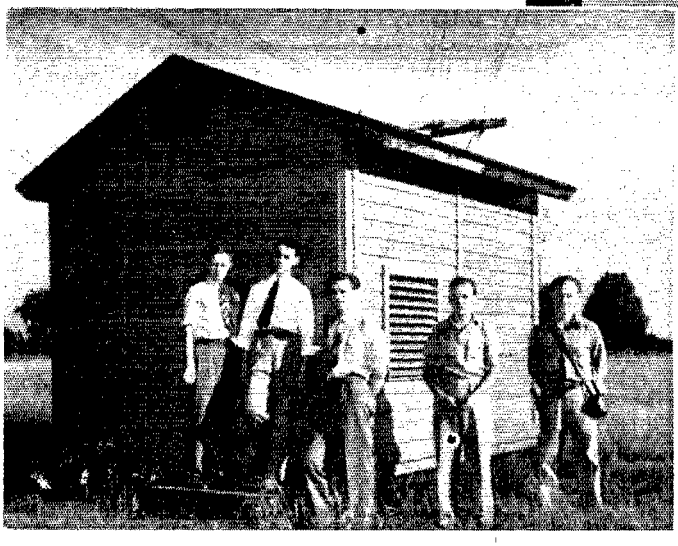
A close-up of one of the 20-foot dipoles of the Adcock direction finder. Adjustment of this antenna is so critical that even a spider-web across the transmission line will cause an error in taking a bearing.

Three folded dipoles are supported in a V-shaped pattern around and above the transmitter house. Telephone poles are spread out in every direction like trees in a huge forest. We found that they lead to eight rhombic antennas which are oriented to cover 360 degrees. In addition there are three Beverage antennas, a dozen folded dipoles, miscellaneous ultrahigh-frequency doublets and a special array of transmitting dipoles near the transmitter house.

The Adcock D/Fs

The most important items in this elaborate installation are the two Adcock direction finders. These are located at a goodly distance from the main building and are kept clear of the antenna installations. These direction finders, highly perfected by RID personnel from the principles advanced by the Englishman, Adcock, are of the balanced "H" type. Their adjustment is so critical that a spiderweb across the transmission line will cause an error in taking a bearing of 1 or 2 degrees. Furthermore, the spacing at the junction of the transmission line is so critical that a 1/16-inch deviation will upset their calibration.





Above—A small frame building houses the three RCA 200-watt remotely controlled transmitters and the Onan 5-kw. emergency gasoline-driven a.c. generator. Folded dipoles and miscellaneous doublets are supported by three telephone poles. *Left*—Irl Ball, W8VNY; Ken Miller, W5AOC; Bill Hoffert, W5HVB; Dick Boll, W9EVD and the watchman pause to have their picture taken in front of the transmitter house.

♦

We had the thrill of operating one of the d/fs. We squeezed through the narrow entrance to a tiny hut and seated ourselves on a wooden stool (we were later told that the use of a metal stool would cause a serious upset in calibration). It came very close to representing a typical ham shack, with the exception that no transmitter was present. Before us was a Hallicrafters SX-28 receiver, an HT-7 frequency standard, a small speaker and a microphone (used in conjunction with the intercom system connecting the d/f to the cruising rooms) and, finally, a large automobile-type wheel above which was a calibrated scale and indicator.

At first it appeared that with so little equipment the taking of accurate bearings would be impossible. We soon found out that such was not the case. Signals which were coming in better than R9 were completely eliminated as we swung the dipole elements broadside to the signal.

This particular direction finder is operated entirely from power supplied by a 120-volt 60-cycle line. In spite of extreme precautions, the operation of these highly sensitive direction finders is hampered by the very presence of the supply line, which in this case is buried fifteen feet underground and is enclosed in lead sheath. In addition, elaborate line filters are installed directly beneath the hut of the direction finder. But even with these precautions there are certain errors which appear in the direction of the power line. If an important bearing must be taken in that direction, the second d/f is placed in operation. This second unit is operated entirely from storage-battery supply. Current drain from the batteries is rather heavy and for that reason the a.c.-operated d/f is used wherever possible. The a.c.-operated finder is used principally for frequencies higher than 5 Mc. and the other for frequencies lower than 5 Mc.

Check bearings are taken frequently on known stations at known frequencies and at known distances, to make certain that the calibrations of the d/fs have not varied.

Cruising Room

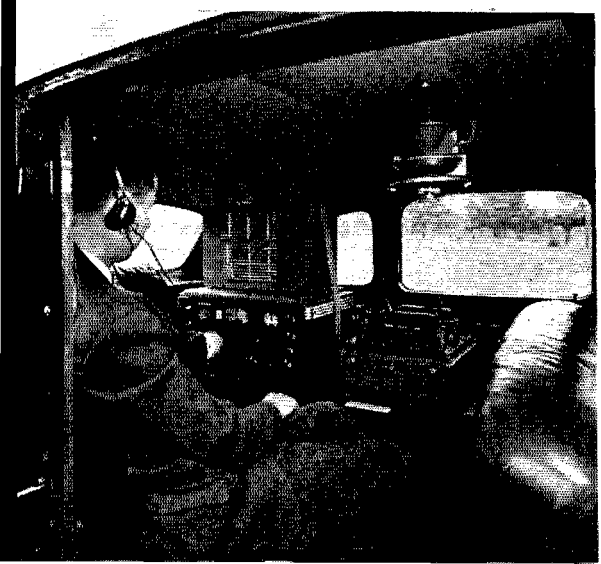
Our tour of inspection next brought us to a large sound-proofed room which houses a maze of receiving and recording equipment. Three operators were on duty. The receiving positions are attended day and night. There is always at least one man tuning over the various frequencies throughout the entire spectrum. They identify transmissions by frequency, call, type of keying,

modulation characteristics and, primarily, by traffic procedure.

When one of the ops hears a signal he can't identify from various log sheets, he immediately checks the frequency accurately with an HT-7 Hallicrafters frequency standard or, if it requires extreme accuracy, a General Radio primary standard. He immediately gives the correct frequency and type of emission (A1, A2, etc.) over the special teletype circuit, together with the type of keying and various other identifying characteristics. Then he accurately prints the complete transmissions of the station under observation letter by letter. This information appears simultaneously on the teletypes at all of the other primary stations in the network. At the same time he has "alerted" the operator at the Adcock direction finder over the station's intercom. The d/f operator immediately takes bearings on the signal under observation, making certain he is tuned to the right signal. All other primary stations also tune to the frequency specified and make certain from the information on the teletype circuit (TLT) that the station they have under observation is the same one that has been spotted originally.

The operators at the direction finders at the other stations also take accurate bearings. Reports are then called for by the Washington intelligence center where they are evaluated and plotted for a "fix." Then, knowing the station's location, the type of emission and other information which appeared over the teletype, the intelligence center can (in most cases) make an identification. If the station is still unidentified, it calls for continuous monitoring of the signal by one or more of the units.

After the initial fix has been established, mobile units are sent to the area under observation. Using direction finders they repeat the taking of bearings and are able accurately to locate the signal within a radius of but a block or so. Those of you who have seen the film, "Patrolling the Ether," are familiar with the little gadget known as the "snifter." This sensitive field-strength indicator is used in the final stages in locating the clandestine transmitter at its hideout.



Taking a close-range bearing from one of the mobile units. The operator first sets his d/f loop scale to true North. Graduations then read accurately over 360 degrees. The signals are recorded on wax cylinders.

Intercept Room

In many cases high-speed code signals, which cannot be copied by hand or on the mill, must be identified. Operators in the intercept room immediately tune in the same signal on other receivers and the entire transmission is recorded on a Boehme ink recorder. This machine is capable of handling code at any speed used. The tape is later removed and read visually by women trained especially for this task. They transcribe the complete transmissions by typewriter. If this information is needed by the intelligence center at Washington in order to identify the station, contents of the transmission are then sent by teletype. Memovox disc recorders and Telecord wax cylinder recorders are also used in many cases. Amateur-type communications receivers are used. In the intercept room, for example, are seven Hallicrafters SX-28s. Six more are used in the cruising room. They have never made a major repair on any of these sets since 1941. Corrections for the calibration of the main tuning dial are made with the bandspread dial when required. Bill Hoffert told us that receivers and other equipment are in operation day and night.

Mobile Units

The equipment within these cars is similar to that used by the primary and secondary stations. They include a Hallicrafters SX-28, an S-27 and a Telecord wax cylinder recorder. Needless to say, all equipment is operated from power supplied by the heavy-duty storage battery. Accessory items include the famous "snifter."

The records show that nearly 400 unlicensed stations have been located and put out of commission since July 1, 1940. The RID has investigated nearly nine thousand cases of alleged, unlicensed or subversive transmission in this country and elsewhere. Thanks to the RID, such stations, at least in this country, have practically ceased to exist. More than two hundred Axis spies have been rounded up in South America with the help of the RID. That, fellow hams, should convince the most pessimistic layman that the radio amateur is performing one of the most important functions in our country's fight against espionage.

Lost Aircraft

As mentioned in earlier paragraphs, one of the most important jobs performed by the RID is to be on the alert for planes that are lost, disabled or forced down. It has become daily routine for the RID ops to search for these planes, to give them accurate bearings, and to direct them safely and surely to a landing strip.

A typical "case history" concerns an incident that happened on January 30, 1943. A Douglas DC-4 of the Army Transport Command became lost en route to Miami, Florida, from Trinidad.

Right — Operating position in the intercept room where signals are recorded on tape, on wax cylinders or on disc recorders. The receiver at the extreme right is the diversity version described in the text. Note the selector switches for the rhombics. Feeders from the rhombic antennas may be seen at the top center where they enter the room.

♦

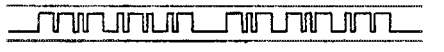
Below — Transmissions being recorded on Memorox discs. Each drawer beneath the amplifier includes a turntable and a magnetic recording head which embosses on paper based discs one hour and five minutes of playing time per side. The operator here is transcribing signals which have been previously recorded.

It was carrying 23 passengers. When the plane was an hour and a half overdue at Miami, contact was made with the plane and assistance was requested from the Army Information Center and the CAA. The RID was notified by the CAA.

At 0730 GMT Pan American advised the plane of a bearing of 70° from Miami. At 0753 GMT a bearing of 32° was given. At 0800 the plane was given a bearing of 320° from Miami. The first fix at 31° 45′ N and 80° 10′ W was given at 0810 GMT. Another was given at 0817 GMT showing the fix to be 31° 20′ N and 82° 10′ W. This position, together with the fact that the Savannah airport was hearing the plane very strongly, indicated that the plane was near Brunswick. The frequency of the Savannah range station was given in an attempt to bring the plane safely into that airport. At 0820 GMT the plane reported that it was running low on gasoline and was circling over an unidentified airport. At 0823 the plane reported that it had made a safe landing.

It is interesting to note that, during the period the plane was lost, it had been within the area of no less than seven range stations. This aircraft was equipped with two direction finders, but they were not used in determining its location. If it had not been for the RID, the plane undoubtedly would have remained lost and its passengers and crew — among them Kay Francis, the movie actress — would have met an untimely death.

America owes much to the personnel of the RID. Without a backlog of trained ham operators, precious time would have been lost in setting up one of Uncle Sam's most effective defensive weapons. Countless lives and costly planes would have been destroyed without the help of the RID.



This girl is reading tape that has just come from the Boehme recorder. If the information is needed in Washington to help identify the station, the contents are forwarded by teletype. Above the photograph is a sample of the inked tape of the type she is transcribing.

The Cathode-Ray Tube and Its Applications

A Discussion of Its Construction and Operating Principles

BY DONALD MIX,* WITS

In the past, cathode-ray tubes have received less attention from the average amateur than their usefulness and versatility warrant. This is chiefly because of the relatively high cost of these tubes and the general impression that an understanding of their principles and applications perhaps is beyond the ham's capabilities. With wartime mass-production and application bringing the price of cathode-ray tubes down, it is hoped that this article, and others to follow, will dispel the notion that there is anything mysterious or complicated about the operating principles.

ALTHOUGH the cathode-ray tube is one of the oldest of electronic devices, predating as it does even the triode vacuum tube, only in recent years have its many applications been exploited extensively. As the core of the oscilloscope, it is without doubt the most versatile of all our devices for analyzing electrical and mechanical phenomena. Today it is the heart of modern television receiving systems. Other uses, such as in panoramic reception, are and will be unfolding.

Since the cathode-ray tube seems destined to assume in the future a position of much greater importance than it did in prewar days — in the amateur station as well as in the laboratory — its principles and general applications should be of more than casual interest.

Electron Generation and Control

The modern cathode-ray tube by itself is a very simple device, differing in principle very little from the original model developed by Braun in 1897. Tubes of this type may be divided into two general classifications, according to whether they are current or voltage-operated.

A sketch of a typical tube of the latter type appears in Fig. 1. This variety is known as the *electrostatic-deflection* type. The first three elements from the left, as viewed in the sketch, should be familiar to anyone having a speaking acquaintance with radio tubes. These are the *heater* or *filament*, *cathode*, and *control grid* or *control electrode*. As in other types of vacuum tubes, the filament heats the cathode indirectly and the heated cathode surface emits the electrons. The principle difference between this cathode and that of a radio tube is that the emitting surface is confined to the top end of the cathode (right-hand end in the sketch). The control grid or electrode surrounds the cathode and is in the form of a cylinder, closed at one end except for a small aperture through which electrons from the cathode may flow. As usual, varying the amount of bias on the control electrode provides a primary means of controlling the number of electrons which are permitted to pass through the aperture.

Acceleration and Focusing

The negative electrons are drawn along the dotted line of Fig. 1 by positive charges which are applied to the anodes. In the usual radio tube, the *anode* (or plate as it is more often called when referring to radio tubes) surrounds the cathode and grid, obstructing the further passage of electrons into space. In the cathode-ray tube, however, there are at least two anodes and they are in the form of cylinders, open at both ends except for restricting apertures, so that most of the electrons attracted by the strong positive charges of the anodes are not impeded in their progress, but are free to continue movement through space along the dotted line of Fig. 1. One of the primary purposes of the anodes, therefore, is to accelerate

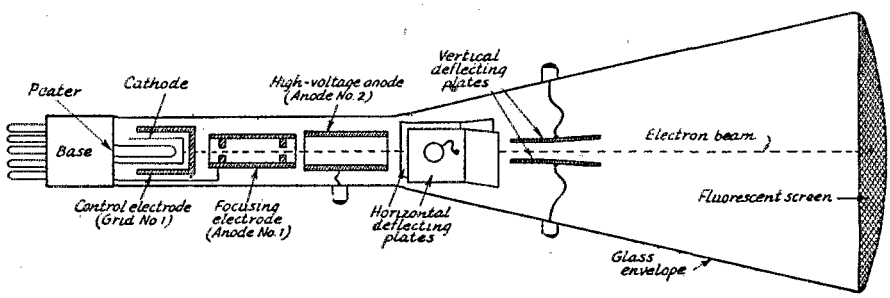


Fig. 1 — Sketch showing the construction of a typical cathode-ray tube of the electrostatic-deflection type. The envelope is usually made of glass, although at least one small type is made of metal except for the glass fluorescent screen at one end. Terminals for the high-voltage anode and for the deflectors are customarily mounted on the side of the envelope, while connections to other electrodes are made through the plug-in base.

*Acting Technical Editor, QST.

the electrons to a velocity sufficient to permit them to strike the fluorescent screen at the end of the tube. Another purpose is to compress or "focus" the stream of electrons into a sharp beam or ray similar to a pencil of light. The *focusing electrode* (first anode) and the *high-voltage anode* (second anode) combine to form an electronic system similar to a system of lenses in optics.

The Fluorescent Screen

From the preceding description it is quite easy to understand why the group of elements in the "neck" of the cathode-ray tube is referred to as an *electron gun*, since it serves to "aim" and "shoot" the electrons toward the screen at the end of the tube.

The fluorescent screen is a coating on the inside of the circular end of the tube. The coating consists of a thin layer of one of several substances which have the property of glowing visibly under electronic bombardment. Thus when the electron beam is properly focused on the screen, a small luminous spot appears at the center of the screen, as shown in Fig. 2-A.

Beam Deflection

Since the beam is made up of electrons which are negative charges, it is obvious that a charged electrode will tend to deflect or bend the beam if the electrode is brought within the field of the beam. If the electrode is positively charged, it will attract electrons toward it and the beam will be deflected toward the electrode. If, on the other hand, the electrode is negatively charged, it will repel electrons and the beam will be bent away from the electrode. Thus it is not difficult to understand the purpose of the two sets of *deflecting plates* or *deflecting electrodes* shown in Fig. 1. The beam passes between each pair of plates in succession. The two sets of electrodes are placed at right angles to each other so that one set may be used to deflect the beam in a horizontal plane, while the other pair serves to deflect the beam in a vertical direction.

Simple Applications

If a battery is placed across the two horizontal electrodes, as shown in Fig. 2-B, the beam will be bent toward the positive electrode and away from the negative electrode and, as a result, the luminous spot will move to the corresponding side of the screen. Similarly, if the battery is connected across the vertical plates, the spot will be moved vertically in the direction of the positive electrode, as shown in Fig. 2-C.

Since the distance the spot will move from the center of the screen is proportional to the battery voltage, measurement of the distance between the spot and the center of the screen offers a means of measuring voltage. The operating data supplied with each tube by the manufacturer includes the voltage required to move the spot one inch. Either horizontal- or vertical-deflection plates may be used for voltage-measuring purposes, of course.

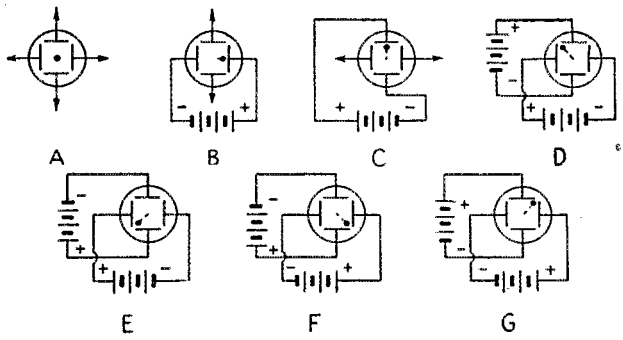


Fig. 2 — Sketches showing the position of the spot on the fluorescent screen for different deflector potentials. A — Both deflectors at zero potential. B — Positive potential on right horizontal deflector. C — Positive potential on upper vertical deflector. D, E, F, G — Equal positive potentials on adjacent plates.

If the influence of both vertical and horizontal deflectors upon the electron stream were equal and if batteries of equal voltage were placed simultaneously across each set of deflector plates, the spot would assume a position along a 45-degree line whose quadrant would depend upon the polarities of the various electrodes, as shown in Figs. 2-D through 2-G. If the batteries were not of equal voltage, the spot would be located along lines at different angles depending upon the relative voltages applied, moving closer to the electrode having the greater positive charge. Thus it is seen that by correct application of suitable voltages, the spot may be placed at any desired point on the screen. Conversely, it is possible to determine relative magnitudes and polarities of unknown voltages connected across the deflection electrodes by calibrating the position of the spot. This is the basic principle by which the cathode-ray tubes serves as an analyzer of electric-circuit phenomena.

While the above simple illustrations are confined to d.c. voltages, the greater advantage of the cathode-ray tube lies in its application to the analysis of a.c. and transient wave forms. In serving in this capacity, it has the important feature that a negligible amount of energy is required to deflect the beam so that connection of the deflecting plates across high-impedance circuits imposes a minimum of loading. Since the beam has negligible mass and inertia, it may be deflected at a rate sufficiently high to follow high-frequency wave forms.

Magnetic-Deflection Tubes

Tubes such as the one under discussion above, in which the beam is deflected by electrostatic action, are sometimes referred to as *voltage-deflection* tubes because the degree of deflection depends upon the voltage applied to the deflection electrodes. Since a moving stream of electrons constitutes an electric current, and since an electric current creates a magnetic field about its path of flow, it is reasonable to assume that the

beam may be deflected by magnetic as well as electrostatic means. Such is the case in the so-called *magnetic-deflection* or *current-deflection* type of cathode-ray tube. In tubes of this classification two sets of coils replace the deflection electrodes. The coils are mounted outside the glass envelope. The term *current-deflection* stems from the fact that the degree of deflection depends upon the current flowing through the deflection coils. Each system of deflection has certain advantages for specific purposes which the other does not possess. In general, electrostatic-deflection tubes are more commonly used for laboratory-analysis work, while the magnetic-deflection type is preferred for television work.

Power Supply

Now that the fundamental principles of the cathode-ray tube have been discussed, the practical construction and operating functions of the various electrodes may be studied in somewhat greater detail. Sizes vary from small tubes with a screen one inch in diameter to large ones with a screen 12 inches in diameter. Experimental tubes for television work have been built with diameters up to 30 inches. The 5-inch size is the most popular for general laboratory work, while the 9-inch or 12-inch sizes are more suitable for classroom demonstrations.

A circuit showing how the operating voltages are applied to the electrodes appears in Fig. 3. Manufacturers have standardized on two heater

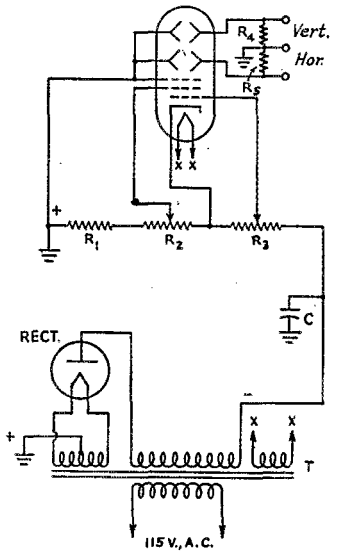


Fig. 3 — Circuit diagram showing power-supply connections to cathode-ray electrodes.

C — Filter condenser, usually 0.5 to 2 μfd., high voltage.
R_1 — Voltage-divider resistance.
R_2 — First-anode potentiomater (focus control).
R_3 — Grid-bias potentiometer (intensity control).
R_4, R_5 — Electrode-discharging resistors.
T — Special high-voltage, low-current power transformer with rectifier and filament windings.
Rect. — Special high-voltage, low-current, high-vacuum rectifier.

ratings. The filaments of some types draw 0.6 ampere at 6.3 volts while others operate at 2.5 volts, 2.1 amperes. The current drain on the high-voltage supply is very light, a typical tube drawing an anode current of only 70 microamperes at 5000 volts. Therefore the output of a half-wave rectifier can be filtered quite readily by a simple capacity filter consisting of a 0.5- to 2-μfd. condenser. Special high-vacuum rectifier tubes, such as the types 878 and 879, capable of handling economically small currents at high voltages, have been developed for this application. Control-grid bias, as well as anode voltages, are obtained from the single power supply by connecting the cathode at a point which is positive in respect to the point of grid connection to the voltage divider consisting of R_1, R_2 and R_3.

Controls

Adjustment of the grid-bias potentiometer, R_3, controls the number of electrons in the beam, voltages more negative in respect to the cathode reducing the number, while a decrease in bias will increase the flow of electrons. This provides a convenient means of varying the intensity of the luminous spot on the screen, since the brightness of the spot depends to a large extent upon the number of electrons in the beam. The bias required to cut off the beam completely varies between — 20 volts and — 120 volts for tubes of different types.

The focusing electrode (first anode) is operated at a relatively low positive potential, varying from 100 to 200 volts for small tubes up to 1500 volts or more for large tubes. These values are roughly 20 per cent of the voltages applied to the high-voltage anode (second anode) which operates at voltages between 500 and 10,000. The larger tubes require the higher voltages. Voltages of 1000 to 3500 are common for tubes used in oscilloscopes, while the higher voltages are usually used with television tubes.

As mentioned previously, one of the functions of the anodes is to accelerate the electrons so that they will strike the screen with sufficient velocity to cause the screen to fluoresce. The intensity of the luminous spot depends upon electron velocity as well as the number of electrons, so that anode voltages as well as the grid bias will affect the intensity. The final velocity attained by the electrons is set principally by the voltage of anode No. 2.

Higher anode voltages result in increased velocities, of course. However, changing the *ratio* of anode voltages has an influence upon the focus as well as upon the intensity so that variation of the grid bias provides a more independent control of intensity than an adjustment of anode voltage.

Even though the beam may be fairly well defined when it leaves the grid aperture, further restricting influence is necessary because each individual electron being a negative charge tends to repel its neighbors with a resulting tendency to spread the beam as the electrons travel along the path to the screen. The focus depends upon the shapes of the anodes as well as the voltage ratio

so that focusing voltages vary considerably among tube types. Since the distance between the "gun" and the screen increases with the size of the tube, it is understandable that the larger tubes require higher anode voltages to "shoot" the electrons over the greater distance.

While a change in the voltage of either anode will affect the focus, it is customary to operate the high-voltage anode at a fixed voltage and vary the lower voltage of the first anode for focusing. Thus the potentiometer, R_2 in Fig. 2, provides the principal means of adjusting the focus. However, in practice it is necessary to juggle slightly the two controls, R_2 and R_3, to arrive at a focused spot of the desired intensity.

High-Voltage Connections

In contrast to the usual practice in transmitters and receivers, the positive high-voltage, instead of the negative terminal of the power supply is grounded. This is a measure of safety more than anything else, since there are fewer exposed terminals and wiring on the negative side and it is therefore easier to insulate this side of the circuit. This means, however, that the heater winding of the power transformer must be insulated for full voltage of the second anode. It also will be noticed in Fig. 3 that one of each pair of deflecting plates is connected to ground and therefore to the positive high-voltage terminal. This is to provide a path to ground for any electrons which would tend to interfere with the proper functioning of the deflection electrodes by forming an accumulated negative charge on the electrodes. A path to ground also is provided for the same purpose from the other two deflectors through the high resistances, R_4 and R_5.

Connections from the circuits under investigation are made between each of the horizontal and vertical terminals, marked in Fig. 3, and ground.

Screen Coatings

Several different coatings have been developed for cathode-ray tube screens. The selection for use in any particular type depends chiefly upon the purpose for which the tube is to be used. In certain applications it is permissible to use a coating which glows for a relatively appreciable length of time after the beam has been moved or cut off so as to give the eye or camera a better chance to record the behavior of the spot. In other cases where observations are being made of extremely rapid transient fluctuations a "slow" screen would cause the spot indication to be blurred. For applications of this sort, tubes with "fast" or *short-persistence* screens are available.

Different coating materials also result in spots of different colors. Blue records better on photographic film while the green spot which is produced on screens of some materials is preferred for work where the observation is to be made by eye. Yellow and white are colors commonly chosen for television tubes.

In the early developmental stages, difficulty often was experienced with accumulations of electrons on the screen, which resulted in a charge which would act on the approaching beam electrons so as to repel them and interfere with the proper forming of the spot. Various steps were taken to eliminate this trouble. In modern tubes the difficulty is avoided by selecting screen materials which will liberate any accumulation of electrons by means of secondary emission at the proper rate. One operating precaution which must be observed is that the spot should not be allowed to remain in one position longer than necessary, since there is danger of "burning" a hole in the coating material.

Deflection Sensitivity

The voltage required on the deflecting plates to move the spot a given distance on the screen depends principally upon the velocity of the beam electrons. As in the case of a stream of water or air, it requires greater influence to alter the course of a high-velocity beam than one in which the electrons are moving more slowly. Because the larger tubes usually must be operated with higher beam velocities, as explained earlier, these tubes require correspondingly higher deflecting voltages.

Deflection voltage or *deflection sensitivity* is usually given in terms of millimeters of spot deflection per volt or sometimes in volts per inch. Deflection sensitivity is inversely proportional to the voltage of the second anode and also there is a relation between the sensitivity and the distance between the deflecting electrode and the screen. This becomes obvious when it is considered that the movement of the spot on the screen is a magnified version of the smaller movement of the beam at the deflector. A similar case is that of the small movement of a searchlight which causes a greater movement of its beam as the distance from the light increases.

Since the two sets of deflectors necessarily are placed at different distances from the screen, it readily can be understood why the sensitivities of the vertical and horizontal deflectors are not exactly the same. In practice the deflection sensitivity may vary from 0.08 to 0.6 mm. per volt. In tubes operating with a second-anode voltage of 1000, the sensitivity ranges from 38 to 680 volts per inch with different types. Average sensitivity runs from 38 to 80 volts per inch of spot movement.

In a future article, the application of a.c. and other forms of rapidly changing voltages to the deflector plates and the interpretation of the resulting screen patterns will be discussed.

CIRCULATION STATEMENT

PUBLISHER'S STATEMENT OF CIRCULATION AS GIVEN TO STANDARD RATE AND DATA SERVICE

This is to certify that the average circulation per issue of *QST* for the six months' period January 1st to and including June 30, 1944, was as follows:

Copies sold	51,454
Copies distributed free	377
Total	51,831

K. B. Warner, Business Manager
D. H. Houghton, Circulation Manager

Subscribed to and sworn before me on this 14th day of September, 1944
Alice V. Scanlan, Notary Public

IN THE SERVICES

NOTHING much to ragchew about this month. We're looking to a tremendous increase in our mail as soon as the new forms which appeared in the September issue of *QST* can be filled in and returned to us, so don't delay!

With this issue, we again are listing some of the amateurs who, although staying on the home front, are supporting the boys on the fighting front by their work with airlines and aircraft companies. The listing published this time is composed of OMs who are on flying duty and also those who never get their feet off the ground, all grouped together under one general heading to conserve space and still get as many names and calls as possible in black and white.

COAST GUARD

1KNW, Powell, RM1c, foreign duty
ex-1LPR, Torpacka, CRM, foreign duty
1LWJ, Pendergast, RT1c, Groton, Conn.
1MQO, Bean, CRT, foreign duty
2BRZ, Cochran, CRT, New York, N. Y.
2HWY, Ruffalo, S1c, Groton, Conn.
3IIM, Poinkowski, S2c, Silver Spring, Md.
4GFJ, Garrett, ARM1c, Lindbergh Field, Calif.
4HJR, Hiers, CRM, foreign duty
7SJ, Heatlie, WO, foreign duty
8RSL, Ziliox, RM1c, foreign duty
8UYE, Hecker, CRM, foreign duty
9KJC, Holmes, Lt., Portsmouth, Va.
9KLE, Johnson S2c, Silver Spring, Md.
9QFZ, Jeppesen, RT3c, Buffalo, N. Y.

Operator's license only:

Houseal, RM1c, foreign duty
Landau, RM3c, foreign duty
Logan, RT2c, foreign duty

MARINE CORPS

2NKQ, Shreve, Cpl., foreign duty
ex-4AYH, Harris, Pfc., Clarksville, Ark.
4EPT, Eggart, Pvt., Parris Island, S. C.
4GXQ, Burdine, Pfc., Santa Ana, Calif.
5EOO, Smith, 2nd Lt., Quantico, Va.
5JVF, Hillmeyer, Pvt., San Diego, Calif.
5JXR, Young, Cpl., Washington, D. C.
6CLS, Steventon, Lt., San Mateo, Calif.
6KJE, Ellis, foreign duty
6OOR, Harvey, S/Sgt., Camp Lejeune, N. C.
8JCK, King, Cpl., San Diego, Calif.
8JOI, Holland, Lt., Corpus Christi, Texas
8RDD, Coffe, CRO, foreign duty
8VZF, Fauntleroy, address unknown
8WFN, Cronin, Sgt., Camp Lejeune, N. C.
9SGB, Oberg, Pfc., Oceanside, Calif.
9YUX, Ferguson, Pvt., Clarksville, Ark.
9ZID, McNeil, Lt., foreign duty

Operator's license only:

McKowen, S/Sgt., Camp Lejeune, N. C.

Major Leland W. Smith, who operated W4AGI before the war, is now communications officer for the Fourth Marine Air Wing now striking at the Jap-held bases in the Southwest Pacific. He has been an active amateur for over ten years and at the time of entering the Marine Corps in 1940 he was the Georgia SCM.

ARMY—SIGNAL CORPS

1JQL, Simonds, Cpl., Ft. Monmouth, N. J.
1MYQ, Litrides, Lt., Ft. Benning, Ga.
2IND, Starr, Pvt., Camp Blanding, Fla.
2JMT, Novack, T/4, Santa Monica, Calif.
3GWU, Wolberg, Pvt., Camp Crowder, Mo.
3HBM, May, T/Sgt., foreign duty
3HXM, Conner, T/Sgt., foreign duty
3JMP, Saber, Pfc., Baltimore, Md.
K4ERA Lamboy, Cpl., Ft. Benning, Ga.
4HOM, Monger, Pvt., foreign duty
ex-5JGS, Yatko, T/Sgt., foreign duty
ex-K6DTR, Jaeger, Pvt. Ft. Monmouth, N. J.
ex-6SR, Cady, Pvt., Camp Crowder, Mo.
K7FTM, Ritchie, T/4, foreign duty
K7GIE, Felix, S/Sgt., foreign duty
7GKW, Lauby, T/4, foreign duty
7IOX, Curtis, Pvt., Ft. Monmouth, N. J.
7ITN, Rhodes, Pvt., Camp Crowder, Mo.
7JR, Peterson, Major, Camp Cooke, Calif.
ex-8CGO, Dunwell, Major, Arlington, Va.
8OZN, Brunett, 2nd Lt., address unknown
9EDO, Gentry, Sgt., Camp Bowie, Texas
9GRZ, Bianchi, Cpl., foreign duty
9GYZ, Brawley, Capt., foreign duty
9IRU, Dunn, 2nd Lt., San Francisco, Calif.
9KRK, Engebretsen, Pvt., Pine Camp, N. Y.
9MTS, Olsen, Sgt., foreign duty
9SKU, Ward, Pvt., foreign duty
9SYU, Clifford, Lt., foreign duty
9TJG, Fleming, 2nd Lt., foreign duty

Operator's license only:

Mead, Cpl., foreign duty
Peebles, Pvt., Ft. Huachuca, Ariz.
Pendell, Pvt., Petaluma, Calif.
Sawyer, T/4, Barksdale Field, La.
Strickland, S/Sgt., Camp Gruber, Okla.

NAVY—SPECIAL DUTY

1DHC, Tavares, RT3c, foreign duty
2KXP, Bach, Bainbridge, Md.
2MLZ, Witt, CRT, foreign duty
3DFJ, Sichel, RT3c, Chicago, Ill.
3JMK, Zinman, RT1c, foreign duty
4GIA, Rhoden, RT3c, Chicago, Ill.
5HAT, Stermer, RT2c, foreign duty
6JWK, Woodyatt, CRT, foreign duty
6LBN, Edwards, CRT, Treasure Island, Calif.
6RXO, Lawhead, R1c, foreign duty RT1C
6UAS, Boyte, RT1c, foreign duty
6UDY, Koller, RT3c, Treasure Island, Calif.
7BTV, Dodge, RM1c, foreign duty
7INH, Evans, RT2c, Gulfport, Miss.
8MOT, Hummel, Lt. Comdr., Houma, La.
8QLC, Frederick, RT1c, foreign duty
8VVN, Rogers, RT3c, Washington, D. C.
8WVU, Campbell, RT2c, foreign duty
ex-9GRC, Larsen, RT3c, Chicago, Ill.
9PCB, Howard, RT3c, Treasure Island, Calif.
9VLV, Senzel, RT2c, Bellevue, D. C.

Operator's license only:

Barry, RdM3c, foreign duty

NAVY—AERONAUTICS

ex-1DEF, Marcoux, ACRT, foreign duty
3EXM, Kulp, ACRM, Norfolk, Va.
4GQL, Williams, A/C, address unknown
4HGV, Oster, ACRM, Ft. Lauderdale, Fla.
6CRT, Connor, RE, Alameda, Calif.
6MND, Koch, ART1c, foreign duty
6TIL, Hoffman, Lt.(jg), Miami, Fla.
8BNT, Demidio, ART1c, Lakehurst, N. J.
9PHC, Leih, AP1c, West Atlantic City, N. J.
9QUW, Sander, ART2c, address unknown
9SSY, Boudreau, ART1c, foreign duty
9UPR, Barsumian, ACRT, Evanston, Ill.

When these radio amateurs got together to have their picture taken for *QST*, they were attending Coast Guard Radio Material School near Silver Spring, Md. *Left to right:* S2c J. Poinkowski, W3IIM; S2c E. Johnson, W9KLE; RT2c J. H. Kitterman, W9NLQ; RT3c W. Weingart, W2LUC, and S2c L. Lyon, W5KIO.

ARMY—GENERAL

1CBA, Lunden, Sgt., Ogden, Utah
1MTA, Johnson, CWO, Camp McCoy, Wis.
ex-2HYY, Schermer, Pvt., Camp Atterbury, Ind.
2LAP, Levy, Pvt., Ft. George G. Meade, Md.
2LMT, Goetz, T/5, Camp Stewart, Ga.
3AUY, Thole, T/4, Ft. Knox, Kentucky
K1FAC, Caro, T/Sgt., foreign duty
5JAV, Crandall, Major, Sunmount, N. Y.
5KSQ, Bailey, Cpl., foreign duty
6KZD, Oldfield, Sgt., foreign duty
6TQG, Germany, Sgt., foreign duty
6TUQ, Merrill, T/5, Ft. Benning, Ga.
7GPV, Hulst, Lt., foreign duty
8ACX, Atchley, Pvt., foreign duty
8AQO, Markovich, S/Sgt., Ft. Riley, Kans.
8BDT, Couch, Lt., foreign duty
8KGD, Mathias, Lt., Swannanoa, N. C.
8MHI, Buehn, S/Sgt., Ft. Riley, Kans.
8SCM, Hesselgrove, Pfc., foreign duty
8UOZ, Winchester, Pfc., foreign duty
ex-9AOZ, Peter, Pvt., Camp Joseph T. Robinson, Ark.
9BGV, Blastik, T/5, Camp Bowie, Texas
ex-9DMD, Finch, CWO, foreign duty
9JMG, Ellsworth, Pvt., Camp Plauche, La.
9LZL, Callaway, Sgt., foreign duty
9NSJ, Simonds, Cpl., foreign duty
ex-9ST, Jennings, Sgt., Camp Roberts, Calif.
9VDU, Waidmann, Pvt., Camp Maxey, Texas

Operator's license only:

Judge, T/Sgt., Ft. Bliss, Texas
Klein, Sgt., Ft. Leonard Wood, Mo.
Seib, T/5, Camp Davis, N. C.
Thrutchley, Pvt., Ft. Riley, Kans.

NAVY—GENERAL

THE Red Cross nurses undoubtedly are welcome visitors to any convalescing service man, but when he is a ham and she has a copy of *QST* amid the books she's distributing, then she's sure to see a bright countenance. We heard of such an episode at the Naval Medical Center at Bethesda, Md., recently, and the ham was S1c H. A. Roadknight, W3EKY.

1AGO, Beaulieu, RM1c, foreign duty
1AH, Neff, Lt. Comdr., New Haven, Conn.
1ARY, Flanders, CRE, foreign duty
1GQO, Bassett, CRM, foreign duty
1LMT, Merritt, F2c, Sampson, N. Y.
1NKU, Miller, EM2c, New London, Conn.
2ARP, Ramhorst, S2c, Newport, R. I.
2HRB, Eisenberg, Ens., address unknown
2IAN, Gomersall, S1c, Camp Rousseau, Calif.
2LEY, Farley, A/S, Hoboken, N. J.
2NNH, Bienstock, S1c, Great Lakes, Ill.
ex-3HIV, Brooks, RM1c, foreign duty
3JHL, Moss, Ens., foreign duty
3JIX, Wilt, RM1c, foreign duty
3JLA, Moore, S1c, New York, N. Y.
3JUZ, Bermes, S1c, Great Lakes, Ill.
4BOZ, McCord, Lt.(jg), address unknown
4BWB, Evans, Lt., Norfolk, Va.
4BWT, Hamrick, Ens., foreign duty
ex-4CB, Boruch, RM1c, foreign duty
4DYY, Biggs, RM2c, Chicago, Ill.
4GSJ, Bay, S1c, Great Lakes, Ill.
4HPB, Wallis, RM1c, foreign duty
5ECU, Cecil, Ens., foreign duty
5FBG, Graves, S1c, Great Lakes, Ill.
ex-5FPX, Gibbs, CRM, foreign duty
5GSD, Smith, S1c, Great Lakes, Ill.
5JHE, Wilson, CRM, foreign duty
6AAA, Bigelow, Lt.(jg), Gainesville, Ga.
6FMH, Gonzalez, S1c, Treasure Island, Calif.
6KEZ, O'Lincoln, SoM1c, foreign duty
6LED, Starks, A/S, Farragut, Idaho
6LUA, Kuppe, Ens., Banana River, Fla.
ex-6NQ, Jones, CEM, foreign duty
6NRT, Halton, RM1c, foreign duty
6OEH, Wells, RM1c, foreign duty
6OIM, Ray, S1c, Great Lakes, Ill.
K6RUA, Jacobs, Lt.(jg), foreign duty
6SBL, Kiesner, S1c, Chicago, Ill.
6TVF, Williams, RM1c, Corona, Calif.

Lt. Comdr. F. T. McAllister, W8IIKT, has been a licensed ham since 1931, and is a past president of the Southwest Michigan Radio Club. He enlisted in the Naval Reserve in 1932, volunteered for active duty in 1940, and has spent most of the last three years at sea. Good reason for his looking so natural in this FB nautical pose!

K6TXH, McDannold, RM1c, foreign duty
7AGE, Alnutt, Lt.(jg), foreign duty
7FDH, Clayton, S1c, Great Lakes, Ill.
7GYB, Myklebust, S1c, Springfield, Mo.
8BBI, Ervin, Lt., foreign duty
8GFB, Holzmiller, RM1c, foreign duty
8GHX, Owen, Lt., foreign duty
8KHG, Weidow, RM3c, Evanston, Ill.
8KXF, Spon, Lt.(jg), foreign duty
8MWV, Lange, WO, foreign duty
8NAF, Taylor, A/S, Camp Peary, Va.
8PPB, Van Loon, S1c, Sampson, N. Y.
8UJG, Carmody, Ens., address unknown
8SWY, Schuster, S1c, Great Lakes, Ill.
9BCW, Slusser, Lt. Comdr., foreign duty
9BPJ, Lusted, A/S, Notre Dame, Ind.
9CHJ, Schultz, S1c, foreign duty
9CNK, Ridenour, A/S, Farragut, Idaho
9DVT, Mackinder, S1c, Great Lakes, Ill.
9FJX, Desper, RM3c, Oceanside, Calif.
ex-9GNW, Weigel, Lt.(jg), Cambridge, Mass.
9LRZ, Medley, S1c, Great Lakes, Ill.
9LWM, Howard, S1c, Great Lakes, Ill.
9OCN, Mellaney, Ens., Princeton, N. J.
9QXS, Davis, Lt.(jg), Charlottesville, Va.
9SMK, Chapman, RM3c, Evanston, Ill.
9TNH, Elliott, A/S, Ames, Iowa
9UHC, Kanago, S1c, Great Lakes, Ill.
9UOH, Thomasson, S1c, Great Lakes, Ill.
9ZXX, Johnson, S1c, Chicago, Ill.

Operator's license only:

Blaustein, S1c, Great Lakes, Ill.
Bruner, CRM, foreign duty
Ferguston, S1c, Great Lakes, Ill.
Hontz, S1c, Great Lakes, Ill.
Kelly, Albuquerque, N. M.
Lippacher, RM3c, foreign duty
Marks, S1c, foreign duty
Milstein, RM3c, Evanston, Ill.
O'Sullivan, BM1c, foreign duty
Robertson, S1c, Great Lakes, Ill.
Trevithick, S1c, Del Monte, Calif.

Shot down over enemy territory in the South Pacific and reported missing for nine months, Captain F. C. Hargesheimer, W2NOU—ex-W9RAU, is shown here relating to a companion some of his experiences. Winner of the Silver Star, Purple Heart, D.F.C., and Air Medal, Captain Hargesheimer has made forty-eight recco and photo missions over such hot spots as Rabaul, Wewak and Kavieng. W2NOU has been a ham for ten years, has a B.S. in EE and was a radio engineer working on f.m. before enlisting in the AAF.

ARMY—AIR FORCES

WHEN Lt. A. M. Monsees, W6HJP, answered mail call at a station somewhere in the Pacific he found a copy of *QST* among his personal letters. Of much less importance to this "dyed-in-the-wool" amateur was the fact that Bob Hope and party arrived on the same plane to put on a show for the outfit. In fact, this ham of prewar days remained in his quarters and eagerly absorbed the technical articles, section news and even the advertisements, and learned from the others what a sensation the show was. *Semper fidelis!*

1IHW, St. Onge, S/Sgt., Selfridge Field, Mich.
1MEM, Colafati, T/Sgt., foreign duty
2GMV, Steeky, 2nd Lt., address unknown
2ILG, Flynn, T/Sgt., Victoria, Kans.
2IZH, Rose, Sgt., Drew Field, Fla.
2LVA, Lotufo, Pvt., Herington Kans.
3BOP, Keiper, 2nd Lt., Spokane Field, Wash.
3GJU, James, Pvt., Hamilton Field, Calif.
3GVY, Harriman, 2nd Lt., address unknown
3JLE, Dickinson, Sgt., foreign duty
4FNS, Anderson, Cpl., Boca Raton Field, Fla.
5HYK, Wallace, A/C, New Haven, Conn.
5KGO, Polder, 2nd Lt., address unknown
6JJI, Nichols, 2nd Lt., foreign duty
6JZT, Bowman, Capt., Greensboro, N. C.
6KVN, Thorpe, Lt., Kirtland Field, N. M.
6LCB, Lamoreaux, 2nd Lt., address unknown
6MPG, Lackey, 2nd Lt., address unknown
6MVN, Hayes, 2nd Lt., address unknown
6NBM, Brown, S/Sgt., Hendricks Field, Fla.
6PSX, Archer, Capt., foreign duty
6RJU, Tamura, Sgt., MacDill Field, Fla.
6SFE, Garman, Pvt., Stockton, Field, Calif.
6UJD, Stewart, 2nd Lt., Lincoln, Nebr.
7EHD, Wagner, Major, Greensboro, N. C.
K7IEQ, Wayer, Lt., foreign duty
7IPT, Pickering, Capt., Shreveport, La.
8JJL, Hackett, 2nd Lt., address unknown
ex-8LLM, Kavalauskas, Major, foreign duty
8NGT, Bonigut, S/Sgt., Chico Field, Calif.
8OQE, Biresak, S/Sgt., foreign duty
8RRJ, Shaulis, Pvt., Bergstrom Field, Texas
8RYG, Harvey, 2nd Lt., address unknown
8TNE, Lustic, A/C, New Haven, Conn.
9CJR, Plummer, Pvt., foreign duty
9CRK, Wolff, T/Sgt., address unknown
9DVK, Fillmore, M/Sgt., foreign duty
9ECP, Gabrielson, Cpl., DeRidder, La.
9EQF, Grant, 2nd Lt., address unknown
9EYK, Hutchinson, 2nd Lt., address unknown
9FKH, Koda, Pvt., Scott Field, Ill.
9GNG, Doyle, Pfc., Columbus, Miss.
9HAA, Karamark, 2nd Lt., address unknown
9HFB, Breece, Major, Boca Raton Field, Fla.
9JKW, Weed, Lt., foreign duty
9KWU, Mies, Cpl., Boca Raton Field, Fla.
9OJT, Goodyear, 2nd Lt., Randolph Field, Texas
9QXY, Moore, 2nd Lt., Selfridge Field, Mich.
9SBQ, Wasmuth, Pvt., Sheppard Field, Texas
9TLK, Rehbein, 2nd Lt., Maxton, N. C.
9UDX, Waite, CWO, Camp Pinedale, Calif.

All officers in the Air Corps, these OMs are now stationed at Yale University, New Haven, Conn. *Left to right, front row:* Lt. L. W. Kessinger, W5KFN; Lt. J. L. Whitaker, W6QGE, and Lt. R. A. Neste, W9WFO. *Back row:* Lt. G. Bell, (operator's license only); Lt. J. S. Allen, W6PFX; Lt. J. M. Hoffer, W8UFH, and Lt. A. Lephakis, W2MFC.

9UNF, Weed, 2nd Lt., Alliance, Nebr.
9WRZ, Dykeman, S/Sgt., foreign duty

Operator's license only:

Boone, Lt., foreign duty
Chirillo, Pvt., Scott Field, Ill.
Clark, Pfc., Scott Field, Ill.
Hubby, Cpl., address unknown
Murphy, S/Sgt., Campluna, N. M.
Underwood, Cpl., Sioux Falls, S. D.

MERCHANT MARINE AND MARITIME SERVICE

1JOE Matteson; 2DXW, Fischer; 2HNV, Hill; 2JIN, Grober; 2KCC, Nielsen; 4HYQ, Pierce; 5KKD, Lewis; 5KLB, Tidwell; 6OYB, Barrett; 6QWG, Carpenter; 7DOS, Mehner; 8FU, Nelson; 8VSF, Surina; 9FIR, Baker; 9IMM, Anderson; 9NVW, Kawula; 9PYF, Kortum; and 9UOZ, Hots. Bink, Britton, Copeland, Hayes, Neukrans, and Stratton hold operator's license only.

CIVIL SERVICE

1DTS, Gibbs, OWI, foreign duty
2BAP, Costigan, SC, inspector, Newark, N. J.
2LSF, Karton, War Dept., radio engineer, foreign duty
3CZS, Wolfskill, SC, radio engineer, Ft. Monmouth. N. J.
3ILY, Hoover, AAF, Middletown, Pa.
3JTV, Eskridge, FBI, radio engineer, Washington, D. C.
3OV, Stone, OWI, foreign duty
4BMH, Cromwell, CAA, Slidell, La.
4DRY, Harrell, SC, radio engineer, East Point, Ga.
4DSF, Palmisano, SC, radio engineer, Atlanta, Ga.
4EDC, Rowsey, CAA, aircraft communicator, Jacks Creek, Tenn.
4HBQ, Pemberton, inspector, foreign duty
4HFO, Chandler, SC, radio repairman, Camp Stewart, Ga.
4IFM, Pike, engineer, North Beach, Md.
5AAM, Smith, Navy Dept., radio inspector, DeKalb, Ill.
5BCO, Hicks, OWI, foreign duty
5ICR, Richards, AAF, instructor, Amarillo, Texas
5ILB, Gooch, radio operator, Barksdale Field, La.
5PK, De Bardeleben, FCC, Kingsville, Texas
6IWE, Wood, FCC, jr monitoring officer
6OCA, Ellis, OWI, foreign duty
6PDV, Vessey, CAA, aircraft communicator, Reno, Nevada
K6PJJ, Chadwick, OWI, foreign duty
6SZZ, Chadek, OWI, foreign duty
7FHZ, Drenner, OWI, foreign duty
7GPS, Layton, CAA, inspector, Seattle, Wash.
7HBV, Allen, FCC, Spokane, Wash.
7HIT, Wheeler, CAA, aircraft communicator, Yakima, Wash.
7HO, Ryno, SC, radio engineer, Seattle, Wash.
7IEO, Nichols, CAA, aircraft communicator, Everett, Wash.
7JDW, Hipsh, CAA, Garden City, Kans.
8DXF, Kenny, OWI, foreign duty
8IKD, Manola, SC, inspector, Carlisle, Pa.
8JXV, Bannon, OWI, foreign duty
8KGW, Pennebaker, OWI, foreign duty
8KQB, Hutnick, SC, inspector, Jersey City, N. J.
ex-9AAP, Szukalski, Navy Dept., inspector, Milwaukee, Wis.
9AFX, Bets, SC, inspector, Philadelphia, Pa.
9FET, Ritter, OWI, foreign duty
9GMT, Harhat, CAA, radio electrician, foreign duty
9JQW, Hausler, OWI, foreign duty
9MCT, Mann, Navy Dept., radio mechanic, foreign duty
9NHQ, Kiefer, OWI, foreign duty
9NQI, Beringer, FCC, Allegan, Michigan
9OXU, McBride, CAA, Kansas City, Mo.
9SFS, Velde, FBI, San Francisco, Calif.
9UHS, Gathmann, AAF, radio mechanic, Mather Field, Calif.
9WXJ, Unruh, radio mechanic, Orlando, Fla.
9YOR, Nungesser, OWI, foreign duty

Operator's license only:

Huguley, CAA, aircraft communicator, Greenville, S. C.
Krocsak, Navy Dept., aircraft radio mechanic, Pensacola, Fla.

100 PER CENT—AIRLINES AND AIRCRAFT COMPANIES

WHEN Linwood M. Pattee, W1LMO, a radio officer with Northeast Airlines, Inc., walked into the radio shack at an Army base in Greenland a few weeks ago, this was the greeting he received: "What is your name, call and code speed?" Small wonder he adds this comment: "The hams in the AACS make the rest of us feel very much at home whenever we fly into any of their bases.

1AIY, Winchell, radio engineer, Scovill Mfg. Co.
1CPH, Siglin, FRO, Consolidated Aircraft Corp.
1KJR, Lapanne, Northeast Airlines
1LMO, Pattee, FRO, Northeast Airlines
1LPJ, Moore, Air Transport Command
1MOG, McLellon, Air Transport Command
ex-2CVK, Randall, inspector, Chance-Vought Aircraft
2EGG, Savaia, FRO, American Airlines Inc.
2GKE, Smith, FRO, American Airlines
2GPY, Braun, RO, Eastern Airlines
2HMJ, Nickel, RO, Eastern Airlines
2HTO, Stuart, inspector, Republic Aviation
2IRY, Horne, Grumman Aircraft
2JBP, Jones, aircraft radio technician, Eastern Airlines
2LBZ, Hilts, RO, Eastern Airlines
2LKF, Kennyherts, CRO, Transcontinental and Western Air, Inc.
2MRY, Gillen, FRO, Naval Air Transport
2NOA, Davis, CRO, Transcontinental and Western Air, Inc.
2OCP, Voelker, aircraft electrician, Kellett Aircraft Corp.
2WE, Clarke, SFRO, Transcontinental and Western Air, Inc.
3DWX, Anderson, assistant radio engineer Glenn L. Martin Co.
3EMA, Whiting, aircraft radio engineer, Taylorcraft Aviation
3ZG, Becker, RO, Eastern Airlines
4BTI, Brannen, inspector, Bell Aircraft Corp.
4EFL, Russell, radio engineer, Bendix Aviation Corp.
4EQQ, Brookes, RO, Eastern Airlines
4FYJ, Conner, radio inspector, Lockheed Aircraft
4GBF, McMillan, FRO, Chicago and Southern Airlines
4GXD, Jupe, RO, American Airlines, Inc.
4MY, Brown, RO, Delta Airlines
5ALA, Moore, Lockheed Aircraft
5BBL, Gordon, Douglas Aircraft Corp.
5BNQ, Rigby, radio inspector, Lockheed Aircraft
5BYC, Cox, Douglas Aircraft Corp.
5DLP, Smiley, radio inspector, Lockheed Aircraft
5DRN, Hayden, Lockheed Aircraft
5EA, Brians, Aircraft Radio Lab., Wright Field
5EHU, Snyder, Douglas Aircraft Corp.
5ETU, Travis, Lockheed Aircraft
5FEC, Hawkins, Douglas Aircraft Corp.
5FIV, Patterson, FRO, American Airlines
5FKM, Deitrick, radio inspector, Lockheed Aircraft
5GKB, Robinson, FRO, Transcontinental and Western Air, Inc.
5GLD, Wood, inspector, Lockheed Aircraft
5GP, Irwin, Douglas Aircraft Corp.
5ICB, Keen, RO, Lockheed Aircraft
5ISM, Davis, Lockheed Aircraft
5JCQ, Wood, Douglas Aircraft Corp.
5JDB, Hinson, Douglas Aircraft Corp.
5JGX, Hayes, Lockheed Aircraft
5JJJ, Berge, FRO, American Airlines Inc.
5JJK, Sullivan, RO, Lockheed Aircraft
5JNS, Savage, Braniff Airways
5KSG, Malmin, FRO, American Airlines
6HG, Dery, Douglas Aircraft Corp.

6IEQ, Glover, RO, Transcontinental and Western Air, Inc.
6LIP, Huntley, FRO, United Airlines
6LZQ, Wholey, engineer, Army Transport
6MNL, Barnes, Consolidated Vultee Corp.
6MRP, Pedersen, radio inspector, Douglas Aircraft Corp.
6QQL, Osborn, engineer, Transcontinental and Western Air, Inc.
6SET, Beal, radio inspector, Consolidated Vultee Corp.
6SJ, Davis, radio engineer, Lockheed Aircraft
6TNH, Pate, engineer, Lockheed Aircraft
6TPM, Powell, radio crew chief, Lockheed Overseas Corp.
7AXR, Tutton, inspector, Consolidated Aircraft
7GOY, Dack, Boeing Aircraft Co.
K7HAR, White, inspector, Boeing Aircraft Co.
7IOA, Simpson, inspector, North American Aviation
7JEA, Walling, Army Transport
8BBS, Peuser, radio technician, Eastern Airlines
8DWE, Gershey, radio specialist, Eastern Airlines
8GWT, Orcutt, radio inspector, Bell Aircraft Corp.
8IJV, Bauer, Curtiss-Wright Corp.
8INK, Markwardt, CRO, American Airlines
8IVA, Bolton, radio dispatcher, address unknown
8JKG, King, SRO, Eastern Airlines
8KVV, Bryant, radio inspector, Curtiss-Wright Corp.
8LHH, Mort, radio technician, Ford Motor Co.
8MEE, Wright, radio technician, Curtiss-Wright Corp.
8MSM, Gallatly, engineer, Ford Motor Co.
8NLP, Wren, Transcontinental and Western Air, Inc.
8OVG, Ponnet, radio technician, Curtiss-Wright Corp.
8PCI, Pollard, FRO, American Airlines
8PTW, Littell, radio technician, Ford Motor Co.
8QB, Lens, inspector, Bell Aircraft Corp.
8CBF, Shirer, radio engineer, Fisher Aircraft
8RIT, Immel, radio operator, All American Aviation, Inc.
8UJR, Haungs, engineer, Scott Aviation Corp.
8WCJ, Leffel, American Propeller Corp.
8WMP Tester, Consolidated Aircraft
8WTL, Arestad, aircraft radio tester, Lear Aviation, Inc.
9AJG, Anderson, FRO, Consolidated Aircraft
ex-9BWB, Mosher, SFRO, Transcontinental and Western Air, Inc.
9CGC, Eavenson, radio electrician, Cessna Aircraft Co.
9DBX, Pasquale, SFRO, Transcontinenta and Western Air, Inc.
9FGS, Guy, radio tech., Lockheed Aircraft
9FYZ, Pluff, radio operator, Braniff Airlines
9GRH, Malloy, North American Aviation, Inc.
9GSH, Denk, radio operator and technician, Eastern Airlines
9HVG, Marchbank, Douglas Aircraft Corp.
9LJC, Manning, inspector, North American Aviation, Inc.
9LPQ, Katherheinrich, radio electrician, Republic Aviation Corp.
9LYJ, Green, FRO, Continental Airlines
9MDT, Leonard, Air Transport Command
9NET, Murray, radio operator, Curtiss-Wright Corp.
9PFS, Wiederhold, Braniff Airways
9QQT, Neal, Boeing Aircraft Co.
9RON, Chwiedziewicz, FRO, American Airlines
9RQM, Goetsch, radio instructor, Northwest Airlines
9SP, Blough, FRO, American Airlines
9TZP, Quinn, SFRO, Transcontinental and Western Air, Inc.
9VLY, Jordan, United Airlines
9WSU, Shook, SFRO, Transcontinental and Western Air, Inc.
9WZB, Lanham, radio technician, Douglas Aircraft Corp.

Operator's license only:

Hutcheson, technician, Ford Motor Co.
Kolocotrone, Eastern Airlines
Schwab, FRO, Air Transport Command
Thompson, radio foreman, Consolidated Aircraft

HAM HOSPITALITY

BECAUSE we've had so many interesting and appreciative letters from OMs who have enjoyed a personal DX contact in some foreign land they never quite expected to visit, we're prefacing this section with a paragraph from one. Sgt. Richard A. Cade, who holds a Class B license, has this to say in a recent V-mail: "While in New Zealand I happened to meet a few of the amateur operators there and they certainly lived up to the expected ham hospitality. Their terms and expressions may be a little different from those to which we are accustomed, but radio is an international language which soon becomes readily understood."

Ever so many of our boys are, in fact, being made at home away from home by the mere dropping of a knocker, and we are grateful for the following new name and address. This neighbor across the border writes that he will always welcome any visitors of the armed forces who happen to be in Montreal. His name and QTH: Rupert K. Grant, VE3QQ, 1545 Graham Boulevard, Apartment 11, Town of Mount Royal, P. Q., Canada.

As might be expected by reason of the fast-moving current events these days, we now have a change of address from England to France. LAC G. J. Smith, whose address appeared on page 37 of the August issue, is now serving in France and we quote the following from his recent letter: "Many thanks for putting my name and address in *QST*. I hope I may be of service to your lads. I am now serving in France so I wonder if you could ask any of the hams who are also in France to drop me a line in view of holding a meeting and a general get-together." His present address: F.R.U., Royal Air Force, British Liberation Army.

From time to time we have published the address of the Radio Society of Great Britain under this heading and suggested that any amateur stationed in the vicinity of London would be warmly welcomed by the Society's secretary, John C. Clarricoats, G6CL. One of the hams who has taken advantage of this opportunity is W7IXX, who tells us that Secretary Clarricoats can't quite figure out why so few Americans have failed to communicate with him and, to quote T/Sgt. Faries, "Neither can I." RSGB Headquarters, at 28/30 Little Russell Street, London, W. C. 1, is only a short distance from Rainbow Corner in Picadilly Circus, and from all reports it's well worth any ham's time to drop around.

The attraction of a ten-meter beam in a backyard in VK land is vividly told by this picture. The visiting hams, members of a signal service company stationed in Australia, shown here with their hostess are, *left to right:* T/Sgt. L. D. Held, W2KLD; Sgt. J. Hermann, W6URB; Mrs. V. E. Nolan, VK4LO; Pfc. C. D. Costopoulos, W4GKZ, and S/Sgt. E. Penick, W5GWI. Additional details about the visit are included in a letter appearing in the Correspondence from Members section, page 61, in this issue.

A Single-Tube WERS Transceiver

"Cathode" Modulation Applied to Portable Gear

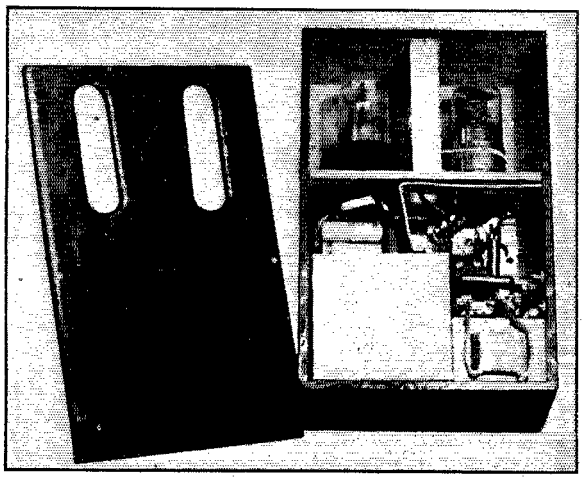
BY GURDON R. ABELL, JR.,* W2IXK

SIMPLICITY is a prime requirement of transceivers. In most cases the set ceases to be simple where several tubes, audio and modulation transformers, etc., are included in the design. In this instance an attempt was made to see how far one could go toward simplicity of design without too greatly impairing performance. The result is a one-tube unit exclusive of power supply.

The elimination of the usual modulator tube and its associated transformer or other coupling device has been made possible by connecting the carbon microphone directly in the cathode circuit of the oscillator tube. While the efficiency of such an arrangement admittedly is not so great as that of the more commonly used plate-modulation system, results with the single tube, both in reception and transmission are entirely adequate for the short-haul work which most hand-portable units are called upon to perform.

Obviously, the number of parts required for such a set is a minimum, the size is small, and the set is light in weight. How about simplicity of operation? Well, anyone who can operate a one-tube regenerative receiver ought to be able to adjust this little set either for transmitting or receiving. With the good antenna system described later on, many WERS networks should find their equipment problems solved by the use of transceivers of this type.

* Gamma Laboratories, 83 College Ave., Poughkeepsie, N. Y.



Rear view of the one-tube cigar-box transceiver. Two tubes are shown, but the one at the left is the power-supply rectifier tube. With slight modification of the present design, an external power supply may be used. The antenna is plugged in at the top of the box, as a unit.

Alternative Circuits

The two circuits shown in Fig. 1 are identical except that one is for use with a cathode-type tube while the other shows how a filament-type tube could be used. A transceiver built according to the circuit of Fig. 1-A would be suitable for use in an automobile with a vibrator power pack, or in a fixed station where a.c. is available. The circuit of Fig. 1-B probably will be of greater interest, however, since it illustrates the application of a filament-type tube of the sort used in hand-portable equipment where restrictions on weight and size are most important.

In either circuit, when the send-receive switch, S, is switched over to "R" (receive) the tube functions as a standard self-quenched detector. In the "T" (transmit) position, the tube becomes a "cathode"-modulated oscillator. In Fig. 1-A the switching is done in the "B"+ lead in order to prevent heater hum during reception. In Fig. 1-B it is done in the "B"− lead, and can be accomplished through the use of a simple four-spring jack switch.

Connecting the microphone directly in the cathode circuit of the oscillator greatly simplifies the transmitting circuit. Since this system is capable of providing only a very small percentage of plate modulation, it may be considered as essentially a grid-modulated arrangement.

Now a few more circuit details. The excitation control, C_3, while not absolutely necessary, is an inexpensive refinement. During transmission, the 'phones and R_3 are shorted out, and the tube is biased by the IR drop through the microphone. Resistor R_2 is not a grid leak, but is used for the sole purpose of suppressing parasitic oscillations of the Hartley type. In this case, RFC_1 and RFC_2, tuned by C_2, form the tank circuit for such parasitics. The lowest possible resistance which still will do the job should be used for R_2.

It will be noticed that the usual regeneration control resistor does not appear in the circuit diagram. Regeneration is controlled by varying the antenna coupling. This method has worked out very well in practice.

No special type of tube is specified in either circuit diagram because almost any receiving triode or multi-grid tube which can be triode-connected may be used. Low-μ tubes give the greatest carrier output, but high-μ tubes may be most easily modulated. Medium-μ tubes

(μ = 10 to 30) are a satisfactory compromise. Suggested types are the 6J5GT/G for the cathode-type circuit and a 1LE3, 1G4GT/G, or 1E4GT for the filament-type.

Simplicity and low cost are desirable features for WERS equipment, since parts often are hard to come by, constructional work usually is done by the relatively few who have the time and ability, and the cost frequently must be borne by individual members of the network. The one-tube transceiver circuits discussed in this article should, therefore, be of more than ordinary interest. Through the use of a "cathode"-modulated oscillator, components have been cut to the minimum and operation is correspondingly simplified.

Construction

Placement of the parts in the experimental model using a cathode-type tube is shown in the accompanying rear-view photograph. As is apparent, the entire unit is built in a cigar box. The 6X5GT/G rectifier is at the upper left, with the 6J5GT/G oscillator next to it. The power transformer and vibrator are shown below in a metal box. The filter equipment is at the lower right. Unless the power-supply equipment is shielded very thoroughly, "hash" will feed through to the r.f. section. Even with 115-volt 60-cycle input to the rectifier, an intolerable amount of hum may be expected unless proper isolation of the r.f. and power supply units is provided by adequate metallic shielding. For this reason it may be preferable to build the power supply as a separate unit, located a few feet away from the transceiver. No problem of this nature is involved, of course, when dry-battery supply is used in a portable unit.

The ⅞-turn antenna coil, L_1, may be seen near the upper right-hand corner of the transformer shield. To the right of L_1 is the tuning condenser, C_1, a mica trimmer which is operated by the tuning dial in the manner outlined in "Hints and Kinks" in *QST* for June, 1943.[1] Farther over is L_2 which is mounted and connected between the plate prong of the tube socket and the junction of C_1 and C_2. Connected to the center of L_2 is RFC_1 which is shown standing on C_4. C_3 consists of a piece of tinfoil, one end of which is connected at the socket to the cathode, while the other end merely is wrapped around the case of C_2. Above and to the left of the R_1C_2 combination is RFC_2, which leads over to the send-receive switch. Out of sight in the lower right-hand corner is C_6. Resistor R_3 runs from the upper one of the 'phone jacks to the terminal strip on the filter choke.

Antenna

Constructional details of the antenna unit are given in Figs. 2 and 3. This unit is plugged in at the top of the cigar box, just above the shelf on which the tubes are mounted. The variable coupling arrangement is shown in Fig. 2. The rubber band shown in the drawing passes first around the coupling coil and then around the base of the 6J5GT/G oscillator tube. This rubber band provides tension enough to allow L_1 to move closer to L_2, according to the setting of the soft-wood eccentric cam. In order that a smooth variation of this coupling position may be achieved, the cam is shaved, a little at a time, until L_1 may be moved smoothly from a minimum to a maximum distance from L_2 (and back to minimum again) for one complete rotation of the cam.

[1] "Mica-Trimmer Tank Condensers in WERS Gear," Hints and Kinks, *QST* for June, 1943.

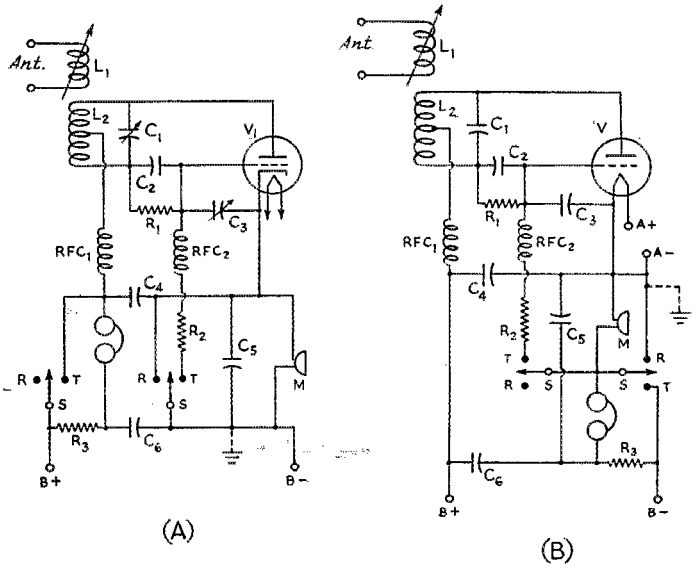


Fig. 1 — Circuit diagrams for the single-tube transceiver. (A) For cathode-type tube. (B) For filament-type tube. The following constants apply to both circuits:

C_1, C_3 — 3-30-$\mu\mu$fd. mica trimmer.
C_2 — 50-$\mu\mu$fd. mica.
C_4 — 0.005-μfd. mica.
C_5 — 250-$\mu\mu$fd. mica (see text).
C_6 — 0.1-μfd. paper.
R_1 — 5 megohms.
R_2, R_3 — (See text).
L_1 — ⅞ turn, No. 12 wire, ½ inch in diameter.
L_2 — 3½ turns No. 12 wire, ½ inch in diameter, ⅝ inch long.
M — Single-button microphone.
RFC_1, RFC_2 — V.h.f. choke; 1-inch winding No. 30 enameled wire, ¼ inch diameter, close-wound.
S — D.p.d.t. toggle switch.
V — 6J5GT/G, 1LE3, 1G4GT/G, or 1E4GT oscillator. (See text for discussion of other types.)

The antenna system is mounted as a unit so that it may be used with any other transceiver where the plug-in jacks are similarly spaced. The antenna is a vertical current-fed Zepp with tuned feeders electrically one-quarter wave long. (Call it a "J," if you wish.) It consists of two vertical rods, one a half-wave longer than the other and tuned at the base by a small variable condenser. By placing this condenser at the base of the rods rather than across the open ends of the stub, losses are reduced and a bandspread effect is provided. The nearer the total effective length of the combined stub and antenna coil approaches an exact quarter-wave (from the lower side), the smaller of the capacity needed for resonance. A total length of $^3/_{16}$ wavelength (about 18 inches) for the stub and antenna coil is about right for the antenna shown.

Operation

This type of circuit, in common with all grid-modulated circuits, is rather sensitive with respect to excitation and antenna loading. Although the set will work after a fashion no matter how it is adjusted, the following procedure is recommended for establishing optimum operating conditions:

With the send-receive switch on "T" (transmit), with a dummy load consisting of a resistor of from 50 to 200 ohms connected across the antenna terminals, and with a tone from some source such as a buzzer feeding into the microphone, adjust C_3 and the coupling between L_1 and L_2 until the modulated output, as heard in the receiver or a crystal detector, is the loudest and clearest. Thereafter, C_3 and R_3 should be left fixed. Further adjustment of the antenna coupling for best reception automatically will establish optimum transmitting conditions. Incidentally, this method of adjustment may be employed profitably in other types of transceivers.

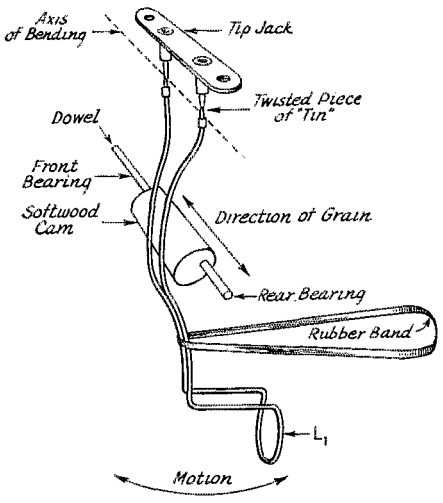


Fig. 2 — Constructional details of the antenna coupling coil.

Once the proper adjustments are found, only actual contacts over the air will determine the range of the set. For a transceiver which costs only two dollars or less, as this one does, any

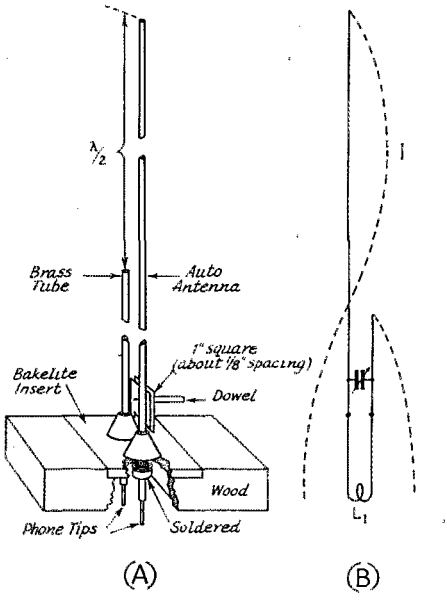


Fig. 3 — The plug-in antenna unit, complete with feed system. (A) Constructional details of vertical antenna and stub sections, trimmer tuning condenser, base, and insulators. (B) Schematic drawing of current distribution and tuning arrangement for the complete antenna system.

attainable range should be satisfactory. We said two dollars. If the junk box is not too depleted these war days, the cost actually may be reckoned in pennies, not counting that of the "mike," 'phones, and power supply, all of which the average ham has on hand.

Rochester Fall Meeting

THE 1944 IRE Rochester Fall Meeting will be held in the Sheraton Hotel (formerly the Sagmore) in Rochester, N. Y., November 13th and 14th. Registration will be at 8:30 both Monday and Tuesday mornings. Papers and reports scheduled for the technical sessions include: "The Reactance Theorem for a Resonator," "A Resonant Cavity Method of Measuring Dielectric Properties at Ultrahigh Frequencies," "Low Frequency Compensation of Multistage Video Amplifiers," "Standardization of Capacitors for Civilian Equipment," "Designing Thoriated Tungsten Cathodes," "Electronic Tube Trends," "The RCA Laboratories at Princeton," "The Organization of Research in the Radio Industry after the War," and others. The meeting will conclude with a banquet Tuesday evening at which Major General Roger B. Colton will be the guest speaker.

HAPPENINGS OF THE MONTH

POSTWAR ALLOCATIONS

WITH victory looming in Europe, the country's plans for postwar radio allocation have suddenly been thrown into high gear and are now bowling along at a very merry rate. With the announcement by FCC of the beginning of formal hearings on this topic on September 28th, there are now three major agencies in this field before whom such a radio service as ours must make more or less simultaneous representations. It is late August as we write. We summarize below, for the information of amateurs, the situation to date so far as it can be reported:

1) The Department of State's special committee on communications opened the public phase of its work with a two-day meeting in Washington August 11th–12th. Three study committees were set up, with membership open to any interested person or organization, and work began at once. This follows the traditional pattern of United States preparation of our position for international conferences — for that is the objective of the State Department program. Draft proposals of the committee for the revision of the Madrid convention and the Cairo radio regulations, including the restricted IRAC allocation proposal, are the initial basis for the discussions. It has been announced that this work must be completed by December 1st.

2) FCC, with the peacetime job of allocating to the nongovernment radio services, begins a formal public hearing on September 28th which will doubtless go on for many days. It is a full-dress affair. A formal order puts every radio service on notice to come down to Washington and put on a comprehensive display of its needs for frequencies. The pattern is reminiscent of that of the extensive u.h.f. hearings that occurred in 1936. The Commission is to hear the Radio Technical Planning Board and its service-panel chairmen, as well as the interested services and organizations themselves. It is then to be presumed that the Commission's own committee on postwar allocation will arrive at Commission proposals for the civilian services and will take them to the Department of State for reconciliation with the present proposals which have been set up by the Government services.

3) RTPB now finds that it cannot take until December to finish its allocation studies but must be in position to offer testimony at the FCC hearings in late September. Its panels and committees are therefore scheduled to be in frequent meeting throughout September and it is expected now that the allocation study will be completed in time to present it to FCC so that the latter, with what modifications it deems desirable, can undertake its incorporation into the State Department committee's preparation of our international position — again with what further modifications the last-named deems desirable.

Thus it will be seen that the autumn months of this year are to be important and exceedingly busy ones for everyone concerned with allocation matters. ARRL is vigorously participating in the activities of all three of these agencies, with four representatives. The Planning Committee of the ARRL Board of Directors is meeting in Washington in early September to deal with the accelerated situation. The heat is on: the committee meetings in smoke-filled rooms, the mimeographed minutes, the "tea-cupping," now begin in earnest. It is the time for which we have long prepared. There should be more definite news in another month. Meanwhile, we repeat what we said last month: our postwar outlook, as of this writing, is excellent!

PHYSICISTS & ENGINEERS & TECHNICIANS

BELIEVE it or not, ARRL is advised that there is still a pressing need for skilled radio personnel for employment in laboratories devoted to the development of special devices used in the war effort. This work is by no means ceasing; the end is not in sight; in fact, in some departments of this work, the need for men is increasing every month. Opportunities of the most interesting sort exist for highly-skilled and experienced people in practically every category of radio work from laboratory technician to technical directors. The need is especially keen for engineers and physicists, particularly those whose experience qualifies them to take over the direction of a staff working on a project. There is still time for such persons to contribute their efforts to the winning of the war and much interesting and important work remains to be done. Readers who find this opportunity attractive-sounding may obtain further particulars by engaging in confidential correspondence with the president of the League, George W. Bailey, in his official capacity as chief of scientific personnel of the Office of Scientific Research & Development, at 1530 P Street, N. W., Washington 25, D. C.

ANYTHING BUT "CROSS TALK"

KEITH HENNEY, editor of *Electronics*, speaking in his editorial column, "Cross Talk," in his August issue:

"Within the past few months, the Editor of *Electronics* has had his hands full of a high-priority job for one of the armed services. Many men have been hired. It is only fair to state, right now, that the best men on his staff are those who have had amateur experience. This testimony is available anytime, anywhere that it may be useful in keeping the amateur in radio after the war."

AMATEUR WAR RECORDS WANTED

THE time has come, as the saying goes, to stand up and be counted. Are you on record? Our AWSRecord we mean?

For we are trying to assemble, at ARRL Hq., a record of the service by every licensed United States and Canadian amateur who is employing his radio-electrical knowledge toward the winning of the war. Our file will yield, we hope, the statistics and the names to back up our assertion that amateur radio served the nation and that its rights must be continued after the war.

The data we want — on you particularly, but on your associates also, if you have the time — are simple: just clip the convenient form on the bottom of this page, or reproduce its essentials on a post card if you prefer. This gives us dope also for a mention of you in our department of those "In the Services."

ELECTION NOTICE

TO ALL Full Members of the American Radio Relay League residing in the Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern and West Gulf Divisions:

You are hereby notified that, in accordance with the constitution, an election is about to be held in each of the above-mentioned divisions to elect both a member of the ARRL Board of Directors and an alternate thereto for the 1945-1946 term. Your attention is invited to Sec. 1 of Article IV of the constitution, providing for the government of ARRL by a board of directors; Sec. 2 of Article IV, and By-Law 12, defining their eligibility; and By-Laws 13 to 24, providing for the nomination and election of division directors and their alternates. Copy of the Constitution & By-Laws will be mailed any member upon request.

Voting will take place between November 1st and December 20, 1944, on ballots that will be mailed from the headquarters office in the first week of November. The ballots for each election will list, in one column, the names of all eligible candidates nominated for the office of director by Full Members of ARRL residing in that division; and, in another column, all those similarly named for the office of alternate. Each Full Member will indicate his choice for each office.

Nomination is by petition. Nominating petitions are hereby solicited. Ten or more Full Members of the League residing in any one of the above-named divisions may join in nominating any eligible Full Member of the League residing in that division as a candidate for director therefrom, or as a candidate for alternate director therefrom. No person may simultaneously be a candidate for the offices of both director and alternate. Inasmuch as the by-laws provide for the transfer of all the powers of the director to the alternate in the event of the director's death or inability to perform his duties, *it is of as great importance to name a candidate for alternate as it is for director.* The following form for nomination is suggested:

Executive Committee
The American Radio Relay League
West Hartford, Conn.

We, the undersigned Full Members of the ARRL residing in the ..... Division, hereby nominate ....., of ....., as a candidate for DIRECTOR; and we also nominate ...., of ....., as a candidate for ALTERNATE DIRECTOR; from this division for the 1945-1946 term.

(Signatures and addresses)

The signers must be Full Members in good standing. The nominee must be a Full Member and must have been both a member of the League and a licensed radio amateur operator for a continuous term of at least four years immediately preceding receipt by the Secretary of his petition of nomination, except that a lapse of not to exceed ninety days in the renewal of the operator's license and a lapse of not to exceed thirty days in the renewal of membership in the League, at any expiration of either during the four-year period, will not disqualify the candidate; provided that if a candidate's membership has been interrupted by reason of service in the armed forces of the United States, he shall not be deemed to be disqualified so far as concerns continuity of membership if he has, since May 7, 1943, renewed his ARRL membership within ninety days of discharge from the military service. He must be without commercial radio connections: he may not be commercially engaged in the manufacture, selling or renting of radio apparatus normally capable of being used in radio communication or experimentation, nor commercially engaged in the publication of radio literature intended, in whole or part, for consumption by licensed radio amateurs. Further details concerning eligibility are given in By-Law 12. His complete name and address should be stated. The same requirements obtain for alternate as for director. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon EWT of the 20th day of October, 1944. There is no limit to the number of petitions that may be filed on behalf of a given candidate but no member shall append his signature to more than one petition for the office of director and one petition for the office of alternate. To be valid, a petition must have the signatures of at least ten Full Members in good standing; that is to say, ten or more Full Members must join in executing a single document; a candidate is not nominated by one petition bearing six signatures and another bearing four. Petitioners are urged to have an ample number of signatures,

AMATEUR WAR SERVICE RECORD

Name

Present mailing address

Rank or rating

Branch or bureau: Signal Corps, AAF, Buships, WAVES, etc. If civilian industry, give title and company.

Call, present or ex; or grade of op-license only

SERVICE

- ☐ Army
- ☐ Navy
- ☐ Coast Guard
- ☐ Marine Corps
- ☐ Maritime Service
- ☐ Merchant Marine
- ☐ Civil Service
- ☐ Radio industry, 100% war

since nominators are frequently found not to be Full Members in good standing. It is not necessary that a petition name candidates both for director and for alternate but members are urged to interest themselves equally in the two offices.

League members are classified as Full Members and Associate Members. Only those possessing certificates of Full Membership may nominate candidates, or stand as candidates; members holding certificates of Associate Membership are not eligible to either function.

Present directors and alternates for these divisions are as follows: Central Division: director, Goodwin L. Dosland, W9TSN; alternate, Everett H. Gibbs, W8AQ. Hudson Division: director, Robert A. Kirkman, W2DSY; alternate, George Rulffs, jr., W2CJY. New England Division: director, Percy C. Noble, W1BVR; alternate, Clayton C. Gordon, W1HRC. Northwestern Division: director, Karl W. Weingarten, W7BG; alternate, R. Rex Roberts, W7CPY. Roanoke Division: director, Hugh L. Caveness, W4DW; alternate, J. Frank Key, W3ZA. Rocky Mountain Division: director, C. Raymond Stedman, W9CAA; alternate, Willard C. Wright, W9BQO. Southwestern Division: director, John E. Bickel, W6BKY; alternate, Eldridge E. Wyatt, jr., W6ARW. West Gulf Division: director, Wayland M. Groves, W5NW; alternate, Jennings R. Poston, W5AJ.

These elections constitute an important part of the machinery of self-government in ARRL. They provide the constitutional opportunity for members to put the direction of their association in the hands of representatives of their own choosing. Full Members are urged to take the initiative and to file nominating petitions immediately.

For the Board of Directors:

K. B. Warner,
Secretary

August 1, 1944.

★ BOOK REVIEWS ★

Electrical Essentials of Radio, by Morris Slurzberg and William Osterheld. Published by the McGraw-Hill Book Co., Inc., New York. 529 pages, 5¼ x 8¼, illustrated. 1944. Price $4.00.

This book is intended for use by persons having a limited mathematical background and deals with the development of d.c. and a.c. theory and circuits. An explanation of basic theory, leads into a description of batteries followed by a discussion of simple circuits and circuit elements. Another chapter deals with magnetic theory.

This is followed by an explanation of the principles and details of operation of meters. The idea is developed that by the use of shunts and multipliers a meter may be used for more than one application.

The subject of electrical power apparatus calls for a discussion of generators and transformers. Alternations, cycles and frequency are introduced to assist an understanding of their operation.

Inductance is treated generally. Types of inductors, inductive reactance, angle of lag, effect of resistance, mutual and self inductance and coefficient of coupling are among the topics covered. Much space is devoted to the mathematical concepts of inductance. Capacitance is similarly covered.

The subject of alternating current circuits is necessarily extensive. Simple *R*, *L* and *C* circuits lead to the subjects of vector analysis, impedance, phase angle, apparent power, power factor and series and parallel circuits. Resonance and its effect on circuit values introduce such items as *Q*, bandwidth, *L/C* ratio, series and parallel effects and the use of resonant circuits.

A generous number of problems and questions as well as a comprehensive bibliography are to be found at the end of each chapter. Several appendices list information on a variety of subjects.

The book is a beginner's book, perhaps a little heavy in spots for those with limited math. It apparently is a first edition for it contains more than the usual number of errors.

T. A. G.

ARE YOU LICENSED?

When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

Radio Waves and the Ionosphere, by T. W. Bennington. Published by Iliffe & Sons, Ltd., London 81 pages, 4¾ × 7¼. Price 6 shillings.

This book brings to the reader who is making his first acquaintance with the principles of radio communication a summary of the nature and behavior of radio waves and the various conditions governing their propagation in the ionosphere.

The author's style is clear and interesting. The treatment is non-mathematical. No more of a background of scientific knowledge is required of the reader than that which is supplied by a high-school physics course.

Up-to-date information on the structure of the ionosphere is presented, together with an explanation of the methods of ionosphere sounding used to gather this information. The application of such knowledge to a study of the behavior of radio waves at different frequencies is made so clearly as to open the way for an excellent understanding of communications phenomena, which would serve as a helpful background for more detailed study.

The author does not include a discussion of the behavior of waves in the troposphere. His classification of radio waves as "ground waves" and "sky waves," although it follows tradition, fails to make a needed distinction between the ionospheric wave and the tropospheric wave.

The book is recommended as a concise popular treatment of a subject in which many people have a new interest.

— H. M. F.

Communication Circuits, by Lawrence A. Ware and Henry R. Reed. Published by John Wiley and Sons, Inc., New York. 330 pages, 5¼ x 8¼. Second edition, Jan., 1944. Price $3.50.

This book is offered as a textbook for those interested in communication engineering. The basic principles of communication, transmission lines and their associated networks are presented, covering the range from audio through ultrahigh to microwave frequencies.

A working knowledge of calculus and the elements of alternating current theory on the part of the student have been assumed.

The book opens with a chapter on transmission-line parameters. It is shown how the transmission line can be represented as being made up of T or sections and how design formulas can be derived. Conversions of T sections to section and vice versa are explained. General considerations of three- and four-terminal networks are detailed as well as the generalized lattice structure.

Much space is devoted to the basic theorems — Thevenin's, super-position, reciprocity, compensation and the maximum-power transfer theorems.

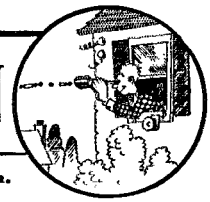
The general transmission line is followed by open and shorted lines. Sending, transfer and input-impedance formulas are derived.

One of the most important topics in communication work is filters. Constant-K, stop and band-pass, high- and low-pass and band-elimination filters. Design equations are given. These involve such factors as cut-off frequency, variation of $Z\delta$ with frequency, attenuation and phase-shift constants. Other items of filter theory include the M-derived and composite filters, the matching properties of half sections, tandem reactive matching networks and reactive T sections as impedance transformers.

The balance of the book is devoted mainly to the transmission of microwaves in wave guides. The elements of field

(*Continued on page 98*)

EXPERIMENTER'S SECTION



Address correspondence and reports to ARRL, West Hartford, Conn.

PROJECT A

Carrier Current

W6KQO and I both are interested in carrier current and have been on about five months now. The transmitter at W6KQO is a 6L6 oscillator and 35T final amplifier running approximately 15 watts input on 175 kc. It is modulated by a pair of 6L6s in Class AB_1. The rig here is a 6L6 oscillator and an 809 final running approximately 15 watts and modulated by p.p. 6L6s, Class AB_1. We both are using the converter described in March, 1942, *QST*.

We would appreciate hearing from anyone in or near Burbank who might be interested in joining us on the power line. W6KQO is located at 700 N. Frederic St., telephone CHarleston 8–2668. The telephone here is CHarleston 8–6102. — *Harry A. Young, 702 N. Naomi St., Burbank, Calif.*

—•••—

I would like to contact anyone on the North Side who is interested in carrier current communication. We have two c.c. rigs constructed and are ready to go. — *Freeman Woodhull, W9YLL, 5001 No. Winchester, Chicago, Ill. Tel. (after 7 P.M.) Ardmore 5735.*

PROJECT B

Light Beams

MATERIAL of interest to experimenters with modulated light beams will be found in an article in the I.R.E. *Proceedings*, October, 1933, pages 1495–6. This article by Profs. G. Wataghim and R. Deglio of the Royal School of Engineering, Torino, Italy, treats various methods of modulation and discusses types of filaments suited for the purpose, and the use of a controlling grid.

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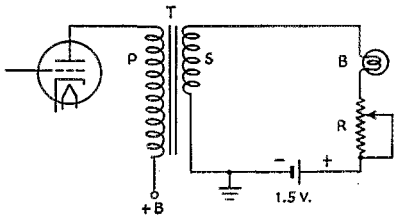


Fig. 1 — Modulating circuit for light beam transmission. The resistor should be 6 ohms or larger.

In practically all of the light-beam transmitters described in *QST*, the audio-frequency current from a low-impedance winding on an output transformer is used to vary the intensity of the light from a flashlight bulb. When no modulation is being impressed upon it, the light from the filament is of low intensity. Under modulation, the added current varies the intensity at audio frequencies.

Tests with several of these transmitters revealed that the audio quality at the receiver end was passable on voice, but downright poor when music was used. As the difficulty seemed to be due to non-linearity in the variation of the intensity of filament brilliance under modulation, an effort was made to overcome this by the method shown in Fig. 1.

In this circuit a single flashlight cell and a low-resistance rheostat are placed in series with the secondary of the output transformer and the flashlight bulb. To adjust the circuit, the rheostat is varied until the filament lights to about half of its normal brilliance as determined visually. Modulation is then applied while the audio gain control is adjusted until only the extreme audio peaks light the filament to full brilliance. Care is needed in this adjustment, as a sudden peak may overload the filament and burn it out.

The result will be an alternate addition and subtraction from the steady d.c. current flowing through the filament, observed as a continual increase and decrease in the intensity of the light with respect to the reference level established by the preliminary adjustment of the rheostat. This is a condition closely analogous to linear modulation of the carrier wave of a radiotelephone transmitter.

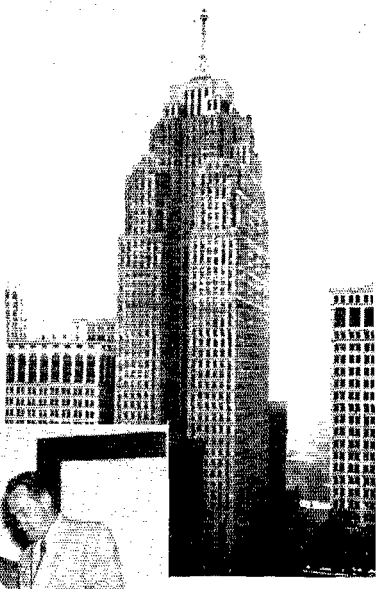
Listening tests showed a marked improvement in audio quality after making these extremely simple changes in the output circuit. Most of the improvement is a result of varying the filament voltage in a more linear mode, but some of the benefit can be attributed to the introduction of the added resistance in the rheostat, which constitutes an appreciable part of the load across the transformer secondary. Distortion produced in the modulator tube is minimized by variation of the load resistance under modulation.

Since the filament cannot vary its light output rapidly enough to follow the higher audio frequencies, the tendency is for low frequencies to predominate in the receiver output. To partially compensate for this it was found worth while to include either low-frequency attenuation or high-frequency boost in the audio amplifier circuit. — *Roger J. Houglum, W7FHB.*

WKAU Proves Its Worth

Detroit Amateurs Score A Round For WERS

FRED A. CHEVILLOT,* W8SWI



WKAU-1 and WKAU-15 are located on the 45th floor of the Penobscot Building in Detroit.

Not so long ago, a very cheerful group of WKAU officials was seen leaving the local OCD office in Detroit. There was a reason for their high spirits, too, and it had nothing to do with bottles. They had just come from a meeting which insured the continuance of WERS activity in Detroit, regardless of what the fate of the local OCD organization might be.

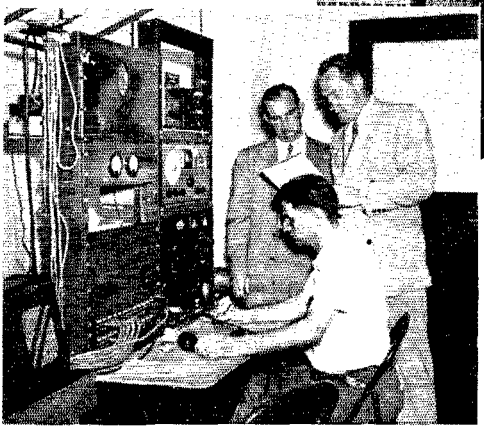
To make the taste of victory even sweeter, WKAU had been heartily endorsed and assured of full coöperation at all times by representatives of the city's chief welfare and relief organizations. These included the telephone company, the water board, the Red Cross, the fire department, the police department and the Michigan State Troops — hearty boosters of all WERS activity. Indeed, this meeting had resulted in a real triumph for WKAU, and for WERS.

Some of you, reading this far, might be of the opinion that the success of WERS in Detroit was due mainly to the coöperative attitude of the city officials. While this may be partly true, it is not the whole story; for WKAU, like so many other WERS units throughout our land, first had to prove its worth before receiving the blessings of the city fathers.

At the time of Pearl Harbor, Detroit was the center of the automobile industry. With the advent of war, however, all her industries were immediately converted to war production. Almost overnight her factories began turning out the planes, tanks, guns and other war implements which were needed so badly by our armed forces.

Naturally, a large war production area such as Detroit needed protection from possible enemy attack and sabotage, so the Detroit Civilian Defense organization sprang into being. It would seem that the founding of this organization would presage the origin of the War Emergency Radio Service in the area, but such was not the case. The city was fortunate in having experts who had witnessed the London "blitz" first hand to organize the CD set-up; but skilled as these experts were, they did not include any form of radio communication in the organization plans. They knew that communication was of vital importance, but relied solely on telephones. They went about dividing the city into thirteen areas, each of which had its own headquarters, linked with the control center by telephone communication.

*Deputy Radio Aide, WKAU, 15105 Tracey Ave., Detroit 27, Mich.



Operation of the control station, WKAU-1, is demonstrated by Nevin Fisk, W8TKL, with Radio Aide Arthur Lyman, W8SPJ, *left*, and OCD Director Frank McLaury, *right*, observing. Mounted on the panel can be seen the HT-7 frequency standard, interpolation oscillator and calibrated Hallicrafters S-27 receiver.

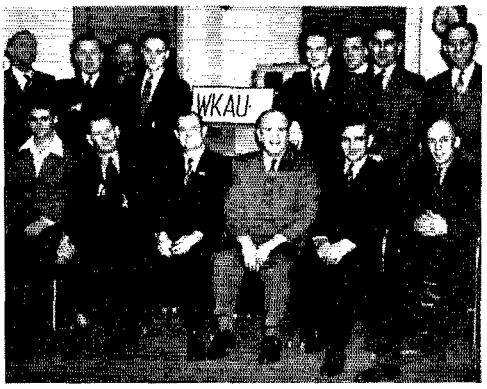
To the amateurs of the city, then, fell the task of approaching the local communications officer to "sell" him the value of having a War Emergency Radio Service network as an adjunct in this well-organized system. Finally, the plan was approved and Arthur Lyman, W8SPJ, was appointed radio aide for Detroit by Mayor Jeffries. Upon his shoulders fell the immediate burden of organizing the local WERS network.

The first problem to receive consideration was the proper location for the control center station. Fortunately, an available spot for the control station was found on the 45th floor of the Penobscot Building in the city, which is 660 feet high.

Then, since the city had been divided into thirteen defense areas, it was decided to place a fixed station at each area headquarters — which were schools, in most instances. Along with this scheme came the necessity for obtaining equipment and enrolling volunteers for radio operators.

Equipment Procurement

W8SPJ knew that once again the amateurs could be depended upon to come through in this emergency, and come through they did. Meetings of all the radio clubs in the area were held immediately, and inventories were made of all the



Deputy radio aides of the WKAU network. *From left to right, front row:* S. Vancea, W8SPO; R. McDonald, W8BXV; Arthur Lyman, W8SPJ, radio aide; Harold Feighner; J. Gareau, W8VAF, and R. Hudson, W8SYX. *Standing:* L. Tayler, W8EWO; R. Baaso, W8TQW; N. Fisk, W8TKL; O. Lane, W8UYG; P. Smith, W8HUD; T. Kirby, W8TDO; D. Scott, W8VNH, and F. Chevillot, W8SWI.

2½-meter equipment owned by the members which could be turned over to the radio aide. Individuals who had such equipment elsewhere in the city were contacted.

Since it was then September, 1942, new parts and tubes were practically impossible to obtain. The amateur radio clubs in Detroit saved the day, however. For instance, the technical committee of the Great Lakes Amateur Radiophone Association had previously purchased parts for the construction of 2½-meter equipment described in the December, 1941, issue of *QST*. This equipment, and that possessed by other radio clubs, was readily turned over for use in the new WERS net.

With this equipment on hand, construction was undertaken of several *QST* horseshoe-type oscillators, modulators and power supplies. When completed, this equipment was checked for frequency stability by Doctor Byerlay of the Peterkin Laboratories. The stability of the oscillators was found to be well within the requirements governing WERS stations, for the frequency shift of each was approximately 54 kc. at 112 Mc., or less than ½ of 1 per cent. That was the green light to go ahead. More equipment was assembled and construction was begun in earnest to equip all the area stations.

The amateurs of the city were quick to respond to the call for WERS operators. Some time was consumed in obtaining operator permits for them, and in training others who were interested in becoming WERS operators. Meetings were held and operators were required to attend air-raid warden instruction classes, to help familiarize them with local damage report procedure.

At this same time W8SPJ appointed the following deputy aides, in charge of one of each of the defense areas: Steve Vancea, W8SPO; Robert McDonald, W8BXV; Olan Lane, W8UYG; Ty Kirby, W8TDO; Rowland Hudson, W8SYX; Fred Chevillot, W8SWI; Harold Feighner; Joe Gareau, W8VAF; Les Tayler, W8EWO; Philip Smith, W8HUD; Ran Baaso, W8TQW, and Marv Maten, W8TWP. The control center was to be manned by Howard Truxell, W8NFF; chief operator Nevin Fisk, W8TKL, and chief engineer De Loss Scott, W8VNH. Each deputy aide was made responsible for the installation and maintenance of equipment and supervision of operators in his area station. In almost every case, operators were assigned to area stations located a convenient distance from their homes, to insure regular attendance at drills.

WKAU Licensed

On January 12, 1943, a WERS license was granted to the City of Detroit, with the call letters WKAU. The first tests were then conducted, and shortly thereafter twice weekly drills were established for equipment testing and damage report message handling. Within a short time, also, WKAU was active in all city alerts, blackouts and simulated incident practices. WKAU was then considered a definite part of the Detroit OCD organization.

At the beginning, WKAU numbered thirteen fixed stations and fifty-five operators. At the present writing, there are fifty-five licensed station units and ninety-two operators. All of the original operators were amateurs, and amateurs still comprise eighty-nine per cent of the operating personnel. The fact that WERS is a valuable wartime communications service, and not a "ham venture," was stressed from the beginning. As a result, amateur practices in WERS operating have never been a problem. Strict operating procedure has been consistently maintained, and adherence to all WERS rules and regulations has been the guiding rule for all WKAU operators.

As WERS operation became more streamlined, it was deemed wise to add mobile units to the net. It was originally planned that all mobile units were to work into their respective area headquarters, and the traffic would then be relayed to the control station. However, by assigning the more powerful mobile units to the more distant

WKAU-14 in operation. *Left to right:* Radio Aide Arthur Lyman, W8SPJ; H. Truxell, W8NFF; Ralph Stone, jr., and D. Scott, W8VNH.

areas, it was found eventually that all units could work directly into the control station.

As the number of stations increased, however, it was found necessary to have two complete transmitters, working simultaneously on different frequencies, at control. The equipment at first consisted of a calibrated S-27 receiver, transmitter, and a Hallicrafters HT-7 crystal standard, checked with a General Radio 620A heterodyne frequency meter and calibrator, used in conjunction with an interpolation oscillator. (This most valuable piece of equipment was obtained through William Scripps of WENA, the *Detroit News* station.) A second receiver was then added, a National One-Ten, and another transmitter constructed. Two coaxial antennas are used on the roof of the building, each of which is fed by a 72-ohm concentric line about one hundred feet long. (Various other types of antennas are used at the area stations, but the three-wire folded doublet is predominant.)

WERS in Detroit today is more active than ever in spite of the general let-down in CD activities in other places. Drills still are held twice weekly, and more new operators are being licensed. As mobiles were added to the net, OCD officials were thoroughly impressed with the many uses of WERS, and considered it more than just a supplemental means of communication in an emergency. Special large-scale bombing incidents were planned; in which all reports were handled exclusively by WERS. In the continued absence, fortunately, of enemy air raids, WKAU has been active in drilling for the purpose of natural disaster emergency communication.

At the present time, many tests and drills are conducted with the Michigan State Troops. WKAU works in the capacity of a liaison agent with the State Troops, maintaining its own individual and independent status. On the State Troops' maneuvers on July 14th, WERS was the sole means of communication when three Detroit areas were patrolled during a simulated fire and resultant disorder emergency. A letter expressing appreciation for the services of WKAU recently was received by radio aide W8SPJ from Brigadier General Thomas Colladay, the commander of the Michigan State Troops. This letter reads, in part:

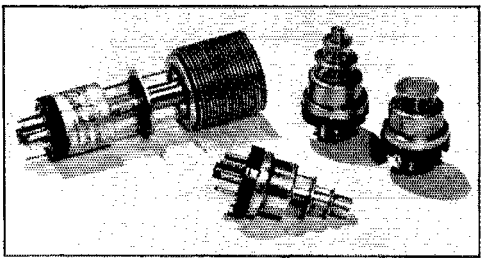
"From reports covering the maneuver, your organization rendered a very worth-while and commendable service to the State Troops. It is apparent that such an organization is a necessity in operations of this kind. It is believed the training of your organization could be coördinated with that of the State Troops so that the same good job could be handled in any emergency. . . . It is hoped that the same mutual relations will be continued between your organization and the 31st Infantry."

Although WERS was not designed for DX communication, it might be of interest to add that a phone call, commenting on a regular Sunday test period, was received from a government monitoring station in New York. Reports also have been received from Toledo, Ohio, a distance of some fifty-five miles, giving some of our units OSA-5 reports. Apparently much is to be said for the station locations and antennas.

(Continued on page 92)

Top: Forrest Wallace, assistant area warden of area No. 6, is shown operating at station WKAU-6. This is one of the fourteen fixed stations which are all uniform in their construction, consisting of interchangeable *QST*-type units. *Bottom:* The transmitter and receiver at station WKAU-3.

S. Vancea, W8SPO, stands by with mobile unit WKAU-35. The mobile units work into their respective area headquarters or directly into control, depending upon their power.



New Tubes

Newly Released Data on G.E. and Eimac Military Types

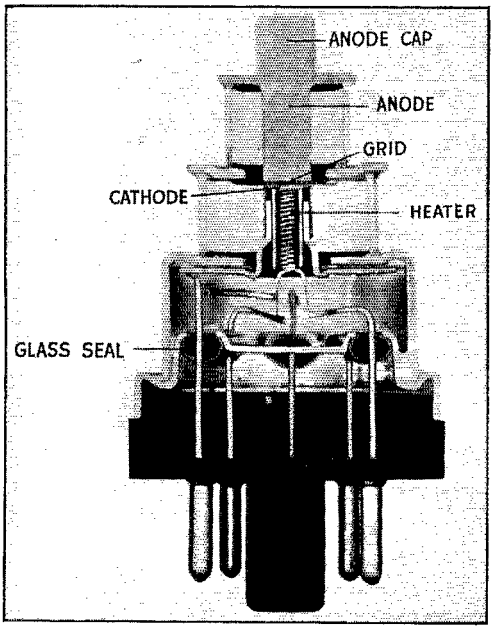
Four G-E megatron, or so-called "lighthouse," tubes which are based on the disk-seal development. The tube at the left is a transmitting tube and the others are receiving tubes.

THE military services have recently approved the release of general descriptions and partial technical characteristics of some of the scores of new types of v.h.f. and u.h.f. tubes which have been developed to fulfill the requirements of military communication — the tubes which have enabled the Allies to outstrip the Axis in the field of military radio.

G.E. Megatrons — the "Lighthouse" Tubes

Among these tubes is the series developed by the General Electric Co., widely known among military radio engineers as "lighthouse" tubes. For the commercial field, these tubes have been assigned the trade name "megatron."

Instead of the plate, grid and cathode being fitted around each other as in the past, these tubes are constructed with the electrodes in parallel planes, as shown in the cross-sectional sketch below. Glass and metal are fused together by a "disk-seal" process in rigid, inseparable units which are strong enough to be capable of withstanding severe jolts. The result is an extremely compact structure in a tube which delivers a high-power output at very high frequencies.

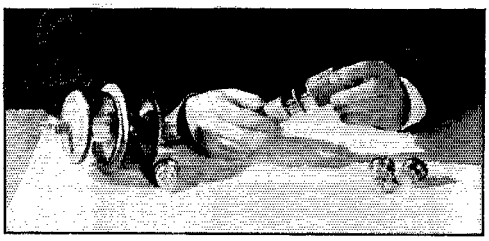


A cross-sectional sketch of the "lighthouse" tube, showing the coplanar arrangement of the electrodes.

The uniform coplanar electrode design permits a very low plate-to-cathode interelectrode capacitance and high permanence of characteristics.

The tubes are manufactured in both receiving and transmitting types, some of which are shown in the photographs. There is a large family of megatrons, each having design features for a specific application, as in the case of earlier series of tubes.

The military services will not at present permit the release of specific characteristics, details of circuits, or the increases in power and frequency



This view illustrates the comparative sizes of the three receiving types and the smaller transmitting tube. A larger transmitting megatron is shown at the left.

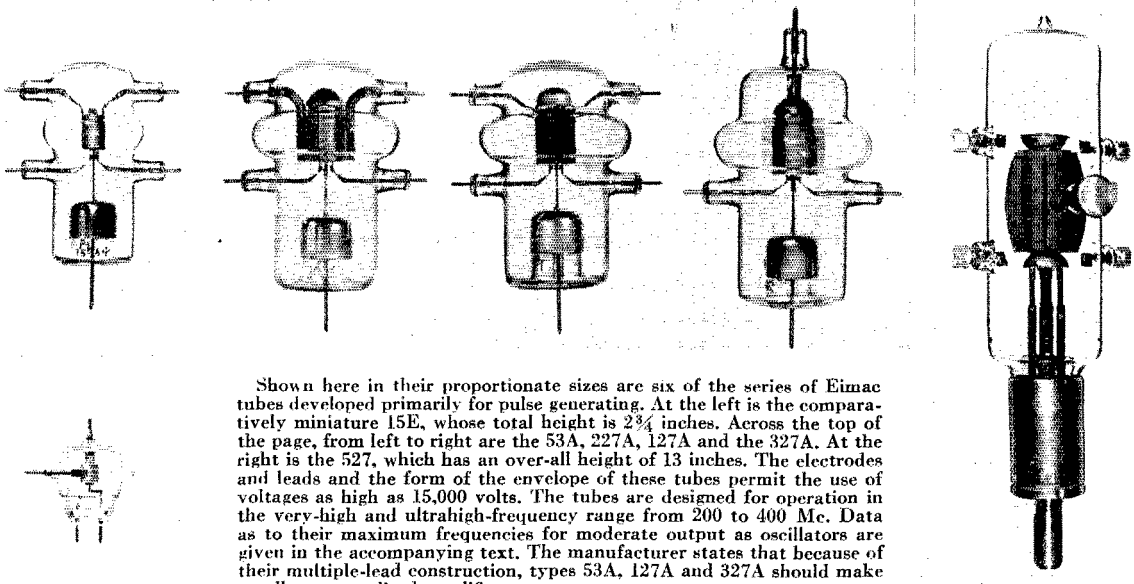
range made possible by the new tubes. It may be said, however, that many very-high and ultra-high frequencies will be opened up for practical use under conditions of power output and freedom from interference which have hitherto been considered possible only on the lower and medium frequencies.

Many services, including f.m. broadcast, television, navigational aids and high-frequency communications will be expanded by the use of the "lighthouse" tube in the postwar era. Efficient relay systems can be developed. It is believed that amateurs will be enabled to extend greatly the use of their present very-high-frequency bands and possible new allocations in the higher ranges of the radio-frequency spectrum.

Eimac "Pulse" Tubes

A series of eight tubes developed primarily for pulse generating by Eimac have recently been removed from a "confidential" classification. Their interest to amateurs lies in the fact that they are designed for operation in the very-high and ultrahigh-frequency range from 200 to 400 Mc.

Six of these tubes are shown in the photograph at the top of the facing page. All are characterized by an arrangement of electrodes and leads,



Shown here in their proportionate sizes are six of the series of Eimac tubes developed primarily for pulse generating. At the left is the comparatively miniature 15E, whose total height is 2¾ inches. Across the top of the page, from left to right are the 53A, 227A, 127A and the 327A. At the right is the 527, which has an over-all height of 13 inches. The electrodes and leads and the form of the envelope of these tubes permit the use of voltages as high as 15,000 volts. The tubes are designed for operation in the very-high and ultrahigh-frequency range from 200 to 400 Mc. Data as to their maximum frequencies for moderate output as oscillators are given in the accompanying text. The manufacturer states that because of their multiple-lead construction, types 53A, 127A and 327A should make excellent neutralized amplifiers.

and form of envelope, which permits the application of high voltages, of the order of 15,000 volts.

Although no data is available on operation of these tubes as Class-C amplifiers, tentative characteristics are suggested for their use as oscillators.

The 15E is a high-μ triode with a filament current of 4.0 amperes at 5.0 volts. In oscillator service it may be expected to deliver 15 watts output at 400 Mc.

Interelectrode capacitances of the 15E are approximately as follows: grid-plate, 1.15 $\mu\mu$fd.; grid-filament, 1.40 $\mu\mu$fd.; plate-filament, 0.30 $\mu\mu$fd. The glass envelope is 2¾ inches in length and 1 9/16 inches in diameter.

Another high-μ triode rated at 50 watts output at 300 Mc. is the 53A, with a 5.0-volt filament drawing 12.5 amperes.

Approximate interelectrode capacitances are: grid-plate, 1.9 $\mu\mu$fd.; grid-filament, 3.6 $\mu\mu$fd.; plate filament, 0.4 $\mu\mu$fd. Maximum over-all dimensions of the 53A are, length, 5 1 1/16 inches, diameter, 2 5/16 inches. Multiple-lead construction suggests that this tube might serve as an excellent neutralized amplifier.

The same general type of construction in the 127A and 327A also indicates their adaptability as amplifiers. Both of these tubes have a maximum plate dissipation of 100 watts. The 327A is designed for grounded-plate operation. In oscillator service the 127A and 327A are rated at 75 watts output at 200 Mc. A tube similar to the 127A, with the addition of plate cooling fins, is the 227A, not included in the photograph. The 327B, not illustrated, is similar to the 327A, but without cooling fins. Filament ratings for the 227A, 327A and 327B are 10.6 amperes at 10.5 volts. The 127A filament is rated at 10.5 amperes, 5.0 volts.

Average interelectrode capacitances have not been announced for the 127A. For the 227A, 327A and 327B they are as follows: grid-plate, 2.25 $\mu\mu$fd.; grid-filament, 3.4 $\mu\mu$fd.; plate-filament, 0.3 $\mu\mu$fd. Over-all dimensions of these tubes are: length, 6 5/8 inches; diameter, 3 1/8 inches.

The 527 is given a maximum plate dissipation rating of 300 watts. Its filament consumes 135 amperes at 5.5 watts. In oscillator service it delivers 250 watts output at 200 Mc. Like the 327A it is designed for grounded-plated operation.

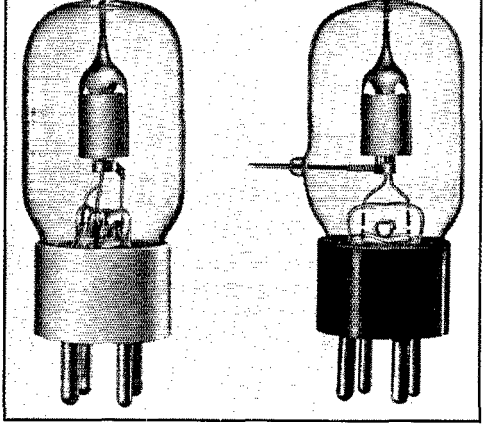
The average direct interelectrode capacitances of the 527 are: grid-plate, 12 $\mu\mu$fd.; grid-filament, 19 $\mu\mu$fd.; plate-filament, 1.4 $\mu\mu$fd. The 527 is 13 inches in length and 2 5/8 inches in diameter.

As to plate voltage, the manufacturer's representative states that there is no ordinary limitation. Any one of this series will take anything which an amateur is likely to have available.

25T and 3C24

Two additional Eimac types are the 25T and the 3C24, medium-μ triodes, rated at 25-watt plate dissipation, and used as modulators, oscillators and amplifiers. The 3C24 will work up to

(*Continued on page 92*)



Two of the new Eimac tube types are, *left*, the 25T and, *right*, the 3C24. Data characteristics have been released on these tubes and are given in the text.

Hams in Combat

The Great Spiderweb

BY PVT. H. D. COLSON* AND S/SGT. ROBERT C. FLEISCHMAN,* W8TOZ

"Captain Crowell skinned up the icy vertical antenna pole to attach the guy wires. His feat was dangerous — the most dangerous of the whole job as a matter of fact — for one slip might mean a broken limb . . ."

IT is an intriguing story — the story of the war-born Army Airways Communications Service. An outfit of rugged young Americans, the majority of whom are radio amateurs, it operates under the Army Air Forces command.

How little is known about the AACS is indicated by a personal survey we conducted one afternoon in Chicago. Out of fifty officers and enlisted men questioned as to what they knew about AACS, forty-two had never heard of it; one of them was a major in the Armored Command.

Although the AACS boys often have operated under Hirohito's nose in the South Pacific and in vainglorious Hitler's Mediterranean backyard, the tale of AACS personnel in action can best be told by narrating the adventures of a typical AACS expedition—the famed Baffin task force, for instance.

The youthful Americans who made up this neoteric pioneering force sailed unexpectedly from New York City one cold October morning — destination unknown!

"We left with sealed orders, of course," Sergeant Leonard L. Barnes, former radioman of Elgin, Ore., was reminiscing. "We didn't know where we were going, but we had a hunch it would be North because of the heavy clothing we were issued.

"On the first day out this peculiar notice was posted on the ship's bulletin board:

NO OFFICER OR ENLISTED MAN WILL BE PERMITTED TO TAKE A BATH UNTIL FURTHER NOTICE.

"Twenty-three days passed; we still hadn't had a bath. But on the 23rd day we were too excited to worry about bathing for we had arrived at our destination — a God-forsaken strip of desolate Arctic wasteland. It was 9:00 A.M. and the sun was beginning to rise, but it was still pretty dark when we started unloading supplies. On the 24th day some of us decided to take a bath even though there was a shortage of H_2O, for it would be another week before our machinery could be set up to melt snow. The water was used sparingly — only two gallons for a bath!

"Melted snow soon was to be used for practically everything — drinking, cooking, washing, bathing and what have you. . . .

"Our dog team driver — pensive, easy-going Private Tony Columbo — was the only one in the outfit of two officers and six enlisted men who had ever been in the Arctic regions before. Tony had made two previous trips with Admiral Byrd and he commanded a lot of respect. He was the 'character' of our little group. He had a long black beard, a pair of piercing black eyes, a furrowed brow, and was the silent type — always a thinker. . . ."

A faraway look came into the sergeant's eyes. "We had the antenna masts up and the station on the air almost before we knew it. Prefabricated parts were used to set up our first building. Gruelling 15-hour work days followed.

*78th AAF Base Unit, AACS S & R Center, Selfridge Field, Mich.

All track of time was forgotten in the rush; we seldom knew when Sunday came. The officers pitched in with us. Captain Crowell, our CO, and Captain Joachim, our medical officer, were gluttons for punishment — I mean the physical and mental punishment of back-breaking toil. Both officers helped us dig ditches, erect buildings, set up latrines, and raise the antenna masts like any buck private on a labor detail. They were there to do an incredible job and the passion with which they did it was an inspiration to us all. The 'Doc' drilled the anchor holes in the rocks for the antenna rigging. His soft hands soon were calloused and his fingers became stiffened from the rough work and the exposure to sub-zero temperatures.

"Captain Crowell skinned up the icy vertical antenna pole to attach the guy wires. His feat was dangerous — the most dangerous of the whole job as a matter of fact — for one slip might mean a broken limb or a permanent body injury. None of us relished the idea of climbing that icy antenna pole. Our CO insisted on doing it.

"Yes, we worked desperately. We had to," the sergeant explained, "because every moment was precious. Thousands of lives very possibly could depend on the vital information our remote little radio station could supply, if conveyed to the proper place at the opportune moment.

"On one midsummer morning, at 3:00 A.M., Private Barrett awakened everybody in the barracks, excitedly hallooing at the top of his lungs. A load of coal had arrived on the supply schooner; it was imperative that we unload it before the tide went out. Sleepily we dragged ourselves out of our bunks to unload thirty thousand pounds of coal, by relays, in 200-pound burlap bags, each of which had to be carried half the length of a football field. That was a morning I'll never forget. We were dead on our feet before we started — we had had only about four hours' sleep the night before — and those 200-pound bags got heavier every minute. Three hours later we were finished, breakfast was waiting, and we were ready to start our regular day's work. Incidentally, Private Barrett ate seventeen hotcakes for breakfast that morning!

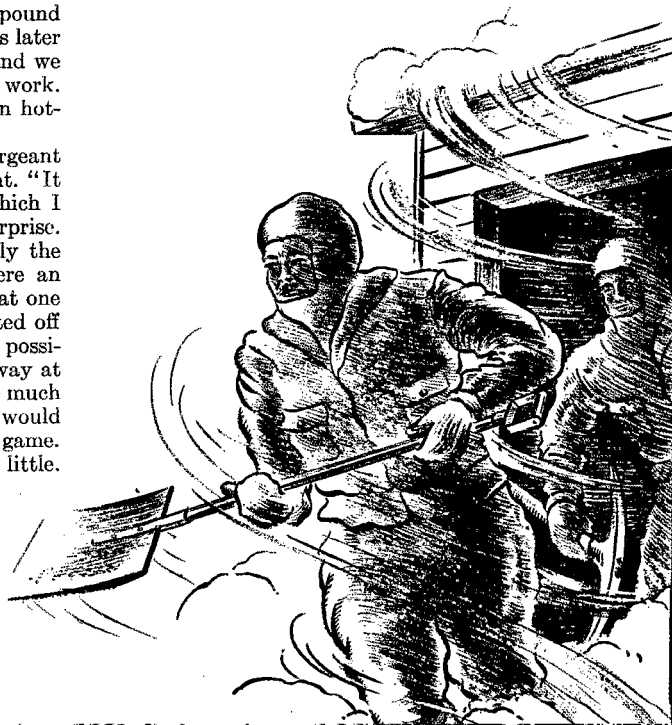
"We had a narrow escape one night," Sergeant Barnes grimaced as he recalled the incident. "It was a howling snowstorm, the likes of which I had never seen. Even Tony was taken by surprise. The wind rose to over 75 m.p.h. Suddenly the building started trembling as if there were an earthquake. Tony casually informed us that one end of the building probably had been lifted off the ground by the wind. Yes, there was a possibility that the building would be blown away at any moment, he nonchalantly told us — much in the same dry matter-of-fact way that he would call a ten-cent bet in a penny-ante poker game. Along toward morning the wind let up a little. We dashed outside, and with picks and shovels dug into the ice and snow, piling great quantities of the stuff against the building, then cabling the barracks down as best we could, to prevent the blow from lifting it off the ground.

"After we had been in Baffin about seven months we had our first mail call. A big Liberator flew over and dropped mail on the back doorstep of the kitchen. I'll always remember that day as one of the happiest of my life. The thrill of anticipation shot through us all; tremblingly we ripped open envelopes, packages and home-town newspapers; a spell of silence swept through the barracks, and there were smiles and tears that we all understood. . . ."

Sergeant Barnes grinned broadly. "Another red-letter day I'll never forget was the arrival of Colonel Storie and Captain — now Lt. Colonel — Allison, W5VV. They were our first visitors from civilization. We didn't attach a helluva lot of significance to the fact that they were the first men ever to land an airplane here. Actually, the only other planes we had seen were a Nazi reconnaissance plane, a PBY, and the B-24 that dropped mail. Anyhow, it was a gala occasion for us. The cook put out the swellest meal of his career and we started a real bull session after chow. Everybody was firing questions and interrupting each other in an attempt to get in on every bit of the conversation. Excitedly we sputtered and pleaded for news from the good old U. S. A.

"In the midst of all the confusion Captain Crowell quieted us with the reminder that there was work to be done. Rubbing his chin thoughtfully, he smiled obliquely and pinned the Colonel with his narrowing gaze; 'Well, Colonel — are you ready to wash the dishes?'

"There was a moment of silence. Captain Crowell's face broke into a dubious smile as



"We dashed outside, and with picks and shovels dug into the ice and snow, piling great quantities of the stuff against the building, then cabling the barracks down as best we could . . ."

he informed the Colonel that it was officer's night to do KP. The Colonel's mouth opened wide in amazement and his face reddened with the realization that Captain Crowell was serious. He eyed the dirty dishes hesitantly, then exploded in a roar of laughter. Everyone in the room broke into hysterics as Colonel Storie flipped a coin with Captain Allison to see who would wash and who would dry. Private Evans, the cook, and the rest of us leaned our chairs back, lit up cigarettes and watched the Colonel and the two Captains clean up the dishes. I'd go through hell for those officers. . . .

"Our CO was the greatest guy I've ever known," Sergeant Barnes continued. "He stripped off his shirt and pants for the GI parties every Friday night and scrubbed the floors — in his shorts — along with the rest of us. After he was promoted to a major he still insisted on scrubbing the floor in his bare feet. . . ."

The AACS man's way of life usually is a far cry from the regular Army routine experienced by most GIs. Often there are no formations, no calisthenics, no chow lines, no reveille or retreat, for the AACS soldier may be on duty or call twenty-four hours a day — week in, week out and month in, month out. He may reside in remote places, alone, from one year to the next, realizing few if any conveniences. He may prepare meals, do his own laundry and, in general, shift for himself in addition to carrying on a multitude of official duties. Little recognition goes with these nerve-wracking jobs. Officers, of necessity, are extremely tolerant with these men for there are many human problems to be considered — loneliness, conflicting emotions, temperament, and ragged nerves. Long confinement often brings the AACS man to tantrums.

"You start talking to the seals after you've been in the Arctic for a few months," reports Staff Sergeant Joseph E. Diehl, of Detroit. "What really makes you mad is — well — the damned seals don't answer!"

"You start talking to the seals after you've been in the Arctic for a few months. . . . What really makes you mad is — well — the damned seals don't answer!"

Scores of AACS stations similar to the Baffin Land establishment now dot the Arctic regions, and the AACS operators literally are "talking" thousands of planes over the skyways that once were considered suicide lanes. Less than two per cent of the ships which have flown these erstwhile North Atlantic suicide lanes, guided by the men of AACS, have failed to reach scheduled destinations — an enviable record for safety in the sky established by Uncle Sam's communications operators. Today there is a shuttle service of thirty giant transports flying on regular schedule over this Great Circle route.

Another remarkable adventure, revealed for the first time by the men of the great North, was one involving four Flying Fortresses. The big ships were ordered for a special flight. Several important Washington diplomatic officials were aboard. Army personnel and much secret material made up the vital cargo. It was a big assignment for the flight officer and he had to utilize every available inch of space on the B-17s. There was no room for ammunition.

The bombers cruised along over the Great Circle route until the Scottish coast was virtually within sight. Suddenly one of the Fortress pilots sighted a formation of some twenty Luftwaffe pursuits — Messerschmitt 109s. These Nazi interceptors — ostensibly ignorant of the fact that the American ships, though armed, were without ammunition — did not seem over-anxious to engage the Fortresses. In desperation the Yankee flight officer made a quick decision; he reversed his course. The Nazis must have caught on for they instantly picked up a hot pursuit. A grim game of hide and seek in the clouds continued for hundreds of miles, with the ME-109s circling, diving, and spitting lead into the Fortress formation. But the enemy efforts were all in vain for the American ships carried a surplus fuel supply — sufficient to carry them far beyond the reach of the ME-109s. Eventually the German pilots were forced to turn back for distant home bases without the satisfaction of having downed a single one of the American ships.

Nevertheless, the B-17s were forced far off their course. Crash landings were made on the Ice Cap in the frigid North Atlantic and much equipment was smashed. Fortunately, no passengers were killed. Emergency transmitting facilities were salvaged and assembled and a frantic SOS went out. It was picked up by a remote AACS station in the Arctic, whose chief ordered a dog team expedition and called for volunteers. Three days of feverish preparation were required before the searching party could set out. The rescuers struggled over a wild trail of dangerous ice-land never before seen by man. Three weeks later the survivors — all of the diplomatic officials, Army personnel and crew members — were picked up and brought back alive — thanks to the men of AACS. The four B-17s are still perched on the Ice Cap.

The indomitable spirit which has keynoted AACS personnel is best exemplified by some of the

(*Continued on page 90*)

Practical Applications of Simple Math

Part VI—Considerations in Push-Pull-Amplifier Design

BY EDWARD M. NOLL,* EX-W3FQJ

THE undistorted output of a push-pull amplifier is more than twice the output of a single stage. On the other hand, it requires more grid excitation and is more critical of bias and proper balance. The push-pull amplifier, as shown in Fig. 1, is driven by two equal but out-of-phase voltages. At the time the signal at the grid of one tube reaches the peak of its positive excursion, the signal at the grid of the second tube is at the peak of its negative excursion. Thus the plate current contributed by the first tube is at its peak value when the plate current of the second tube is at its minimum.

Since the voltage induced across the secondary of the output transformer is proportional to the change in current through the primary winding, the fact that the current is increasing in one half of the primary and decreasing in the other half produces a greater change in magnetic flux than would be the case if the stage were single ended. Therefore there are more lines of force cutting the secondary winding, causing a correspondingly larger induced voltage.

The total resistance, R_t, reflected across the primary of the output transformer is dependent upon the turns ratio of the transformer and has a value

$$R_t = \left(\frac{N_p}{N_s}\right)^2 R_s$$

where $\frac{N_p}{N_s}$ is the turns ratio, N, total primary to secondary so that

$$R_t = N^2 R_s.$$

However, this value of R_t is not the actual load presented to each tube, since the individual plate load is only the resistance reflected across half of the primary winding, or

$$R_l = \left(\frac{N_p}{2N_s}\right)^2 R_s = 0.25\ N^2 R_s$$

By substitution in the previous equation we find that

$$4\ R_l = N^2 R_s = R_t \text{ and } R_l = \frac{R_t}{4},$$

or the actual impedance (resistive in most cases) presented to each tube is one-fourth the plate-to-plate impedance, R_t, of the push-pull amplifier. It is necessary, therefore, to draw the load line on the composite push-pull curves with a slope which is determined by a resistance value one fourth of the plate-to-plate resistance.

*15 Locust Drive, Asbury Park, N. J.

It is evident that if each tube develops the same output as it did operating single-ended the output of both tubes will be exactly double. A further increase in output is obtained by permitting the grid signal to swing the plate current to cut-off, since the distortion normally occurring at low plate-current values and indicated by the curvature of the characteristic curves at these points, is balanced out by the action of the push-pull circuit.

Push-Pull Characteristics

The actual push-pull characteristics are shown in Fig. 2. In reality, they consist of two sets of single-tube curves with the plate-voltage bases back-to-back and the operating plate-voltage ordinates coinciding. Thus the plate voltage on one tube increases to the right of the operating plate voltage while the plate voltage of the second tube decreases, as in push-pull operation. The characteristic curves of a single tube are shown as broken lines while the composite push-pull curves are continuous lines which represent the algebraic sum of the currents drawn by both tubes for various values of bias voltage on each side of the operating bias. Therefore, the characteristic curves for push-pull operation are not fixed as the curves are for a single tube. Instead, a new set of curves is required for each operating condition. The push-pull curves shown in Fig. 2 are for a plate voltage of 300 and a grid bias of −60. The power output of the push-pull stage is found by multiplying the load resistance by the squared sum of the effective currents drawn by both tubes or

$$P = I_t^2 R_l$$

$$P = \left[\frac{(0.200 + 0.200)\ (0.707)}{2}\right]^2 (750)$$

$$= 15 \text{ watts.}$$

The value for I_t, as indicated, is the sum of both peak currents (peak-to-peak), divided by 2 to change it to peak current, and multiplied by 0.707 to change it to effective value. The load resistance presented to each tube is 750 ohms (slope of load line in Fig. 2) and is one-fourth of the indicated plate-to-plate resistance.

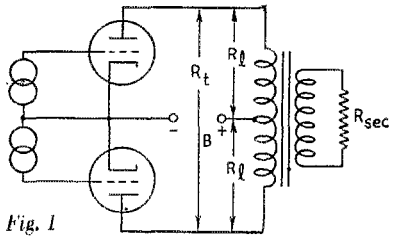


Fig. 1

Composite Curves

Considerable knowledge as to the operation of the push-pull stage can be gained by constructing a few composite curves, as shown in Fig. 3, such as lines *CD*, *KP*, and *HJ*. In the construction of the composite curves the following factors are considered:

1) Operating bias and plate voltage of the 6L6 are, respectively, −14 volts and 250 volts.

2) At the same time tube No. 1 is swinging positive with grid signal, tube No. 2 is swinging negative.

3) When the No. 1 grid is swinging positive its plate current is increasing and its plate voltage decreasing. At the same time, the No. 2 grid is swinging negative, and consequently its plate current is decreasing and plate voltage is increasing.

4) A single set of curves is satisfactory for push-pull calculations, since the second set is identical but inverted. However, in all calculations made, the existence of the second set must be considered.

a) The first composite line to be drawn is *CD*, which is drawn through points *A*, *B* and *G*. This line represents the composite curve for the zero-bias line. The operating plate voltage, 250-, 200-, and 100-volt points were taken and the plate-current values on the zero-bias line recorded respectively as 187, 183 and 170. However, at the same time the instantaneous voltage at the No. 1 grid is at zero, the No. 2 grid is at −28 volts and its plate voltages are respectively 250, 300 and 400 (plate voltage increases on second tube when plate voltage of first decreases). The plate currents for these voltages on the −28-volt bias line are respectively 14, 14 and 15 ma.

b) Since the composite curve represents the currents of both tubes, the currents must be added algebraicly. The last set of readings are negative in sign, since they represent the current of the second tube whose current readings would be below the plate-voltage coördinate (see Fig. 2). Thus the effective composite currents for the zero-bias characteristic are 187 − 14 = 173 (point *G*), 183 − 14 = 169 (point *A*), and 170 − 15 = 155 and are plotted on the proper voltage ordinate.

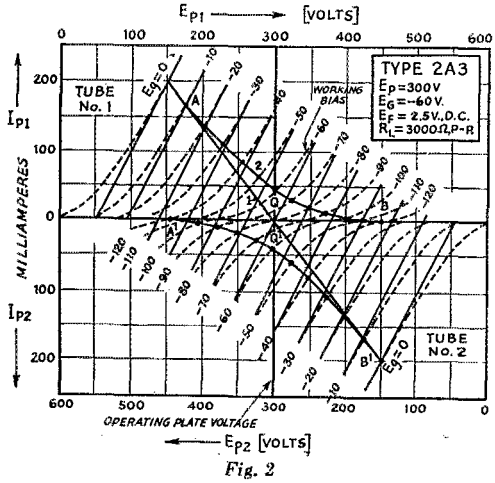


Fig. 2

c) The composite curve, line *CD*, is drawn through these points. Various other points may be plotted for other values of plate voltage and all will fall along a straight line *CD*. Since any two points represent a straight line, two points, such as *A* and *B*, if determined accurately, are sufficient to permit drawing the composite curve. Note that line *CD* terminates below knee in the curve. If the positive swing of the signal is permitted to pass through the knee, distortion will result.

d) This same method is used to locate points *M*, *N* and *P* which permit line *KP* to be drawn representing the −10-volt bias line. A similar process is followed in locating points *E*, *F* and *Z*, which permit line *JH* to be drawn, representing the −14-volt bias line. Observation of line *JH* shows how straight the characteristic becomes at low plate current in comparison with the single-tube characteristics.

e) The same procedure is used to draw composite curves for all the bias lines (see Fig. 2). However, for purposes of clarity, they were omitted from Fig. 2. These composite bias lines are used to determine distortion content and the average plate current of the push-pull stage. In the installment to follow a simpler method of drawing the composite load line and finding the individual load line and average plate current will be presented. However, the logic of the simplified method will be more apparent if this method is understood.

Actual Load Line

The 750-ohm load line of Fig. 2 is linear and represents the push-pull charactersitics of both tubes. However, taking each tube singly, the actual load line is far from linear because of the dependence upon the other tube. When the other tube is at cut-off or near cut-off, the impedance presented to one tube is $\frac{R_L}{4}$. However, as the points where both tubes are conducting are reached, this value drops and the actual impedance presented to a single tube drops away from the composite load line as shown by line *AB* in Fig. 2. The points through which this line is drawn are located on the same voltage ordinates as the points of intersection of the push-pull load line and the composite characteristic curves, but are located at the intersection point of the ordinate with the single-tube characteristic curves (dashed lines). Actually the points represent the plate current contributed by the individual tubes at the same bias and plate-voltage points. Thus point No. *1* represents the plate current of *both* tubes with −50 volts of bias and a plate voltage of 275, while point No. *2* directly above represents the plate current contributed by an individual tube at the same grid bias and plate voltage.

The average plate current drawn by a single tube is found from curve *AB* for one tube and curve *A'B'* for the other. The average plate cur-

rent for both tubes is found by arithmetically adding the currents contributed by both tubes and averaging the sums over the grid cycle.

To demonstrate the action of the load resistor, refer again to Fig. 3. For single-tube operation with −14 volts of bias and a plate voltage of 250, the recommended value of plate load resistance is 2500 ohms. Thus the load line is drawn through the operating point O and corresponds to a load resistance of 2500 ohms. For more detailed information on the construction of load lines the reader is referred to the earlier installments of this series.

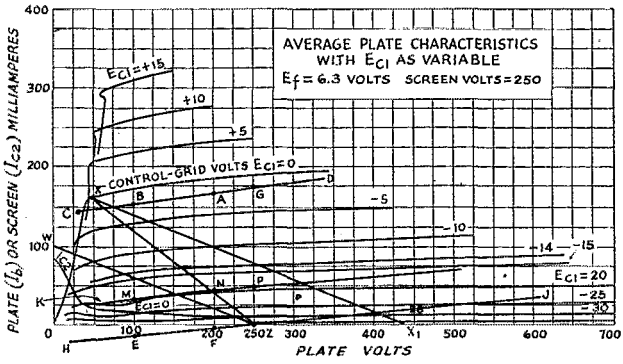


Fig. 3—Characteristic curves for 6L6. The point of origin, O, mentioned in the text is at the intersection of the vertical 250-volt line and the −14-volt bias line.

Power Output

The power output, of course, is equal to the effective current squared times the load resistance, or

$$P_1 = I_t^2 R_l$$

$$= \left[\frac{(0.145)\ (0.707)}{2}\right]^2 (2500) = 6.5 \text{ watts}$$

Now with push-pull operation our operating point drops to the zero plate-current point on the operating plate-voltage ordinate (point *Z*). This is evident when we consider that in push-pull operation with no applied signal, the effective value of the current across the primary of the output transformer is zero, because of cancellation of the d.c. component of current flowing in the primary windings. While at first it appears evident in push-pull operation that if the same load impedance is presented to each tube the output automatically would be doubled, the truth is that the operating point has been shifted to a new point, and consequently the same resistance load line does not set off so great a change in current. Observation of the line *WZ*, which has the same slope as *XX'*, will demonstrate this point. In fact, the output will be almost identical to the output of a single stage, or

$$P = (I_1 + I_2)^2 R_l$$

$$P = \left[\frac{(0.076+0.076)(0.707)}{2}\right]^2 (2500) = 7.25 \text{ watts}$$

($I_1 + I_2$ = currents contributed by both tubes).

True push-pull operation is attained when the impedance reflected to each tube is at least half, or less than half, the impedance for normal single-ended operation. Thus line *XZ* was drawn from the push-pull operating point, *Z*, to the knee of the zero-bias line. The slope of this line is

$$R = \frac{E}{I} = \frac{250 - 50}{0.160 - 0} = \frac{200}{0.160} = 1250$$

Now with exactly double the normal single-tube grid signal, the power output of the push-pull stage becomes

$$P = \left[\frac{(I_1 + I_2)\ (0.707)}{2}\right]^2 R_l$$

$$P = \left[\frac{[(0.160 - 0.014) + (0.160 - 0.014)]\ (0.707)}{2}\right]^2 (1250)$$

P = 12.5 watts, or double the output of a single stage.

If we raise the input signal to more than double the normal signal applied to a single-ended stage the output will be further increased. For example, if the bias is raised to −16 so as to accommodate a 32-volt peak signal, the plate current swings almost to zero, thus increasing the a.c. component of plate current. The new power output becomes

$$P = \left[\frac{(I_1 + I_2)\ (0.707)}{2}\right]^2 R_l$$

$$P = \left[\frac{(0.160 + 0.160)\ (0.707)}{2}\right]^2 (1250)$$

$$= 16 \text{ watts}$$

The next installment will discuss the various modes of operation of push-pull stages and will include some practical design calculations for these different modes.

Strays

Bob Carter of Carter Motor Co., Chicago, whose dynamotors have powered many a rig for prewar field days (and many a WERS outfit since Pearl Harbor), suggests that a new classification and multiplier be assigned to those hams using "self-powered" rigs in postwar contests. The power would be supplied by turning the crank of a new type of generator which furnishes both filament and high voltages for transmitters and receivers. He also suggests that the multiplier be made sufficiently large to compensate for the "muscle power" required to run the generator — which, he says, is considerable.

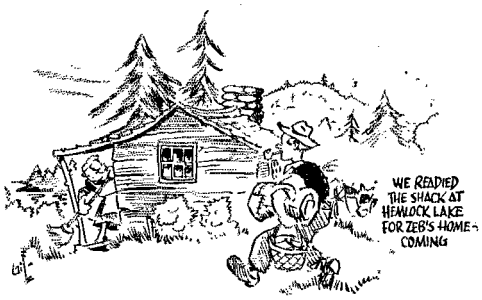
Fishin' and Ham Radio

The Philosopher of Pine Notch Points a Piscatorial Moral

BY "SOURDOUGH"

LAST week we heard young Zeb was comin' home for a few weeks' leave. Soon's th' word got around I got all my fishin' tackle and kinda shined it up and repainted some of the plugs. Sunday we skipped church (Martha said it would be okay just this once) and we took out in the buckboard right after breakfast. One thing about gas rationing — it don't matter when your power unit burns only hay and a few oats.

We had a real nice drive up to the end of the Notch, over through Skunk Hollow and finally out to Hemlock Lake. My shack wa'n't in too bad shape and — bar a little patching up — the canoe was just dandy. Wal, we cleaned the shack out and Martha put away the stores she'd brought along and aired the bunks and put fresh blankets on 'em. We got those chores through



bright and early and decided to lay around awhile before coming back. 'Course, I woulda liked to go fishing a while then, but Martha was real strict — especially since we'd missed church.

Settin' in the sun and chewing my old corncob, I got t' thinking about fishing. In a way, it's a lot like ham radio. The kids around here start off with a bamboo pole, a bit of cutty hunk and a can of worms. Then they graduate to a mail-order rod, a pretty fair reel and maybe a couple of plugs. Some of 'em even get real swell and get to own some flies.

Then along come the city fellers. They got everything — imported rods, waders, books of flies and all the other high-power expensive things the outfitter in the city sold 'em. But does all this riggin' get 'em more fish than the local kids? No siree! Most of 'em are right glad to team up with one of the local boys and get the dope on how the fish meander in these here parts. 'Course, every now and then you get a city feller who is pretty impressed with himself. That don't last long — just about until the time when he meets a local boy trudging home in his bare feet with a string of whoppers strung over his back.

Now in ham radio some fellers blast away with a kilowatt and others perk right along with a couple of 6L6s — and it ain't always the kilowatt that knocks off WAC first.

Likewise, you take a meeting of hams. One OM may be president of the local bank, the next feller the town dentist, and in between 'em is the guy who delivers groceries. You don't get much big shot stuff; they're too busy arguing about crystal vs. e.c.o. or something equally important. Now and then (people being human) you get a blister who thinks *he's* the local Marconi. But ain't you all seen some little Joe quietly take the pompous feller and sit him, figuratively speaking, on top of the filter condensers?

Soon as it got cool we headed back home. I sure liked to drive a car in the old days, but still and all there's something right calm and thankful about a good horse a-steppin' peaceful like down the road.

Zeb turned up right on time and we went right up to Hemlock Lake. He looks some older and kinda tightened up — but he ain't changed much. Right off he wanted to go fishing. Well, farming is serious business and neglecting a farm is as troublemaking as neglecting your missus. But shucks! — when a feller comes back from fifty missions over Germany, farming and everything else can keep on ice for a while. (Besides, we had it all planned that way!)

We had some good fishing, too. But what I want to tell you fellers is what Zeb said when he read that tripe I wrote up there about fishing and hamming. Seems like when Zeb got to "somewhere in the British Isles" he found things was strange. One thing, it rained most all the time. Then he met up with an RAF feller (in a pub, he said it was) who was a G, and in that way he come across quite a few Gs and one or two LAs, SPs and Fs. They all had one thing in common they wanted to talk about, and that was to get back to their hamming. Zeb said it wa'n't till he'd got

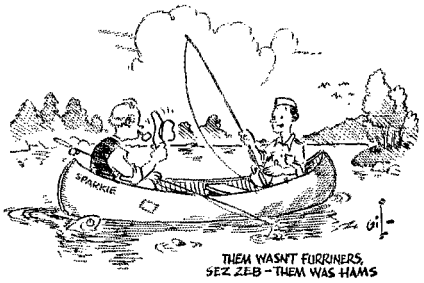
back to his quarters and was going to bed that it dawned on him that these fellers were what we used to call "furriners." Hell, sez Zeb, them wa'n't furriners — them was hams.

A while later the Red Cross put him in touch with a local "Sir" who had what the limeys call

"a bit of fishing." Zeb found out it was quite a bit at that. Small streams of gin clear water with trout in 'em that all had Ph.D.s — which ain't strange, since the monks began fishing them streams with rod and line about six hundred years ago, and people been fishing there ever since.

Zeb says the fishing was different to what he'd been doing but after a while he got the hang of it and caught a couple. After that they went up and met the folks and had tea, and Zeb told the feller all about bass fishing. The "Sir" was right interested and Zeb told him to come try Hemlock Lake after the war and the feller said he sure would try. Going back in the jeep, Zeb said he suddenly realized that this feller was folks and a fisherman, whatever handle he had stuck before his name.

You know, I guess being right up against things in war makes these kids see pretty clear — maybe a lot clearer than we do here at home. Zeb said what he meant was that way down at the bottom both fishing and hamming are activities for the *individual*. Fellers do 'em because they *like* to do 'em; not to be important or to get admired or anything. In both fishing and ham-



ming it's up to you. A little bit more money — or even a helluva lot of money — to spend don't give you much of an edge on the guy who has to take it slow. Unless you really know your stuff, it don't give you no edge at all.

Both hamming and fishing makes friends. If you meet a guy paddling along, you stop and have a chin with him. Why? Because he's fishing and you're fishing and you're interested in his way of doing it and he's interested in yours, and you're both happy and contented doing the same thing as individuals. Same way in ham radio — or even more so. You hear a guy calling from way around and under the globe from you and you bust yourself to hook up with him. Why? Same as fishing — you have a common interest in a highly skilled activity which you're both doing of your own free will and as free men. He needs you to make his contact and you need him, so each of you makes the other guy feel good and there's no reward except friendliness and the feeling that your own skill and patience has paid off in dividends, even though you can't cash 'em at the bank.

Seems to me the solidest friendships are those between fellers who have had to take it together. When the Zebs of this world get back on the air they'll sure have things to talk about we old fogeys are going to miss — but not envy.

★ ★ ★ ★ ★ ★ ★ ★

Gold Stars

S/SGT. FRANK F. LISS, JR., W9VFS, 27, was killed on the Italian front July 1, 1944, in action which saw American troops occupy Siena, 31 miles below Florence. During the engagement, in which, according to his commanding officer, Sgt. Liss had kept radio communications functioning perfectly for his armored regiment, a heavy concentration of enemy artillery fire swept his area and he was killed instantly.

Sgt. Liss began military service in March, 1941. He received basic training at Ft. Knox, Ky., and in May, 1942, went to North Ireland. He participated in the North African invasion and in the Tunisian campaign, taking part in eight major battles in all. Later he saw action on the Anzio beachhead and entered Rome with the American forces.

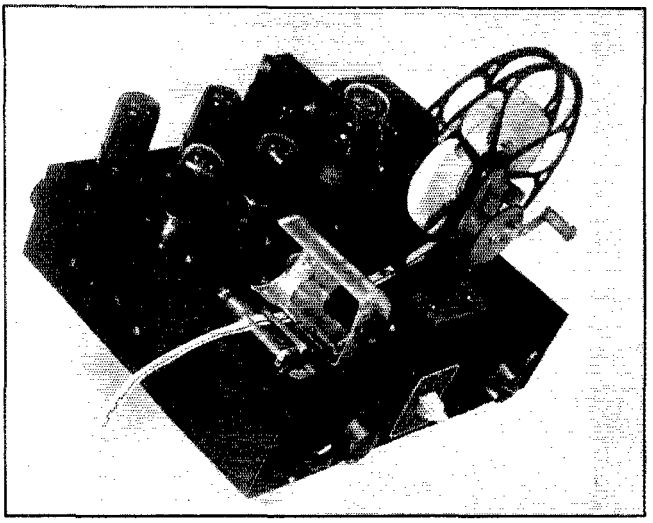
An amateur for the past ten years, W9VFS held a WAC certificate and belonged to the Black Cat Radio Club of Peru, Ill.

S/SGT. WALTER HAUT, W2JNS, was killed in action with all of the other members of his crew in Assam, India, October 29, 1943. For the security of the remainder of the squadron, no further details regarding the accident have been made available.

Sgt. Haut had served in the China-Burma-India sector for eleven months with the "Humpty-Dumpty" fliers of the Troop Carrier Command, flying over the "Hump" to China. Shortly before his death, in a letter to ARRL Hq. he wrote, ". . . I am an aircraft radio operator and mechanic and fly a great deal. I wish I were free to tell you about our equipment and how we operate, and the codes and ciphers we use. . . . I can say that we use a good deal of c.w., most of it about 16 w.p.m., and once in a while up to 20 w.p.m. We use straight keys — no bugs on the ships. . . ."

For his service in the CBI theater, W2JNS was awarded the Distinguished Flying Cross and Air Medal with Oak Leaf Cluster, and the Purple Heart, posthumously.

★ ★ ★ ★ ★ ★ ★ ★



Top view of the electronic keyer, showing tape rewind reel and exciter lamp with hinged cut-away housing. All of the tubes are 6V6GTs except one 5Y3GT (or similar type rectifier), grouped in the background near the power transformer and one of the filter chokes. In the rear, also along the edge of the chassis, is the tone control. Other controls — those for light-beam centering, p.e. tube sensitivity, volume, and keyer tube cut-off bias — all appear from left to right along the front edge of the chassis.

An Electronic Keyer

Making Use of Inked Tape for Code Practice

BY H. L. HASKINS,* W9FWO

More than a year ago, *QST* showed how to pin down those rapid-fire radiotelegraph signals that defy aural copying so that they could be "played back" at lower speeds for code practice.[1] However, a simpler unit was needed for class code-practice work at Northwestern University. Since inked tape could be obtained easily — much more so than the usual perforated kind — it was necessary only to provide a machine which could translate the inked characters into sound. With usual ham ingenuity, the answer was found in the relatively simple outfit described in this article.

Machine work, it will be seen, has been reduced to that involving only a few brackets, nuts, threaded rods, and perhaps a trifle of tap-and-die work. The electrical part of the job is not much more than that required for a typical three-stage resistance-coupled amplifier, plus a simple code oscillator and a power supply. Since the original unit was built in the school shop, it is obvious what a nice project this job would make for student work. More broadly, however, the finished keyer has many other uses than that in the classroom, for which this one was designed. One example is the automatic keying of a transmitter, which is possible with a few modifications of the circuit given here. Therefore, individuals may find plenty of application of this electronic keyer to other purposes. However, lest we wander too far off into the sidelines, let's see what this particular keyer is supposed to do.

*6152 Kenmore Ave., Chicago, Ill.

[1] Gilliam, "A Siphon Tape Recorder for Radio Telegraph Signals," *QST*, April, 1943, p. 18.

Circuit Details

In the unit shown in the photographs, the inked tape is made to control a light-sensitive cell whose amplifier output controls a second amplifier which operates as an electronic switch. This stage is placed between the output of a continuously running oscillator and a third amplifier which feeds a loudspeaker. Thus the audio output from the oscillator to this output amplifier is interrupted in accordance with the characters recorded on the tape.

Apparently then, the most important unit of the circuit in the control of its action is the choice of a suitable photoelectric tube. While any of several of the more common types will do, we chose the type 930 because it was on hand. Having done so, we then had to find an exciter lamp which would give the best light for the color range to which the 930 tube was the most sensitive. An ordinary 15-watt, 110-volt bulb did the trick nicely. Its main color output falls between yellow and infra-red, or in the neighborhood of 8,000 angstrom units — right "on the nose" to match the sensitivity curve of the 930.

When the circuit is put in operation and no light falls on the p.e. cell, very little cell-current flows and therefore the bias on the grid of the first 6V6GT is essentially that set by the voltage drop across the cathode resistor, R_2, which, together with R_5, forms a voltage-divider across the plate-voltage supply. This arrangement holds the bias developed across the cathode resistor relatively constant at a point beyond cut-

Inked tape is not hard to obtain and its use with the keyer described in this article gives a practical solution to classroom and laboratory problems which require such a piece of equipment. The unit shown in the accompanying photographs was made at Northwestern University and used with as many as 128 pairs of headphones, with volume to spare. It was designed to be flexible in operation so that some variations in the circuit constants would not matter. Machine work was reduced to simple hand-tool jobs requiring less than a handful of brass nuts, threaded rods, small pieces of copper or brass and similar odds and ends. In fact, no parts were required which could not be obtained rather easily, even under present restrictions. The fact that the finished keyer may be used for many purposes other than classroom code training makes it both an interesting and a useful project to build.

off so that normally the first 6V6GT does not draw plate current, and, therefore, causes no voltage drop across R_6. However, when light strikes the photoelectric cell, it conducts and current flows through the grid resistor, R_1, in a direction which develops a voltage across R_1 in opposition to the voltage drop across R_2. Thus the bias on the grid of the first tube is decreased sufficiently to permit the tube to draw plate current through the plate resistor, R_6. Since the screen of the second tube receives its voltage through R_6, the screen voltage is reduced when the first tube draws plate current. This reduction in screen voltage is enough to reduce the plate current of the second tube to zero, and the audio-oscillator signal which is being fed to the grid through R_{16} and C_8 is cut off.

When the ink line on the tape blots out the light rays to the cell, normal bias is restored to the first tube, it ceases to draw plate current, which permits the screen voltage of the second tube to increase to the point where the second tube draws plate current, and the audio-oscillator signal is then amplified and passed along to the grid of the output stage and thence to the loud speaker or headphones.

Controls

In order that the above process may be carried out as perfectly as possible, several controls are provided. One of these is the sensitivity control, R_{12}, in the photoelectric-tube circuit. This is an ordinary potentiometer which allows the anode potential on the p.e. tube to be varied. Thereby the amount of potential which this tube will apply to the control grid of the first 6V6GT may be adjusted, within limits, according to the amount of light which is coming through from the exciter lamp.

The audio-oscillator circuit is a Hartley, in which the screen of the 6V6GT serves as the plate,

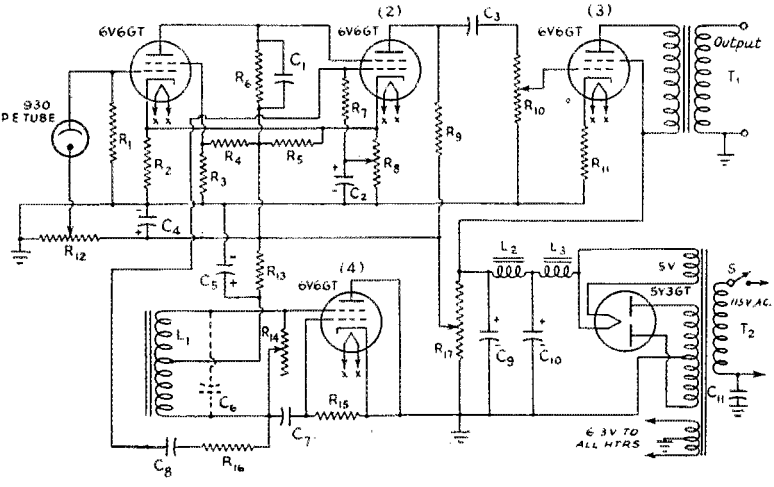


Fig. 1 — Circuit diagram of the electronic keyer.

C_1 — 0.1-μfd., 450-volt paper.
C_2, C_4, C_5, C_9, C_{10} — 8-μfd., 450-volt electrolytic.
C_3 — 0.01-μfd., 450-volt paper.
C_6 — See text.
C_7 — 0.02-μfd., 450-volt paper.
C_8, C_{11} — 0.01-μfd., 150-volt paper.
R_1 — 20 megohms, ½ watt.
R_2 — 150 ohms, 1 watt.
R_3 — 10,000 ohms, 1 watt.
R_4 — 5,000 ohms, 2 watts.
R_5 — 2,000 ohms, 10 watts.
R_6, R_{16} — 50,000 ohms, 1 watt.
R_7, R_9, R_{13} — 5,000 ohms, 1 watt.
R_8 — 100,000-ohm bias potentiometer.
R_{10} — 25,000-ohm volume control.
R_{11} — 200 ohms, 1 watt.
R_{12} — 100,000-ohm potentiometer (sensitivity control).
R_{14} — 1 megohm tone control.
R_{15} — 15,000 ohms, 1 watt.
R_{17} — 5,000 ohms, 50 watts. Power-supply variable bleeder.
L_1 — 250-henry center-tapped audio choke.
L_2, L_3 — 8-henry, 100-ma. filter chokes.
T_1 — Universal audio output transformer.
T_2 — Power transformer, 300 volts each side of c.t. at 100 ma., with rectifier and 6.3-volt filament windings.
Tubes — Rectifier: 5Y3GT, 80, etc. All others: 6V6GT.

the normal plate being connected to cathode to form a triode. Its frequency is adjustable in pitch through manipulation of control R_{14}. If the desired range of tone is not to be had by complete adjustment of this control from minimum to maximum, then a condenser of medium capacity, C_8, may be shunted across the audio choke. However, changing of the shunt resistance of the oscillator circuit through such a control as R_{14} usually is sufficient to give desired results. Since components never behave in exactly the same manner in different pieces of equipment, the acid test is to try out one or both of the above methods.

The variable cathode control, R_8, in the second 6V6GT circuit also is important because it makes possible the proper setting of the bias to work along with the action of the p.e. tube and the first 6V6GT, as described earlier. Clean cutting on and off of all dots and dashes of course is required.

Finally, a useful control is R_{17}, the variable bleeder in the power supply. Excessive plate and screen voltages may cause the dots and dashes to lack cleanness, no matter how the sensitivity and bias controls, R_8 and R_{12}, are adjusted. Some juggling of the plate and screen voltages in addition to the other adjustments therefore will help matters.

The power supply for this rig is nothing out of the ordinary and this makes the going easier for the constructor. It requires two chokes, each with a recommended current rating of 100 ma., and two 8-μfd., 450-volt electrolytic condensers, all for the sake of purity of output, which is a help when headphones are being used.

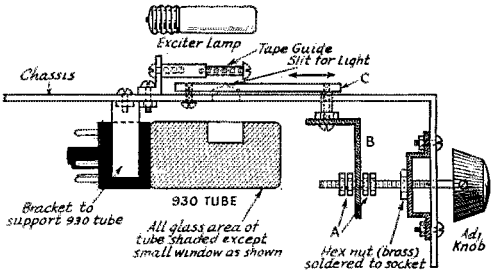


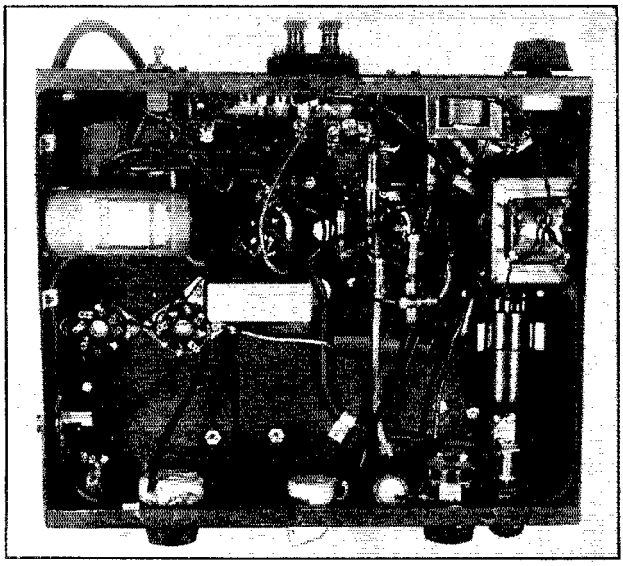
Fig. 2 — Photoelectric tube mounting and adjustable light slit. A — Dual hex nuts soldered to shaft to allow angle bracket "B" to slide freely as the adjustment knob is turned. B — Bracket bent as shown to transfer forward or backward motion of bar, C. C — Sliding bar with light slit drilled in. (See Fig. 3 for details.)

Construction

The whole unit described above is layed out on a chassis measuring 10 × 12 × 3 inches. If the best you can find has a few unwanted holes in it, just go right ahead with the job. Ours was in that shape, but we think the photographs show a fairly good finished product.

On the front-left side of this chassis (top view) is mounted the mechanical unit shown in Fig. 2, the purpose of which is to center the light beam on the photoelectric tube. Here you will need a few small pieces of brass or copper. For the horizontal bar, *C*, we used a piece of brass. Now note that *C* is mounted just above the chassis, while the bar, *B*, which is bound rigidly to *C* is underneath. Then to the right of *B* is the bracket which acts as a bearing-holder for a threaded brass rod that runs from the knob on through the hexagonal nuts at the lower end of *B*. These sketches make it plain that we will have to cut into the chassis in a few spots. Have a look at Fig. 4 and you will see what kind of a cut must be made right under *C*. The long slots act as guides for the machine screws at each end of *C*, and the hole in the center allows light from the exciter lamp to pass through to the photoelectric tube for any position in which the bar, *C*, may be left after adjustment.

While we're on the subject, let's see about the design of the bar, *C*, shown in Fig. 3. The holes at the ends are for the machine screws which guide the bar in the slots described above. For smooth operation, thread these holes and slip a cylindrical collar over each machine screw. The large hole is not a hole through the bar. It is a 3/8-inch countersink drilled about three-fourths of the way through the metal with a 1/16-inch hole through its center which admits light from the exciter lamp. Finally, the lengthwise edges of the bar are rounded off because the tape is going to slide over it during operation.



Bottom view of the electronic keyer. The larger parts mounted along the right-hand side of the chassis from top to bottom are, respectively, the tone control and iron-core audio oscillator choke, universal output transfomer, partially "blacked-out" photoelectric tube, and adjustable brass bar for centering a light beam on the plate of the p.e. tube. The other necessary control knobs are shown along the lower edge of the chassis. All power-supply parts are mounted away from the p.e. tube, over near the upper left-hand corner.

This brings up the tape guide and its construction. Again, the threads of the machine screw which is shown in a horizontal position, should be covered with a cylindrical brass or copper sleeve. This screw and sleeve also should be longer than the width of the tape so that there will be no binding of the tape as it passes over. Now look at the top-view photograph and see that one more such tape guide is required over to the right of the one we are discussing. By this arrangement, the tape is held down close to the bar, *C*, and the inked lines will fall where they should be — directly over the small light-hole in *C*.

Exact dimensions of a few of the parts shown in Fig. 2 are not given but are left to the judgment of the builder. An example of this is the bracket, *B*. This may be long or short according to the depth of the particular chassis which is available. However, the sketch gives proportionate dimensions from which estimates may be made.

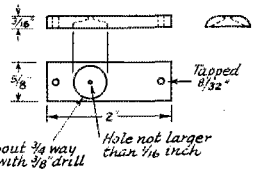


Fig. 3 — Details of sliding bar with light slit.

Operation

If you have ever threaded a movie projector, you will find the job of threading tape through this machine to be even simpler. Here, there are no cogs to line up. Simply slip the end of the tape under the tape guides and over the rounded bar, *C*. Then thread it into a tape puller at the left. Don't worry about the position of the inked lines on the bar, *C*. They can be lined up with a twist of one of the knobs on the front of the chassis.

A little testing of the unit before it is fired up wouldn't hurt. The first objective, of course, is to get a tone out of the oscillator, after which we can make it perform as a keyer. Since the oscillator is designed to run continuously, it will feed a signal into the keyer tube which will come right on through the final 6V6GT amplifier, unless it is held back somewhere along the way. By the design of the circuit, this signal would be held back only through the blocking of the keyer tube, as previously explained. Since we now are interested only in testing the output of the oscillator, if the photoelectric circuit is made inoperative for the time being, simply by not turning on the exciter lamp, then the keyer tube will conduct just as if a line on the tape had passed over the light hole on the bar, *C*. By this method, then, we can get a tone through from the oscillator, as an initial test, if one is going to come through at all. If none is heard, then a small variation in plate voltage, through adjustment of control R_{17} (Fig. 1) may bring the circuit to life. If, however, it still will not "perk", here is the chance to experiment with values of C_6 across the audio choke. Always give the tone control a chance to save the day by varying it slowly over its full range each time a new adjustment is made. If the circuit still refuses to work, try a different 6V6GT before more drastic trouble-shooting measures are undertaken. Sometimes a new tube does wonders, especially in oscillator circuits.

Next, fire up the exciter lamp and run a blank portion of tape under it. Does the tone still come through? It shouldn't, if it does. The light coming through the translucent tape, as previously explained, should cause the keyer tube to be blocked. However, it may be that the bias control, R_8, was set for a low value of bias so that the second tube (keyer) was conducting when you turned on the exciter lamp — so much so, in fact, that the control voltage from R_2 had little or no effect on the output. Try various positions of the R_8 knob, each time turning the exciter lamp on and off. A point should be found where the tone can be cut off completely when the exciter lamp is turned on. If no such adjustment can be found on R_8, then take the best of the lot and start in on the sensitivity control, R_{12}. Maybe this was the trouble all the time, but it doesn't hurt to have the keyer circuit pretty well trimmed up anyhow before the sensitivity control is properly set. Just go through the same adjustment process here as with R_8, except of course that R_8 is left alone this time. A point should be found on R_{12} whereby the tone cuts off completely when the exciter lamp is turned on. If no such spot can be found, your p.e. tube may be dead or the 6V6GT to which it is hooked may be "flat." However, make some point-to-point tests for plate and screen voltages, continuity, etc., before throwing away a tube. Again, it may be just a simple error in wiring that is causing all the grief. Granting that trouble is eliminated, if there is any, then a little juggling of R_8 and R_{12} will permit thumpless output when the tape is run through. So start the tape puller and see whether the keying is clean. It likely will

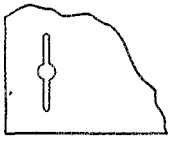


Fig. 4 — Slotted guide in the chassis for the bar, *C*, shown in Fig. 2. The hole in the center should fall directly over the window opening in the 930 tube.

happen that the bar, *C*, has not been set perfectly at the start, so as the tape runs through, vary the knob of the bar, *C*, until it is evident that the dot and dash lines on the tape are falling directly where they should be — right over the light-hole. Once all of the above routine is completed — and it really is a simple job once you get the hang of it — the only other job is to select the right tone and desired volume level.

This keyer unit has fed as many as 128 pairs of headphones with the volume control only half open. This is why we say it is a nifty little rig for

(Continued on page 88)

WHEN the "copy" for the October, 1919, issue of *QST* was being written, the senseless ban on amateur transmitting was still in force and the editorial pages rumbled with indignation as the editor, the directors of the League, and amateurs generally got madder and madder by the minute. Investigation disclosed that the delay in opening was not a matter of Navy Department policy but was somehow attributable to the personal idiosyncrasies of Secretary of the Navy Josephus Daniels. "Daniels Only Knows!," the editor wailed, as the League urged all its members to pick up pen and demand action.

But just as the issue was ready to be mailed the grand and glorious news came — all restrictions on amateur radio operating were lifted, effective October 1st! It is not until the following issue that the editor can tell what then happened: "After throwing everything within reach at the office boy, and finishing off by jamming the wastebasket down over his head, we grabbed the telephone and told the printer for the love of Mike to make room for an emergency sheet to go into every *QST*, and that we would pound something out immediately and be over in ten minutes." So there was a one-page supplement to October *QST*, on pink paper, the famous little page of glad tidings that quoted the Navy order and was headed "Ban Off! The Job is Done, and the ARRL did it. Coming: The Greatest Boom in Amateur Radio History! We're Off!"

For it *was* the ARRL that did the job. Fed up with inexcusable delay, and with the Canadians back on the air months ago, our Board of Direction sent a committee down to Washington and got a resolution introduced into Congress requesting the Secretary of the Navy to furnish the reasons why the restrictions had not been removed. The bill was referred to the House Committee on the Merchant Marine & Fisheries which, at its hearings, let it be visible that it strongly favored our early restoration. As time went by without any action from Mr. Daniels, the chairman of the committee, the Honorable William S. Greene, whom *QST* calls "loyal protector of amateur rights and confounder of all government-ownership programs," got about as mad as we were and introduced in Congress a document which will ever have a place in amateur history:

"Joint Resolution, to direct the Secretary of the Navy to remove the restrictions on the use and operation of amateur radio stations throughout the United States. Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, that the Secretary of the Navy be, and he is hereby, directed to remove the restrictions now existing on the use and operation of amateur radio stations throughout the United States."

There was only one answer — the lid went off. And so here we are, free again, just as this issue is mailed to carry the good word to amateurs everywhere.

The amateur uses vacuum tubes for detector and amplifier. There is a description of the new Connecticut tube, an invention of H. P. Donle; it looks like a medicine dropper, has the filament and grid in the vacuum but the anode is electroplated on the outside of the glass — to get around certain patents — and plate current flows by electrolytic conduction through the heated glass. Transmitter technique, however, is all spark. Guy E. Wilson has an article on "Efficient Transmitters," relating largely to rotary-gap technique as developed in Kansas City. The editor's speculative article on nonsynchronous rotaries in the previous issue excites The Old Man to produce a piece called "Not So Rotten," but much more pertinent comments are made by Edmond Bruce, of Washington, in the correspondence columns. The Amrad quenched gap, the only one ever to appear on the amateur market, makes its bow in an advertisement in this issue; the price is $17.50. An editorial wonders whether there are not some amateurs who can contribute some useful information on the application to amateur radio of Impulse Excitation. Sumner B. Young, in a letter to the editor, states that it is short-sighted of all amateurs to try to work on the same wavelength, and proposes that there would be interesting possibilities if our transmitters were built so that we could work on a variety of wavelengths such as 100, 150, and 200 meters. The lead article is a symposium on "Building Your Own C.W. Apparatus," but it refers only to long-wave listening. K. B. Warner describes the eighty-foot mast which once graced 9JT in Cairo, Ill. Supplementing its famous transformers, Thordarson has brought out a complete line of components for the spark transmitter, promoted by Fred Schnell, including a rotary gap, an oscillation transformer and an oil-immersed condenser. So help us, the condenser has sheet brass electrodes separated by sheet bakelite dielectrics!

Well, the restrictions are off. Now to really get going!

Strays

"Some fellows overseas read the few copies of *QST* they get just as they would a 'sugar report' from home." — *Pvt. G. R. Flournoy*

STRAYS

Chief Radioman George Ray Tweed, USN, whose story of 31 months spent eluding the Japanese in the mountains of Guam has appeared in newspapers throughout the country and in *Life* for August 21st, is none other than KB6GJX. He was on the air almost daily from Guam until Naval authorities closed the ham stations on that island due to subversive activity of the Japs.

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The Radio and Radar Division of WPB on August 28th revoked limitation orders L-76 and L-293. Officials stated that there is no longer any need for L-76, which was issued to stop production of several hundred types of tubes, since the production and distribution of tubes are now being scheduled under order M-293. The revocation of L-293, which was issued to control radio receiver replacement parts and which was designed to secure maximum usage of critical materials, will now allow more efficient use of existing production facilities.

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We hear that W2JA and W2RB claim to be the only hams with two-letter calls in the second call area who operated under their existing calls before World War I and who are still in the game under their original calls. Does anyone challenge that claim?

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The "quietest room in the world" has been built for checking the performance of sound and radio equipment. In this room one can hear his voice as it really is without distortion from reflection or other sounds. The silence is so profound that the small sounds produced within one's own ears by the living processes may be heard. — *Ohmite News.*

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A patent has been granted to George Keinath of Larchmont, N. Y., for a quick and economical method of making jewel bearings out of fused quartz for scientific instruments and fine machinery. In addition to having the necessary degree of hardness, fused quartz provides a considerable advantage over other jewel-bearing materials in that it has an extremely low rate of expansion when heated.

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Ultra-short radio waves are being used for sterilization of vaccines and other medicinal materials packaged in ampoules made of plastics, which would be ruined by the customary heat treatment given glass containers. In this method, invented by Rex E. Moule, the ampoules are placed between terminals transmitting intense radio beams of the order of 50,000 c.p.s.

WILL SWAP — One pair homing pigeons for one 1A7GT, 1H5GT or 12SA7 or any 12-volt series tube. You pay special low express charges on birds. Chas. L. Culley, Melville, La. — *The Cornell Dubilier Capacitor.*

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Home-built amateur transmitters are of no use to the services for obvious reasons, but they are perfect as a source of r.f. for induction heating of transformer cans so that a good soldering job can be done on terminals and end plates. Our transmitters are now in service at Electronic Components Co., doing this job well.

— *W6GZS and W6FKZ*

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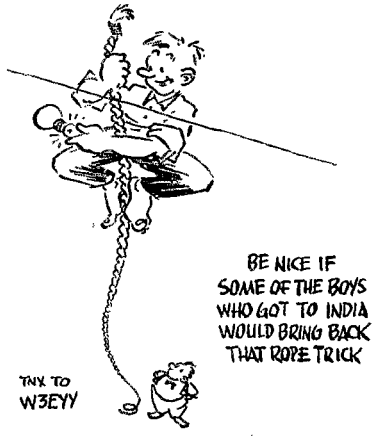
Tungsten, even at red heat, is almost as hard as diamond. Although essential in filaments, cathodes and anodes and in glass-to-metal seals, its chief use is in the making of tools for cutting other hard metals, and a large amount also is used in armor-piercing bullets and shells, armor plate, gun breeches and liners in heavy ordnance. Iron, chromium, copper, nickel and platinum melt at well below 2000° C. The heavier and rarer metals, such as iridium, molybenum, osmium, ruthenium and tantalum, melt at less than 3000° C. Tungsten, however, which itself is rare, requires 3382° C. for melting. Special processes are required to refine tungsten as, in contrast to other metals, it cannot be melted down and poured into desired sizes and shapes.



Although the current production of battery cells runs close to a hundred million a month, this rate must be increased another 40 per cent, according to Signal Corps officers. The 1½-volt cells have been reduced in size to be used in such equipment as handie-talkies until some are little larger than the cap of a fountain pen. Such small cells are short-lived, causing the demand for them to be virtually insatiable.

"Q"-MATCHING TRANSFORMER FOR 112-MC. ANTENNA

THE matching of a transmission line to a v.h.f. antenna requires a good bit of experimenting which becomes tedious when the antenna must be lowered and raised many times. At the WKNQ-2 installation of the Middletown, Conn., WERS net an extended double Zepp antenna is used, with a 150-foot transmission line matched to its center by an adaptation of the Johnson "Q" method.

The antenna is constructed of ¾-inch electrical conduit cut to resonate at approximately 112 Mc. The transmission line is made up of No. 14 copper wire, spaced 4 inches. Its impedance is roughly 575 ohms. The "Q" bars are 25-inch lengths of ¾-inch electrical conduit, spaced 2¾ inches. They were designed for the 112-Mc. frequency, and on the assumption that the impedance at the center of the extended double Zepp antenna is approximately 100 ohms.

The resulting match appears to be entirely satisfactory, as indicated by reports of increased signal strength at distances of 25–40 miles. As the transmission line is attached at the open end of the matching transformer, opposite the antenna, no adjustments are required, as with ordinary matching stubs, after the antenna is in position. — *Philip S. Rand, W1DBM, Radio Aide, WKNQ.*

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CHECK FOR RATINGS OF FIXED CONDENSERS

CONSTRUCTION of a group of classroom demonstrators required a number of fixed mica condensers in the band-change circuits with a tolerance of plus or minus 5 $\mu\mu$fd. These had to be drawn from a stock rated at 250 $\mu\mu$fd., but actually varying from 200 to 300 $\mu\mu$fd. A method was devised to calibrate this lot, using the transmitting equipment on which we were working.

An m.o.p.a. transmitter was set up as shown in Fig. 1 and tuned to resonance. The master-oscillator tuning condenser was shunted with one of the 250-$\mu\mu$fd. condensers chosen at random from the lot. Leads from the tank condenser of the power amplifier were brought out to a small terminal strip across which the "unknown" condensers were shunted, one by one.

The amplifier tank condenser was a variable 100-$\mu\mu$fd. condenser with a dial reading from 1 to 10. The oscillator dial was never moved from its original setting. With one of the condensers to be tested connected across the terminal strip, the amplifier was tuned to resonance with the oscillator. The amplifier tuning dial reading was noted and the fixed condenser was placed in one of eleven sorting boxes which had been labelled from 0 to 10-plus, to correspond with the dial readings.

If too many of the condensers fell below 0 or above 10, it was obvious that the random condenser used to shunt the oscillator circuit was too high or too low in capacity, and another was substituted from the appropriate range of those already tested. The entire lot was then rechecked and sorted anew. In the working set-up the proper value for the oscillator shunting condenser was soon determined, and several hundred condensers were then very quickly checked.

If greater accuracy should be desired, a smaller variable condenser may be used in the amplifier tank circuit to obtain a larger angular variation with a small change in capacity. — *Sgt. P. O. Burk, AAFTTC, Sioux Falls, S. D.*

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CALIBRATION FOR CRL DIAL OF IMPEDANCE BRIDGE

WHEN constructing the impedance bridge described by Athan Cosmas in the July issue of *QST*, I was confronted with the problem of calibrating the CRL dial (R_9R_{10} combination). Others who have no resistance bridge may find my method of calibration worth while as applied to any variable resistance.

The procedure is based upon the Ohm's Law principle that current in a circuit is the quotient of the voltage divided by the resistance. Thus, in

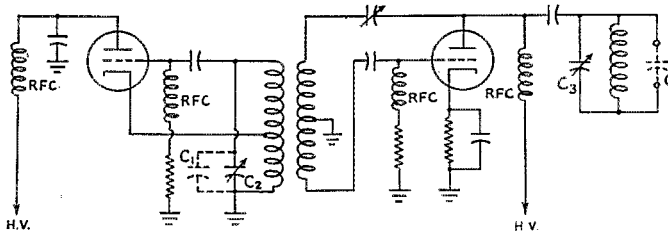


Fig. 1 — Diagram showing use of an m.o.p.a. transmitter in calibrating fixed condensers.
C_1 — Fixed standard.
C_2 — Tank condenser, master oscillator.
C_3 — Tank condenser, power amplifier.
C_4 — Condenser under test.

Fig. 2, if the variable resistor is shorted the current will be one ampere (10 volts divided by 10 ohms). If the current drops to 0.5 ampere when the variable resistor is connected in the circuit, the total resistance has been doubled (10 volts divided by 0.5 ampere equals 20 ohms). Thus the added resistance was the difference between the total resistance and the fixed resistance, or 10 ohms. If the current drop was to 0.25 amperes, the total resistance has been increased to 40 ohms, and the resistance added by the variable resistor was 30 ohms, and so on.

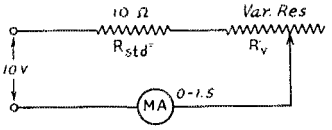


Fig. 2 — Diagram of the circuit used in calibrating a variable resistance.

In the problem of calibration before us, however, it becomes necessary to find the current that will correspond to a desired resistance in the variable resistor. This can be found by the following formula derived from Ohm's Law:

$$I = \frac{E}{R_{std} + R_v}$$

The accuracy of the calibration will of course depend upon the accuracy of the meter used as well as the accuracy of the standard resistor. The ratio between the standard resistor and the resistance in the variable resistor should not be greater than 5, for best results. — *Bernard Julien, 109 Jacques-Cartier, Donnacona, P. Q., Canada.*

INSULATED HOLDER FOR SMALL CARTRIDGE-TYPE FUSES

IN SERVICING radio sets one will occasionally blow a fuse. Here at the hospital this involves most undesirable consequences.

I desired to install a local fuse that would be

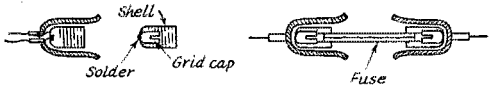
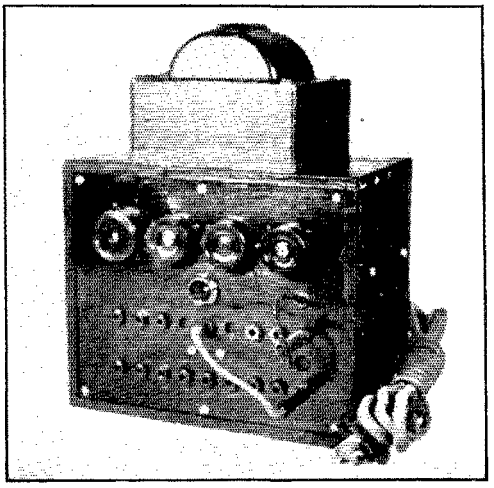


Fig. 3 — Miniature lamp sockets used as an insulated fuse holder.

inconspicuous. The small cartridge fuses available were undesirable because of their lack of insulation. A couple of Christmas-tree miniature bulb sockets were adapted to make an insulated fuse holder as shown in Fig. 3.

The brass shell in each socket was pushed out with long-nosed pliers, and its center contact was punched out. In place of the center contact a small grid cap connector was soldered, making a clip of the proper diameter to receive a small cartridge fuse. The shells were replaced in their original sockets, the result being an insulated fuse holder which reveals about a half-inch of the middle of the fuse barrel.

If insulation is not required, two grid caps alone make a useful holder. — *Harold Ramsey, Bethesda Hospital, Zanesville, Ohio.*



An autotransformer with outlet panel for four voltages and patch-cord connections.

AUTOTRANSFORMER FOR POWER CONTROL

WE ALL know that we should reduce power for local QSOs, not only because FCC regulations require it, but also as a courtesy to our fellow amateurs.

Reduction in power output should be accomplished without lowering the efficiency of the rig and without retuning, detuning, etc. The well-known, but little-used autotransformer, or variac, shown in Fig. 4 serves as a dandy gadget for this and has many other uses around the shack, such as filament voltage control and soldering-iron heat control. Its use provides a reduction of power during the tuning-up process, and may save a tube.

Don't become alarmed over the difficulty of winding a transformer. It is a simple job even without a coilwinder, as the wire is comparatively large and the number of turns relatively few.

Most junk boxes will provide a burned-out transformer having a suitable core. Usually the insulation next to the core will be found to be in good shape and can be used again if carefully removed. A wood core of the same size as the transformer core should be placed inside the core insulation during winding to serve as a handle and to retain the shape of the winding.

(*Continued on page 90*)

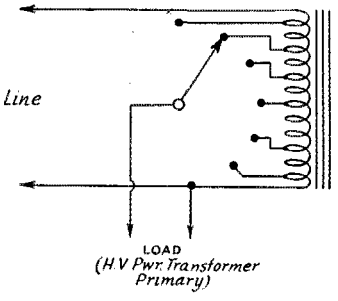


Fig. 4 — Circuit diagram of the autotransformer.

CORRESPONDENCE FROM MEMBERS

The Publishers of *QST* assume no responsibility for statements made herein by correspondents.

A TRIBUTE

APO 565, c/o Postmaster, San Francisco, Calif.
Editor, *QST:*

Just received the April issue of *QST* . . . and note that, according to the editorial, some officers in the Navy are of the opinion that some amateurs are not measuring up. . . .

I have been serving with the Army Air Force since early 1942, and have been working with every type of communications equipment imaginable from that time to this. In addition, I have worked with every type of communications personnel — from the GI radio school graduate to former radio servicemen; from hams to radio engineers. The ham, not only in my opinion but in the opinion of unbiased communications officers, is outstanding in this field, both from the operating and maintenance standpoints.

My outfit is a radio unit and various types of equipment are employed. My chief operator is a ham. My chief radio repairman is a ham. At present I have a ham in OCS who is the best Army radio operator-mechanic I have ever met. Upon graduation he will become my communications officer. I think I then will have the best communications set-up anywhere in the Southwest Pacific area.

Operators? I have worked with hundreds. If a ham was in the section he already had become chief operator, and in many cases was picked for the job by an officer who was not a ham himself. Not because he did not observe circuit discipline, not by rag-chewing, not by sloppy operating — merely because he is tops.

Specific mention is made of FB, OM, TNX and other abbreviations. My chief op is a ham, but he never uses such abbreviations. I know, for I monitor my circuits many times — and I have many circuits. But the offending party in every case is a GI who has heard of, or read about, amateur radio. (Many have the *Handbook.*) They think it is smart to use "ham procedure." As for the "shave-and-a-haircut" routine, that is as GI as bully beef. I have never encountered a GI operator who doesn't use it and find, upon inquiry, that its inception dates back as far as the Army operator.

As for the "Lake Erie swing" and other peculiar fists, that is strictly a problem for the communications officer and the chief operator. If they are on-the-ball, such a fist will be cured before the habit is well formed. Our trouble from this score is almost nil.

I quite agree with Mr. Larimer regarding the 35-w.p.m. boys. Our nets are run on a 20-w.p.m. basis. The 35-w.p.m. men are, almost without exception, "old Army" and are merely showing the civilians in uniform what a hot-shot a "regular" can be. Fortunately their numbers are few.

Reference also is made to hams "tinkering." This organization is the oldest fighter control squadron in the SWPA. Equipment ages fast in this country. Many are our trials and tribulations in maintenance. For obvious reasons I cannot outline these troubles, but suffice it to say that with aged equipment, abusive treatment and New Guinea climate, were it not for our hams our off-the-air time would not be as impressively small as it is. In our organization we encourage so-called tinkering. By such tinkering we have anticipated troubles and eliminated their source before a breakdown had a chance to occur. Since we control aircraft over large areas and during enemy raids, we must control the interception — our equipment must work. Only by preventative maintenance (tinkering to some folks) are we able to function smoothly and fulfill our mission day after day.

All this is not in defense of the ham — he needs no defense. This is only a tribute to the many hams who left families and sweethearts behind for the biggest QSO in history. Without them, I am certain, our fighter control squadron would have had difficulty in earning the presidential citation proudly displayed by members of this organization. Need I say more?

The ARRL can well be proud of the hams — the hams are proud of ARRL.

— *Capt. James H. Rose, AC, W8PDU*

JITTERING AROUND

1918 N St., N. W., Washington, D. C.
Editor, *QST:*

Just ran across an old issue of "Quist." . . . Really is a treat to get hold of the 'ole mag after such a long time. . . .

Have been jittering around and about for the last four years on active duty, and have recently returned to the States from the South Pacific where we were dug in for the last two years or so. Saw quite a few of the ham brethren around and about, and when we did — boy, did we latch onto 'em! Wudden't know wot we wudduf done widout 'em, as the usual run of radio ops cointly are sumpin' in diss lil shindig.

But all kidding aside, I hope (along with fifty million others) that it won't be long before we get back on the air with the 'ole heaps to spread that well-known "blue haze." . . .

Just counting back the other day and came up with the total of 22 years as a licensed ham. The calls were varied, too, ranging from K6, KB6, KC6, KG6 to KF6.

— *Bill Breuer, W6TE*

CHINA AMATEUR RADIO LEAGUE ANNUAL MEETING

P. O. Box 172, Sar-Pin-Bar, Chungking, China
Editor, *QST:*

Members of the China Amateur Radio League gathered at the auditorium of the Central Headquarters of the San Min Chu I Youth Corps on May 5th for the fifth annual meeting of the association. The branches of the League held simultaneous meetings in different places in China and communicated with each other by radio.

Correspondence, photos and radio sets from amateurs in various countries were exhibited. . . . The opening address was made by Dr. Hsu Un Tseng, vice minister of communication. He, being the president of the League, declared that the League has three principal objectives: (1) to train radio personnel, (2) to promote scientific contributions to national defense, and (3) to cultivate friendships with people of other nations by means of radio. Other speakers included Prof. Fred O. McMillen, Glen Akinns and John Sijder, radio experts from the American Embassy; Hu Shu-hu, deputy secretary general of the Central Headquarters of the San Min Chu I Youth Corps, and various members of the League. A demonstration of television also was given.

George Bailey and K. B. Warner, president and secretary of the America Radio Relay League, respectively, broadcast a special program from KWID in Washington. Although we could not hear clearly due to static, we nevertheless appreciated the good will of our friends. . . .

— *Dr. U. T. Hsu, President, China Amateur Radio League*

HAMS ON SAIPAN

c/o Postmaster, San Francisco, Calif.
Editor, *QST:*

. . . I am now a licensed amateur operator, Class B, having received my ticket just a few days after the battle of Saipan. . . .

Paul Matlack, W3FBZ, has done a swell job with radio here on Saipan and helped build our station. The signals are very good and the programs very interesting.

There are quite a few ham ops around here. When I turn the rig on I can pick out a ham in nothing flat. . . . 3FBZ and I had the honor of meeting a great number of hams in the Marshall campaign a while back. . . .

— *Pfc. A. D. Weddows*

PERSONALIZED DX

APO 923, c/o Postmaster, San Francisco, Calif.
Editor, *QST:*

Being in a position to meet personally some of your pre-Pearl Harbor DX contacts is a pleasure that all hams are not fortunate enough to enjoy. A representative group of hams from the States happened to be in our signal company and, since we have been making the acquaintance of some of the VKs, we thought that our fellow hams would be interested in hearing about it.

First of all, from the W side of the pond we have T/Sgt. Leon D. Held, W2KLD; Pfc. C. D. Costopoulos, W4GKZ; Sgt. Harold Jester, W5HXU; S/Sgt. E. Penick, W5GWI, and Sgt. Jack Hermann, W6URB–ex-W8TSF.

Now to the DX side of the picture. The first VK we were lucky enough to meet was a YL op at that — Mrs. V. E. Nolan, VK4LO. A great many of the old DX hounds surely will remember that call on 20-meter 'phone and c.w., and also that of her OM, VK4JU. Dropping in on her rather suddenly (attracted by a 10-meter beam in the back yard), we were very graciously received. We proceeded to fire more questions at her than any two people could answer. We learned that the VK power limit was 25 watts, but that there was always a chance for a "California kw." of 50 watts if one could get away with it. Hi!

VK4LO's 10-meter beam had just been completed at the time of the outbreak of war and she never got a chance to use it. . . . However, it seemed that other antennas worked effectively as she claimed that she had worked 20,000 hams in the states. . . . Down here the word "ham" really means something. Mrs. Nolan told us of winding her own power transformers and getting other parts the hard way. . . .

Most of the pre-Pearl Harbor hams in the U. S. A. will remember the famous all-continent round table on 20-meter 'phone on January 4, 1939. It was comprised of VK4JU; VK3KU; VK3DH; VU2CQ in Bombay, India; G6ML in England; a station in Egypt, and W4DLH in Florida. Mrs. Nolan had a recording of part of this contact. After assuring her that we would take the best of care of it, we borrowed the record and dashed off to the Red Cross Service Club where a phonograph was available. This recording was made by VK3DH and, believe me, it really sounded swell to hear the old familiar phrases and calls again — especially interesting when the VKs were the locals. . . .

We had just finished playing the record when a soldier sitting behind us turned and asked if we were hams. It seems that he was George Mourrad, W1GAC, "Good American Citizen," of 20-meter 'phone in the old days. How these hams do turn up!

All in all it was quite an afternoon. We climbed all over VK4LO's beam and took quite a few pictures of the beam and of the hams present. (A photograph of the group appears on page 31 in this issue — Ed.) This visit gave inspiration to the hams in our outfit for many a rag-chew about the good old days and we resolved to contact other Aussie hams whenever possible. . . .

— *Sgt. R. Hermann, W6URB–ex-W8TSF*

"DARNED THING"

200 Mt. Pleasant Ave., Newark, N. J.
Editor, *QST:*

. . . It might be of interest to you to know that the following hams were involved in the design and development of the equipment pictured at the bottom of page 17 in the August issue

of *QST:* Herman Sachs, W2KSD; Charles K. Atwater, W2JN; Elliott D. Friedman, W2KVV; Mark B. Rudensey, W2HYX; Ermano Boroni, W2MAA; George T. Royden and Francis H. Tratt, both former hams, and O. M. Arnold, W6PAR.

We object to your calling the antenna mast a "darned thing." Hi! In addition, *we* know that a fourth fellow on the ground (not shown) will raise the mast with poles and slings (also not shown); not the hams pictured.

I'm not mentioning the nomenclature of the equipment, but I can say that it's for guiding aircraft. . . .

— *Elliott David Friedman, W2KVV*

FILAMENT REDUCTION—A REBUTTAL

83 College Ave., Poughkeepsie, N. Y.

Editor, *QST:*

This is in answer to Chauncey Hoover's critique, published in the Correspondence section in the June issue of *QST*, p. 61, of my letter which appeared in the April issue.

It should be noted, at the outset, that I recommended filament voltage reduction only when the tube is operating at reduced power input; that is, when the peak emission requirements are less than those obtaining when the tube is run at maximum ratings.

The operating conditions of thoriated filaments are, in general, a compromise between two conflicting desiderata: the long life of thoria content obtaining at low filament temperatures, and the high emission efficiency obtaining at high temperatures. Other factors, such as the balance between thoria reduction, thorium diffusion and induced evaporation do not concern the case I first stated, since several operating temperatures will be used during the life of any one tube. The net result is this: in any given tube design, for the purposes of emission efficiency, the filament temperature is set as high as will give reasonable life for the service intended. This choice is made to match conditions of maximum power input, for it is not the usual practice to run a tube far under its ratings. Hence, when a tube is so operated, its filament structure can supply the lower necessary peak emission at temperatures somewhat lower than those corresponding to rated filament voltage, with corresponding increase in filament life.

In support of this argument, I refer to Chaffee, "Theory of Thermionic Vacuum Tubes," first edition, p. 121, wherein is reprinted a chart of the temperature-life-emission data on a tungsten filament containing 1 per cent thoria, this being taken from "Handbuch der Experimental Physik," Wien & Harms, Akademische Verlagsgesellschaft M.B.H., Leipzig, 1928. Note that, when the filament is operated at 2100 Kelvin, the life is some 2897 hours, a quite reasonable figure. Note further, however, that when the temperature is reduced to 1900 Kelvin, the emission is about 46.3 per cent of the figure for the above case, but the filament life is 94,000 hours. Since this latter case represents a power reduction to about 21.5 per cent of the rated value, assuming a rated temperature of 2100 Kelvin and constant E/I ratio in the tank, it can be seen that when a kilowatt bottle is operated at 200 watts, filament voltage reduction is to be recommended. It should be noted that the temperature reduction represents only about 24.8 per cent less filament voltage, so wholesale filament voltage reduction is not to be contemplated. Also, no great difference in the brightness of the filament will be noted for the temperature reduction described above.

This should cover the subject. I would like to see the matter cleared up once and for all by some responsible tube manufacturer.

— *Gurdon R. Abell, jr., W2IXK*

POSTWAR SERVICE TO THE NATION

4158 Ridge Rd. W., Spencerport, N. Y.

Editor, *QST:*

I was called on by my employers to escort a very important group of Latin American businessmen, industrialists and government officials, on a tour through the company's plants. One of these men was a Argentine government official. He openly admitted to me that something was wrong because the reception he got was exactly the opposite of the opinion he had been led to form before sailing. He said he could not have found a more friendly people. Another of these men was a Guatemalan government official. He frankly confessed to me that he had been terrified at the thought of landing in the United States because he had been "assured" that he would be put through a merciless third degree upon arrival. When the custom house authorities at the port where he landed did not even bother to look at his baggage, he could not understand it. He, too, found things different from what he had been led to believe. So, somebody somewhere in this hemisphere is putting out false information about the U. S. A. with the obvious intention of wrecking Inter-American relations. Therefore, the sooner the people of North, Central and South America get to know each other, the better for all.

In my letter to the editor, published in the June issue of *QST*, I said that Washington believes "there remains the long problem of convincing Latin Americans of the sincerity of U. S. A. policies and of winning the confidence not only of leaders and governments but of *peoples.*"

The solution of this problem is found in the contact with the people. People will understand other people when they are able to talk among themselves. And understanding is perfect when only one language common to both is involved. In the case of this group of Latin American visitors, the fact that those of us who escorted them spoke Spanish fluently, undoubtedly helped to make them see us as we really are, and erased the bad impression forced upon them elsewhere.

But the correction of such misleading information had to wait until contact with the people

(Continued on page 78)

OPERATING NEWS

CAROL K. WITTE, W9WWP
Acting Communications Manager

LILLIAN M. SALTER
Communications Assistant

From Cabbages To WERS. As the walrus said, the time has come to talk of many things, but at this writing we won't waste much time with the cabbages and kings part.

We'd like to say how proud we are of the way in which many radio aides and WERS groups are going out after alliances with local relief organizations. In most cases, the fire, police, state troop, Red Cross and other organizations are enthusiastic over coördinated activities with WERS groups, too.

However, as time has gone on and current talk is full of proposed new uses for two-way short-wave communication, we find that some of our WERS groups have volunteered to all sorts of agencies, many of which have no connection with emergency disaster relief work. Of course, the services of WERS are useful and valuable in all sorts of industrial programs and in connection with publicity groups, but the fact still remains that WERS is still what it always has been, *a war emergency radio service, designed solely to aid in the protection of civilian life and property, in time of enemy attack or natural disasters.*

So while you read of the applications pending in FCC offices for use of two-way radio communication between trains in motion, the granting of construction permits to bus companies in large cities for operating portable units, and the vast postwar plans for use of walkie-talkies on farms between the cowbarns and the south forty, and between apartment buildings and the like, please bear in mind that WERS is still operating as an emergency radio service.

If you are in doubt as to the legality of operations your WERS group is engaged in or contemplating, may we suggest the advisability of carefully re-reading Sections 15.63 and 15.71 of the FCC Rules and Regulations governing the War Emergency Radio Service?

There are certain forms of operations which may be allowable, while not in strict literal accordance with the printed regulations of 15.63. However, when the legality of operation is in question, we'd like to know what the problem is, and set you straight on it, before you go ahead.

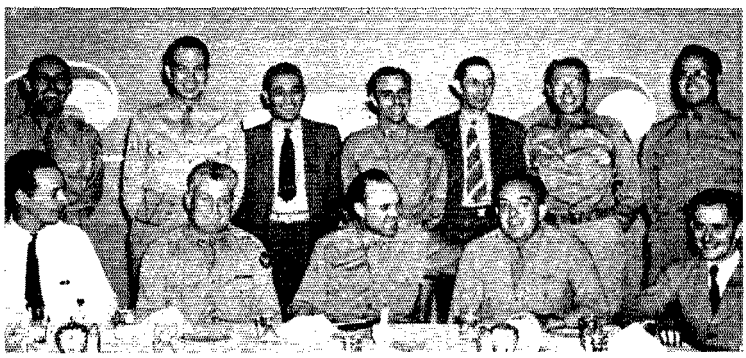
In brief, if the agencies with which you are allying your WERS net are devoted to relief and rehabilitation during or after any emergency endangering life and property, or if the operation has the full sanction of an existent local OCD office, you may be quite sure that your drills and extraordinary operations are fulfilling all the requirements set forth in the rules and regs.

There've Been Some Changes Made. About the surest way to receive a change of address of a serviceman apparently, is to make his current address known. To bear out this contention, we have two changes of address for former CM's in this department from the ones listed in September *QST*. You now have to address mail to CRM John Huntoon to 4527 Chesapeake St., N. W., Washington, D. C., and to OC George Hart to Section V, Squadron D, Class 44L, OCS SAACC, San Antonio, Texas. Here's hoping that they stay put for another month at least. Hi!

—*C. K. W.*

WJJH Helps Cleveland Set Waste Paper Collection Record

ON Sunday, July 30th, a national record was set by the collection of 5,000 tons of scrap waste paper by Greater Cleveland's civilian defense salvage committee. Since this amount was twice the most optimistic guess made prior to the day, all facilities were taxed to the utmost. As a result, WERS was able to assist in this emergency. The fact that there were enough mobile units to cover all the areas in the drive, capable of receiving instructions for the working crews and transmitting reports to headquarters, made WERS an almost indispensable part of this project.



These amateurs on the AACS Hq. Staff and members of the Asheville Amateur Radio Club met in Asheville, N. C., on August 2nd, to formulate plans for monthly club meetings. *Left to right, seated:* Buck Joyner, Captain A. C. Forbes, Major Ronnie Martin, Lt. Col. Don McRae, and Charles Sumner. *Standing:* Capt. Fred C. Hall, Cpl. George Hart (ARRL's former acting CM), J. W. Harrison, Lt. H. C. Stephan, C. B. Shook, Lt. J. R. Croy, and Lt. G. V. Dawson, Jr.

The main control center station, WJJH-1, and the net control station, WJJH-40, atop the Terminal Tower, began calling the roll at 8 A.M. Thirty mobile units and seven fixed stations at report centers were checked in, and the mobiles were then assigned to travel through certain areas, with an appointed aide. Their job was to ascertain whether the paper on the curbs would make the total collection heavy or light, whether there were enough trucks and helpers in the area, whether any important areas remained to be covered and any other points of information which would be of aid to the officials directing the drive.

The chairman of the salvage committee, C. T. Morris, used the services of WJJH-60, operated by Radio Aide John A. Kiener, W8AVH. Since the unprecedented collection presented many last minute changes in planning, Mr. Morris had to make hurried trips to the paper companies, unloading points, etc. He was able to converse directly with other members of his committee, who were in the general headquarters at control center station WJJH-1, at all times during the operation.

Mrs. Mildred Wildman, W8PZA, chief operator at WJJH-1, did a superb job in spite of the fact that the control center resembled a madhouse while members of the salvage committee struggled with their many problems.

Rollie Wildman, W8PWY and operator of mobile unit 55, accompanied a Fox Movietone camera crew taking pictures of the collection for WPB in Washington. Assignments were transmitted to him direct from control station.

D. L. Howe, the chief operator at WJJH-40, assisted by Miss Winifred Hewlett, did a yeomanlike job of handling an immense volume of traffic during the day. Some indication of the traffic handled can be gained from the statement that from 8 A.M. to 3 P.M., the period during which the network was active, there was never a silent period on the 112-, 128-kc. channel on which WJJH-40 operates.

The operators at report center stations on the east and west sides of the city, who were active in relaying traffic from distant mobile units, were: Marvin Klein, 18; John Rau, 16; Jim Hausser, 9; Leonard Johnson, 14; A. C. Gohlke, 26; J. D. Douglass, 28, and E. D. Hartman, 5.

The mobile unit operators were: Archbold, 137; Tunstall, 131; Griesfelder, 98; Rebner, 155; Smith, 61; Goldberg, 73; Anderson, 175; Hanscom, Sr., 111; Blaylock, 141; Kolarits, 106; Hammond, 54; Davies, 154; Klatt, 92; Hanscom, Jr., 113; Snyder, 63; Kisiliwicz, 53; Revilock, 125; Reece (Brandt, driver), 163; Caskey, 170; Thomas, 126; Gable, 123; Champness, 109; Root, 157; Whittam, 97; Davis, 128, and Hradek, 148.

One of the more amusing incidents of the day occurred when report center 9 received information that the paper collection on the streets in that area was extremely heavy, and though there were plenty of trucks, there were not enough men for the collection job. Four of the extra radio operators who had reported for duty at 9 then rolled up their sleeves, and went out to man the trucks, thus clearing up the difficulty.

At the conclusion of the day, Chairman Morris enthusiastically said, "I don't know how to thank you members of WERS for the wonderful job you have done today. You certainly helped us out on a very tough assignment. The ease and rapidity with which the messages were handled to and from the general headquarters and the field crews was quite remarkable, and of course they were a great help in getting the paper off the streets and into the warehouses by nightfall."

Each one of the operators was thrilled and waxed enthusiastic when recalling the events of that day. The fact that nearly all the operators were licensed hams, also, shows that as usual, hams can be counted on in any emergency.

Even though the protection department of the local civilian defense organization has been practically laid away in moth balls for many months, WJJH operators have continued to hold regular drills. This constant practice proved completely justifiable, for WERS was able to jump into the breech and turn a distressing situation into a record-breaking success, while displaying some of the snappiest network operating to be found anywhere.

Six weeks before this drive took place, the services of WJJH were offered to the executive chairman of the defense council, who said, "We'll see if we can use you, and then let you know." Four weeks passed without further word from him. Then, when WJJH got word of the coming scrap drive, the offer was repeated to a member of this same committee. This time the offer was backed up with a procedure drawn up completely, showing the exact methods of operation to be followed, the message form which would be used to relay messages to general headquarters, etc. It brought the desired results, and the Friday night before the drive, the members of WJJH were asked to participate.

This is an example to show how WJJH has had to "take the bull by the horns," locally, to offer assistance in any way to the various disaster and relief agencies. WJJH has had to search out and take advantage of opportunities to render service, and as a result, has been able to maintain a vital organization. As civilian defense fades fast in local communities, it may seem to some WERS groups that the "swan song" is being sung for WERS operations. However, after one such operation as this one, it will be found that enough enthusiasm is welled up in each one of the WERS gang to keep them interested for many months.

As a parting thought to radio aides of WERS groups who have been "tearing their hair" to cut red tape and try to figure out what to do next, we'd like to say, "We're all in the same boat — it's leaky and the water's rough, but the ride's worth taking for two good reasons: the good ole U. S. A. and amateur radio."

— John A. Kiener, W8AVH, Radio Aide WJJH

T/Sgt. "Duke" Komatoskas, W8SYW, shouldn't mind his temporary lay-up at the Ashford General Hospital in White Sulphur Springs, West Va. He is shown here comparing notes on books with movie actress Wini Shaw. "Duke" says he got "messed up" in North Africa a year ago, but expects to be walking again shortly.

BRIEFS

W9MHD, now in Ceylon, reports that in a recent ragchew W7HFZ, W8SOO, W9AJN and he all agreed that what they as hams are really fighting for are the "Four Frequencies," at least.

— • • • —

On August 6th, a 22-year-old Rochester, N. Y., girl, Lucille Sweet, was notified that she had passed her amateur exam. What makes the story news, however, is the fact that she is one of the few blind YLs in the country to make a hobby of ham radio.

— • • • —

At the Associated Police Communications Officers Conference held in Toledo, Ohio, from September 18th through 20th, one of the most popular exhibits was the Carter Motor Company's display of the most powerful Chicago mobile WERS transmitter-receiver installation. The unit, which was installed in a privately owned car, was an added attraction for local amateurs and WERS operators, who were also invited to exhibit transmitters and receivers using the company's products.

— • • • —

W8HKT says, "Being ship's photographer certainly has its points. We have a nice darkroom aboard, with enlarger and all. I got quite a ribbing about it on one trip when we had a WAC photographer aboard; but, needless to say, there were no developments!"

Ham Yarn No. 1

BY VICTOR C. CLARK,* W9AVO—EX—W6KFC

LOOKING back upon ten years of thrills and surprises in ham radio, one experience stands out in my mind as the most astounding of them all. Although it was a simple and entirely explainable incident, happening as it did, it literally took my breath away.

After returning home from school one afternoon during the winter of 1935, I made my way directly to the shack as per my usual custom. There was the rig (a single 210 in a self-excited Hartley circuit), just as I had left it the night before after pounding brass on 80 c.w. until an early hour. Since 80 meters was unsatisfactory for other than local communication purposes at that time of day, I changed coils in the rig for operation on 40 meters. After that, I fired up the old three-tube blooper (type 24 detector and two stages of 27 audio amplification), and commenced the regular ritual of examining the tone and finding the frequency of my transmitted signal on my receiver.

Before pressing the key or disconnecting the receiving antenna, however, I started tuning the receiver down toward the 40-meter band. I suddenly encountered a strong, steady carrier which I did not recognize as being one of the familiar harmonic radiations from a local broadcast station, and which appeared to be devoid of modulation. As I paused to listen to it, the receiver suddenly developed a condition which was known at that time simply as "trouble." The cure for this was usually a brisk banging on the top of the receiver with one's fists. Actually, an intermittent microphonic condition in the detector tube was responsible for the difficulty, and it was sometimes found helpful to remove the cover of the set and rap that tube a few times. In this instance, it became necessary to resort to the second of the corrective measures described. As I bent over the open receiver, which was still tuned to the unidentified signal, I muttered aloud, "What's the matter with this thing?"

My words came through the headphones clearly, after being picked up by the microphonic tube and amplified by the two audio stages. With this result I was thoroughly familiar, but I certainly was not prepared for what happened next. Suddenly, I heard a voice coming from my headphones, querying in a somewhat weak and muffled manner, "What thing?"

Steadying myself against the table, I looked around the room to see who was responsible for the phenomenon, and how he had managed to make it sound as though it came through my headphones. Seeing no one, I ventured a weak and tremulous "Hello" into the recalcitrant detector compartment. Then, as a voice cheerfully replied, "Hello, is that you, Vic?" I slumped into a chair, aghast.

It took but a few seconds for scientific curiosity to overcome my amazement, and then, upon reëstablishing communication with the ghost voice, I discovered that it belonged to my friend, Charlie Johnson (later W6MAJ), down the street.

It was well known to both of us that our bloopers were capable of bridging with a lusty signal the two hundred yards or so which lay between our homes. We were also aware of the problem of microphonic detector tubes which was characteristic of both of our receivers. What we did not know, however, was that the "carriers" produced by both oscillating detectors were capable of being modulated, as a result of the existent microphonic condition. This per cent of modulation was capable of conveying intelligence across the intervening distance between our homes.

Although we had both grown accustomed to the sound of the other's oscillating detector, neither of us had noticed it on that particular afternoon. The "contact" was a completely unexpected event — the result of a coincidence which found both our receivers tuned to exactly the same frequency at the same instant, with both of us bending over our open receivers, trying to eliminate the intermittent microphonic condition which was occurring simultaneously in both sets.

About the time that I discovered that the draft in the room was being caused by my open mouth, Charlie burst into the room, his eyes bulging, exclaiming excitedly as he slid to a stop:

"Well, what do you know about that!!!"

* c/o Radio Engineering Section A-95, CAA, Washington 25, D. C.

HamYarns

What is the most unusual experience you have ever had in connection with ham radio? Have you ever had a QSO that took place under peculiar circumstances, or that resulted in an exciting adventure? Have you ever been surprised, terrified, or highly amused at some incident that occurred during the good old days when you were operating your ham rig?

CD invites you to submit your story of the most unusual ham yarn you know of, whether experienced by yourself or a fellow amateur, for possible publication in Operating News. All stories should contain approximately 500 words, must be true, and must center about the subject of ham radio.

Each winning "Ham Yarn" will be published in this department, and the author may select a bound *Handbook* (Defense or regular edition), *QST* binder and League Emblem, Lightning Calculators, or any other combination of ARRL supplies of equivalent value ($2.00), as his prize.

All entries should be marked "Ham Yarns" and addressed to the Communications Dept., ARRL, West Hartford 7, Conn.

20-Year Club

OUR roster of 20-Year Club members, which was published in February *QST*, caused such a deluge of new applications, that we are publishing another list in an attempt to keep the records up-to-date. If you think you qualify, as an amateur who has held an amateur operator license for twenty or more consecutive years, send along a brief chronology of your ham career to this department. List the date you started in amateur radio, the call and date on your first amateur license, and all the other calls you have held through the years up to the present time. If you are eligible, your call will be published in the next list of 20-Year Club members.

W1AHY APA AZW ACV AJ AR BB BDI BNL BPN BSJ BVR BXC BYG CJA DMF DMP EAO EH ES FA FJE FKS FMP FMV GDY GS HGX HXQ JFN LZ MD MLT NF PG RP UP WR ZL **W2**ADW AOS APJ AX BO BYW CJJ CJX DI DIH DYT DZA EC ELN EMV EY GVU GVZ HCO HTU IMF IP IW IZ JF JRG MIL OEN PF PL **W3**ACX ALE AVJ BO BYR BZ CA DRO EUY FLH GJ GLH GPA GQL HWO JL KT QJ RR WS VT ZI **W4**BZ CNZ DIN WD/5FSI **W5**AJG AQD CVQ EOW ERJ NT NW **W6**AM ANM/GVU AVC AWN BVM CAN CFN/CVC EA EY GM GS IT IWU IX KA KMA KTQ LM MMB MSN NPD OCH OCZ OJY OVK PKX QKI QOJ SN VU **W7**AZX BG COH DVY EMT GCO QP **W8**AL AMS APD AQ AYS BCA BOA BWP CHU CMH CNX DOX FRY GYR'IGT HO JDV KHM ND OA OFO OXH QAN RN SDR SIX SQE SQW TGX TO UGR VZ ZS ZY **W9**AA AB AED BRX CA CAA CCD CCE CDE CS CSZ CVU CX DAX DGM DHJ DHM DI DZG EL ESA EVG EW FRC GTR KWY NZZ OSQ RRC RWF VFW VS VV WIN WTE WZE YNQ **K4**KD **K6**ONM QYI **VE3**RB UX **VE5**GA.

BRIEFS

A V-mail letter from T/Sgt. Harry M. Neben, W9YVZ, informs us that he attended a hamfest in England recently at which the following hams were present: Fogarty, W2LHC; Osbern, BRS-5297; Lang; Dymond, G3HW; Hunt, G2FSR; Crighton, G4JA; Smith, W7GHT; Marriott, G8UZ; Cohn, op. license only; Beckmeyer, W2HHC; Holstein, W4NXR; Barker, op. license only; Bevers, ex-GSVR; MacLeod; Forster, W9ENZ; Loeb, W9——, and Campbell, W6BLC.

ELECTION NOTICES

To all ARRL Members residing in the Sections listed below:

The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office. This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from ARRL full members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from full Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon on the dates specified.

Due to resignations in the San Joaquin Valley and Utah-Wyoming Sections, nominating petitions are hereby solicited for the office of Section Communications Manager in these Sections, and the closing date for receipt of nominations at ARRL Headquarters is herewith specified as noon, Monday, October 16, 1944.

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
Eastern New York	Oct. 2, 1944	Robert E. Haight	Oct. 15, 1944
Virginia	Oct. 2, 1944	Walter G. Walker	Oct. 15, 1944
Northern Texas	Oct. 2, 1944	N. R. Collins, jr.	Oct. 15, 1944
New Mexico	Oct. 2, 1944	J. G. Hancock	Oct. 15, 1944
Santa Clara Valley	Oct. 2, 1944	Earl F. Sanderson	Oct. 15, 1944
Nebraska	Oct. 2, 1944	Roy E. Olmsted	Oct. 15, 1944
San Joaquin Valley	Oct. 16, 1944	Antone J. Silva (resigned)	.....
Utah-Wyoming	Oct. 16, 1944	John S. Duffy (resigned)	.....
Hawaii	Oct. 16, 1944	Francis T. Blatt	Feb. 28, 1941
Sacramento Valley	Oct. 16, 1944	Vincent N. Feldhausen	June 15, 1941
Alaska	Oct. 16, 1944	James G. Sherry	June 14, 1942
Southern Minn.	Oct. 16, 1944	Millard L. Bender	Aug. 22, 1942
New Hampshire	Oct. 16, 1944	Mrs. Dorothy W. Evans	Sept. 1, 1942
West Indies	Oct. 16, 1944	Mario de la Torre	Dec. 16, 1942
South Carolina	Oct. 16, 1944	Ted Ferguson	Aug. 25, 1943
Western Fla.	Oct. 16, 1944	Oscar Cederstrom	Oct. 1, 1943
Idaho	Oct. 16, 1944	Don D. Oberbillig	April 15, 1944
South Dakota	Oct. 16, 1944	P. H. Schultz	May 18, 1944
Alabama	Oct. 16, 1944	Lawrence Smyth	May 22, 1944
Iowa	Oct. 16, 1944	Arthur E. Rydberg	May 26, 1944
Los Angeles	Oct. 16, 1944	H. F. Wood	July 1, 1944
Arkansas	Oct. 16, 1944	Edgar Beck	Aug. 17, 1944
North Dakota	Oct. 16, 1944	John McBride	Aug. 17, 1944
Wisconsin	Oct. 16, 1944	Emil Felber, jr.	Aug. 17, 1944
Kansas	Oct. 16, 1944	Alvin B. Unruh	Oct. 29, 1944
Tennessee	Nov. 1, 1944	James B. Witt	Nov. 15, 1944
Oregon	Nov. 15, 1944	Carl Austin	Nov. 22, 1944
Georgia	Nov. 15, 1944	Ernest L. Morgan	Nov. 29, 1944
Southern Texas	Dec. 1, 1944	Horace Biddy	Dec. 15, 1944
Kentucky	Dec. 1, 1944	Darrell A. Downard	Dec. 15, 1944

1. You are hereby notified that an election for an ARRL Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by ARRL full members residing in the Sections concerned. Ballots will be mailed to full members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more ARRL full members residing in any Section have the privilege of nominating any full member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, ARRL

38 La Salle Road, West Hartford, Conn.

We, the undersigned full members of the ARRL residing in the.....Section of the.....Division hereby nominate.....as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Five or more signatures of ARRL full members are required)

The candidates and five or more signers *must* be League full members in good standing or the petition will be thrown out as invalid. *Each candidate must have been a licensed amateur operator for at least two years and similarly, a full member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated.* The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no member shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials of each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— Carol K. Witte, Acting Communications Manager

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws, electing the following officials, the term of office starting on the date given.

Illinois	David E. Blake, II, W9NUX	Aug. 15, 1944
Ohio	Carl F. Wiehe, W8MFP	Aug. 17, 1944
W. Mass.	William J. Barrett, W1JAH	Aug. 17, 1944
Oklahoma	Ed D. Oldfield, jr., W5AYL	Aug. 15, 1944

The Month in Canada

ALBERTA—VE4

From W. W. Butchart, VE4LQ:

As NOTED last month, Reserve Army camp at Sarcee attracted several hams from around the Province. R/T (radio telephony to you), commonly known as "R-Toc" in Army parlance, was used extensively, and by listening in on the allotted frequencies we could recognize several voices as belonging to Alberta 'phone men. While listening in one afternoon I chanced upon the RCCS net which was just getting organized for the afternoon, so decided to "crash the net." As the equipment we use transmits on the receiving frequency, it was a simple matter to perform the deed. Who do you think came back? Would "Figure Four Geraniums Daffydills" mean anything to you boys? Yep! It was our old pal Jim Smalley of Calgary. During the ensuing week or so we ran across 4XE, Dick Bannard, of Edmonton; 4CY, Sam Litchinsky, of Calgary, and several Army instructors we have known. So all in all it was a lot of fun, and we were able to get our "pipes" in shape for postwar hamming! 4JP, Reid Elliott, of Alliance, also was at Sarcee. He imparted the information that 4HQ, Bill Stunden, of Calgary, was no longer associated with the Calgary Tank Rgt., but that he had paid a visit to the unit in camp only the day or so before. GD's voice is in good shape after all these years, and we'll guarantee that you will be able to recognize it right off the bat! His ready "freewheeling" wit is also right on tap. He led a "scrounging party" over to LQ's outfit to borrow a power unit and needless to say, true to the old ham spirit, Jim got away with the unit plus a part or two! 4XE, as Camp Sarcee signals officer, had his hands full, but as usual he did an excellent job. His work includes supervision of the camp telephone system, p.a. work (portable when necessary), and general supervision of the training of signallers at camp. We saw 4AAD, Jack Freeman, of Edmonton and Calgary, D.S.O. for M.D.13, who is only just convalescing from a rather serious illness. Jack is working only an hour or two a day as yet, but reports he is feeling first rate again. He imparted good news re wireless equipment to be distributed. Within the next few weeks walkie-talkie equipment will be available to signal units authorized to use them. 4CY, Sam Litchinsky, still is interested in both photography and ham radio, so it is not hard to get into earnest conversation with him. We did manage to compare camera equipment with him, however, before GD came along and finally switched the subject back to hamming

(Continued on page 76)

AMATEUR ACTIVITIES

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — 3IKW greets us from VK. His QTH is Lt.(jg) F. D. Moran, USN, Fleet Post Office, San Francisco. 3FRY writes that he has been in poor health for a long time and has just come through a sinus operation. We trust he will improve rapidly. 3JBC is home on furlough. He is attempting to transfer to the merchant marine. 3IJN got married before shipping out to the Middle East. Dick Hanak (LSPH), over Africa way, writes what was probably a very interesting letter, but the censor was strong with the shears. Bob Stevens (LSPH) is in Cairo. 3JNQ is attending Lehigh and sends his 73 to the boys in the Frankford Radio Club. Our first letter from Normandy is from 8UQW. He read in *QST* that 8UWQ was in Philadelphia for a visit. UWQ, a good friend of his, was his first QSO on the air, but they lost contact with each other by being in different services. He wishes to say hello to 8ATF and 8VD. 3HRE says that WERS around Easton is very progressive. A lot of experimenting with antennas is going on at present. Their turnout for drills is just about 100%. Philadelphia WERS goes out on fires of three alarms and up. They have had quite a few calls and have done well. The unfortunate part of it from the ham viewpoint is that the newspapers give little or no publicity to amateur participation. 3ITZ has been appointed by the Philadelphia radio aide to supply *QST* with publicity articles concerning Philadelphia WERS. His 'phone is GRAnite 7388. 3JKC raised 3BSB of Virginia on a CQ at the Penna. R. R. station. 3KT was home from Florida on a furlough. 3CBT is in Italy now. 3AAV, well known to Philadelphia hams, is now Capt. Rogers, USN. 3IKW has been promoted to lt.(jg). 3BXE has a new jr. operator. 3TZ is RM1c at Anacostia. Many thanks to those supplying copy for this column. 73, *Jerry*.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ — ASE is now located with the AACS, Rome, N. Y., as recorder in the control tower, and his address is Det. 104 AACS, RAAF, Rome, N. Y. CDQ is president of the YLRL, and vice president of the Washington Radio Club, which meets at the CREI the second and fourth Saturdays of each month. She is also deputy radio aide in the D. C. WERS. BWT is back on the old job after a vacation spent at Atlantic City, N. J. CAB has retired and keeps busy with photography. 4PL, of the old "hit and bounce" message group, is busy on one of the U. S. engineer boats at Chattanooga, and recently persuaded the powers-that-be to let him change the regulation clothes-line type of antenna to a "cut to fit" doublet, whereby the output of the 150 watts allowed them by the FCC was greatly enhanced. Send some news for the gang. 73, "*Doc.*"

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU — Regional EC for So. N. J., technical radio advisor for N. J. State Defense Council, N. J. state radio aide for WERS and radio aide for Hamilton Twp. WERS, ASQ. EC for Somerville and vicinity, including Southbranch, and radio aide for Hillsboro-Branchburg Twps. WERS, ABS. N. J. state aide reports Westville now licensed by FCC to operate WERS under call WBGI, with one fixed station and four mobile units so far. Hamilton Twp. had excellent work-out recently when a plane crashed within its territory just after the test period opened. WKPX, Hamilton Twp.; WKXQ, Hillsboro Twp., and WJMN, Bridgewater Twp., have had excellent results all ways with a three-way sked during Monday night test periods. ABS, Hillsboro Twp. radio aide, reports their fire companies are now working practice incidents with WKXQ net weekly, and a public demonstration will be held in October, during which the public will be invited to "ride" the mobile units to obtain an idea of how WERS works. ABS will hold examinations for 3 new applicants for 3rd-class 'phone tickets in the near future. Because of government censorship regulations which prohibit divulgement of current location of any serviceman, it will be impossible to give complete addresses of these men. However, anyone wishing the complete address of a serviceman, may obtain same by dropping the SCM a line. CCC was recently home on a short leave. Ed's sons are both in the services, one in Italy, the other in Africa. JAG, radio operator in the merchant marine, writes he is well and happy and would like to hear from any of the boys. ETX's address is APO 557, c/o Postmaster, N. Y. Sgt. Hassal's address is APO 133, c/o Postmaster, New York, N. Y. BVY has been elected secretary-treasurer of reorganized Luscomb Aircraft Corp. New QTHs this month include: EUH, 107 Newell Ave., Trenton, N. J.; JJX, 86 Patterson St., New Brunswick, N. J.; Waldo Henderson, ex-3BIM, 695 Parkway Ave., Apt. A-12, Trenton, N. J.; John Gershey, ex-8DWE, 324 Oakland St., Trenton, N. J.; ISZ, Box 346, Titusville, N. J.; JEU, Washington Crossing State Park, N. J. John O'Dowd, recently discharged from the Navy, has accepted a position with IBM. Because it is impossible for me to personally contact the individual members of the So. N. J. section, I appeal via this column to anyone interested in special employment in a war plant as radio technician or electrical engineer. This is a vitally important plant and it is safe to say that a technician could not make better effort than to affiliate himself with this organization. Anyone interested please write W. R. Tomlinson, SCM, 623 E. Brown St., Trenton 10, N. J., for information. JNO has acquired a very nice wood-working outfit. ITS has recently returned from vacation. GCU has one coming up soon. ASQ left for vacation on Aug. 19th to get himself a rest after working so hard on WERS. Teresa Lanzalotti (LSPH), of Williamstown, has joined her OM, DOR, as engineering aide at Ft. Monmouth Signal Labs. FTU has sold his kw. rig and moved the balance of his equipment up to his farm in Maine. EED is a papa again; jr. operator, Paul Lawrence Yoder, 8½ lbs, born Aug. 2nd. The regular meeting of the Delaware Valley Radio Association was held on Aug. 9th, at which V. S. Wagner, ex-8BRJ, technical radio advisor for the organization, gave a very interesting and instructive demonstration and lecture on the uses and operation of the v.t.v.m. *Ray*

WESTERN NEW YORK — SCM, William F. Bellor, W8MC — It seems that when we want to get track of some old-timer who has dropped from sight, all we have to do is to mention it in this column and immediately someone writes in about him or we hear from the person himself. For example, a month ago we asked for dope on SZB and right away we heard from SZB himself, and the next day a card was received from RVM giving more information. SZB has been located in Syracuse for the past year and is with RCA (photophone). His work takes him up through Malone and down as far as Naples, Dresden, Utica, etc. Elmer's address is 249 Bruce St., Syracuse 3, N. Y. RVM is with RCA in Camden, N. J. Ken tells us that WJA of Lowville is now a lt.(jg) in the Navy. We would like to hear from LLZ on how things are in Jefferson County. The boys of WHNH, Monroe County WERS, threw a big picnic at Ellison County Park on Sunday, Aug. 6th. It was a great success, taking on the aspect of a hamfest. Prizes for men took the form of much-needed pieces of high-frequency equipment, including a calibrated thermal element 112-Mc. wavemeter, while those for ladies included candy and fancy articles. The boys from WKBS (Syracuse) demonstrated their enthusiasm by having a delegation of ten present and walked off with some of the prizes. OGC walked off with the laurels in the hidden receiver hunt with some neat work with his handy-gabby. RKO exhibited his new compact WERS unit. WHNH-1 has been reported as heard down along the shores of Lake Erie, well over 100 miles from Rochester. Your SCM was guest of the Syracuse WERS gang one Monday evening and attended one of their efficient drills and wishes there was space to properly describe their hospitality. DFN, TEX and many more of the Rochester gang took advantage of a week's vacation at Stromberg-Carlson to go fishing, etc., and came back fresher than ever to push along that ol' war job. Let's hear from you all. 73, *Bill*.

CENTRAL DIVISION

ILLINOIS — Acting SCM, George Keith, jr., W9QLZ — QWM feels that the latest dope on his travels is in order. Harold completed 3 months' primary radio and has been sent to Treasure Island. He hopes to keep G, Z and all the other symbols straight for future use. The new address and rating: Harold E. Schrock, RT3c, Co. 41, Sect. 4, Bks. 2, Radio Matériel School, Treasure Island, San Francisco, Calif. Lt. Jorma Leskinen of Langley Field, Va., is one of those unlucky fellows who took the exam 3 weeks before Pearl Harbor. He is stationed with the Signal Corps Maintenance Section, 51st Sub Depot, and from the tone of his letter would like to use that Class B ticket that he has at

home. Lt.(jg) ZDT is a radio matériel officer in Hawaii. WOK is a seaman 2nd class stationed in the Naval Research Labs., Washington, D. C. Latest report puts BDM in Camden, N. J., working for RCA. QYE is on 100 per cent essential work in Chicago. VGE works for Continental Radio in the "windy city." YW, Ill. Inst. of Technology, is doing some experimental work with f.m. in their lab. NVW of Madison has been enjoying a little vacation from the merchant marine. After a few trips to the European theater he had to come home to be introduced to a new member of the family who arrived May 31st. Latest reports say GFF, RT1c, expects to be moved from Treasure Island to Chicago. FOI, somewhere in the Pacific, has advanced to the rank of CRM. UNF comes through with the latest dope on himself as follows: 2nd Lt. Howard S. Weed, Box 1673, Alliance, Nebr.; was formerly flying Douglas C-47s for the Troop Carrier Command but now is flying pursuit ships for the AAF. OII, another Bloomington area resident, has been pounding brass for the AAF in Sardinia. Prior to his present job, OII spent about a year as flight radio operator for Pan-American, flying from Miami to points south. In case the Central Illinois gang wants to do a good deed for the month here is an address: Pfc. Charles K. Mason, APO 650, c/o Postmaster, New York, N. Y. BPV sticks to 100 per cent war work in Armington. S/Sgt. ROK is a radio operator/gunner on a flying fortress. AMP and his YXL, JHO, are in Brownsville, Tex., where AMP does radio maintenance for Pan-American Airways. DBO has been corresponding with PTQ and YZE, the latter being in the Pacific area. YZE hopes to bring home a key to display as proof that he was right on the job looking over the Jap equipment. NGG still pounds brass for the Illinois State Police, where the QRM from 30-watt mobile units from Louisiana takes the joy out of life. Harve says that from the latter part of May until July 15th both coasts and southern states came in on the ultra highs on both a.m. and f.m. NIU and QLZ picked a nice warm (100 in the shade) evening to cut down a tree near the Starved Rock Radio Club shack. A cold winter is expected and the SRRC is all set with plenty of fuel for the fireplace. ODT comes through with a report on continued WERS activity in the Joliet area. KRK, of Chicago, finished radio repair course at Camp Crowder and is now assigned to the Army Experimental Station at Pine Camp, N. Y. His address is: Pvt. E. Engebretsen, 3133rd Signal Service Company, Pine Camp, N. Y. 73, *Geo.*

INDIANA — SCM, Herbert S. Brier, W9EGQ — MKM is chief dispatcher for Oakland Municipal Airport. BPX studies advanced E.E. in Pittsburgh for the Army. NLS wonders where KMY is. They are both on the same So. Pacific island! ZNC finished NCO school. PQL is now a sgt. 8WVU, ex-9GMU, is a radio operator in the submarine service. Are there more Indiana hams in that branch? ABB receives *QST* and the *Bison* regularly at his advance base, Central Pacific. EHT keeps me up to date about the temperature in Washington. WKN is preparing an article for the *Bison*. Fear of libel suits is delaying him. DUT has a 2nd-class commercial ticket. AB is trying again to build a satisfactory 112-Mc. superhet. He installed an 815 in WKBF control station with excellent results. DNQ is back in the Army, going to "repeater-man" school at Camp Crowder. CWY had an opportunity to test a German transceiver which worked from two volts using a vibrapack. He visited Vatican City some time ago. HUV is very busy trying to make his farm produce in spite of the drought. IIL was home on leave in July. He told me about a little oscillator he built to show the trainees what was meant by "jamming." The trainees didn't see the oscillator. They heard the results on their nets. EBB spent his annual vacation in Indiana. PBS listens to Fats Waller records when he is "studying Spanish." WEU is studying calculus at night school. DDH wants information on EUP, SEO and AHJ. He says hello to EHT. KMY is overseas at last. He reports from the So. Pacific that they have an a.c. movie projector, but have only d.c. current. SYJ does radio maintenance work for the Army where oranges, bananas, pineapples, etc., grow in abundance. FOS, in England, writes, "Still thinking about eating ice cream, drinking a few good cold bottles of American beer and hollering 'CQ' like we used to, and hope it won't be long now." SAG is the father of a daughter. Gary WERS control uses an a.m./f.m. superhet built by MTL. Works well; tunes extremely sharp in comparison to superregenerative receivers. SNF was home on a 48-hour pass a few weeks ago. 73, *Herb.*

MICHIGAN — SCM, Harold C. Bird, W8DPE — While compiling this report we received news from the DARA president which we are sorry to have to report. GP is confined to the Ford Hospital in Detroit with a mild case of infantile paralysis. It is expected he will be in the hospital for about three more weeks and then will be confined to his home for some time. All the good wishes of the gang are extended to him. At a meeting of the DARA club recently some very interesting sidelights were given by FX on his experiences while sailing the lakes this summer. Tate finally decided that carrying the mail for Uncle Sam was better than pounding brass, so has gone back to his old job. The boys also discussed some postwar plans that have been brewing for some time. Sgt. Wilbur Kuure, formerly a QMNer from the U.P., writes that for two years he has been in the Signal Corps and is now pounding brass in the aircraft warning outfit. He reports they have been experimenting with beams in their spare time. 4CBU writes that he would like to contact some of the boys who are not working or would like to change their line of work. If you are interested get in touch with your SCM for information. The WERS stations of Michigan have not been reporting their activities of late. Radio Aide Ray Devore, of Center Line, reports that they are carrying on and are having excellent results. The WERS gang of Pontiac City is getting more radio-minded every day. A new set-up has been organized by your reporter, who is radio aide. The set-up is being formed for public safety. It is planned to have receivers on the local police radio system, county and state police, and also a contact with federal troops through a mutual hook-up with their network. In a network of this kind not only the city can be covered by WERS but the entire state can be reached if necessary. The controller at the WERS control would be able to get messages out to the various agencies through the establishment of their radio control right in the same room with the operator, who, by medium of his control, could reach these points. This network proposal has been given the approval of the corps area captain of this area. It is hoped that the other WERS organizations in the State will organize a similar set-up and report their achievements to the SCM, who is interested in establishing a statewide network of WERS stations for public safety. Your SCM solicits your support in sending in reports on activities in your WERS set-up. It is impossible to write a column with nothing to write about. Get your reports in and let's see what is going on in the State. Remember, this is your column and if you want interesting reading send in something. 73, *Hal.*

DAKOTA DIVISION

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — South Dakota activities this month hit an all-time low, according to reports which I received. "Old Faithful" ZBU reports that CRM MBA was recently home on furlough from Sampson, N. Y. where he is radio instructor at the Naval base. SRM was entertained by ZBU. SRM is a fireman in electrical work at Swan Island Navy Yard, Portland, Ore. SNV visited at Platte last month. Come on with the WERS reports, etc. 73, *Phil.*

DELTA DIVISION

LOUISIANA — SCM, Eugene H. Treadaway, W5DKR — Well, gang, no news from the homefront, but thanks goes to the following hams who are on the fighting front and still find time to write in. HMV has been in the European theater of operations for six months and says that after blowing off on 160 'phone during the good old days he is now a c.w. man on a TCC plane. HSH, after a spell in the Aleutian Islands, is convalescing from rheumatic fever and would enjoy hearing from the gang. His address is: U. S. Naval Hospital, Corona, Calif. JNQ is aboard a destroyer somewhere in the So. Pacific. IDI is at Whidbey Island air station. HNW is a lt. in the Navy. AGM is in civil aeronautics at Fort Worth, Texas. IDK is all set and ready to go. HEJ and HEK write HSH often and keep him informed on the gang back home. IPX is in Shreveport. IOP is a telephone man. HUZ is a guard with the Shell Oil Co. IUW writes that he ran across his first *QST* in ages and was happy to see a report of our section and read the dope on the gang back home. His address is M/Sgt. A. S. Williams, jr., APO 512, c/o Postmaster, New York, N. Y. GUU, "Big Foots" of Greenville, Miss., writes in and says, "CQ you bunch of Louisiana Swamp Rabbits." He talks about those good old 160-meter 'phone days and sends 73 to ADJ, HEJ and HEK and others down here. He would like to hear from his Mississippi gang. Write him c/o Army Air Forces, Shaw Field, Box 66, Sumter, S. C. GPR is a captain in the MC in

Australia and enjoys reading his copy of *QST* each month. DWW says nil here this month. Come, gang, drop me a line for our next report. Always glad to hear from you all. 73, *Gene.*

HUDSON DIVISION

NORTHERN NEW JERSEY — SCM, Winfield G. Beck, W2CQD — You guys will be pretty much disgusted with this column or your SCM or sumpin', but there just isn't anything to report, except one letter from LOP. Yours truly is busy night and day at Eastern Aircraft and there's no chance to get around. I could keep telling you about the dozen or so of the local gang at E.A. and the airport, but you've heard about 'em before, so just take a minute and drop a line to me giving all the local chatter. It's being looked for by the gang overseas. And if any of you guys who are globe-trotting get a moment to dash off a line, you may rest assured it will be a welcome contribution to the No. N. J. column. LOP writes from Camp Crowder to say that after being together for 3 months in the Tennessee Maneuvers he and Stan (LVO's brother) learned each other's identity when they wound up in the same hospital. He'd like to hear from any of the following: KXD, NOK, MIG or LFH. His address is T/5 George H. Cooke, ASN 12135929, 3109th Sig. Service Co., Camp Crowder, Mo. 73, gang, and let's hear from you. *Win.*

MIDWEST DIVISION

IOWA — SCM, Arthur E. Rydberg, W9AED — After many difficulties and unpreventable delays due to unusual circumstances, Des Moines and Polk County are now licensed for WERS with the call KFHR. The control station will be at the FEJ location, 1223 56th St., Des Moines. At present there are 16 operator permits with more expected in the near future. Radio Aide URK and his assistants are to be commended for their untiring efforts in getting Polk County WERS going. Former SCM, CTQ, in New Guinea, writes that he is planning his postwar rig. NMA, of the Navy, is in the second month of primary radio at the RT school at Gulfport, Miss. Several hams are there, so he isn't lonesome. GBP is on the West Coast. OCG, Army radio warrant officer, formerly of No. Africa, is home in Des Moines on leave. UAD, in Navy V-12, is at Purdue Univ. PNK, recently home on leave, has gone back to the Great Lakes Naval Training Station. AHP, on vacation, visited ham friends at various old home towns. A recent visit found AS still busy at his lathe. DIB, on vacation, visited ham friends in the Tri-Cities. AEP is warming up to 112 Mc. OLY plans to use that 815 for a 112-Mc. portable for his car. 73, *Art.*

KANSAS — SCM, A. B. Unruh, W9AWP — VPK, formerly a pfc. in field artillery in Oregon, is now in the Signal Corps at Camp Crowder. His brother, JXI, is an assistant area signal officer. KCS is still holding down the fort at the Naval air training station in Texas. A clipping from the Camp Crowder newspaper tells of a meeting of Camp Crowder hams to organize a club. A meeting for postwar ham planning also was held. A directory of hams at Camp Crowder will be made and kept up to date. BCZ joined the Boeing Electronics shop gang; he was formerly an inspector. About 90 per cent of KNQ's ham gear has been turned over to the Red Cross. GSW has been added to the roster in the Boeing confidential radio lab. KG sends greetings to the gang from KHPA. Ken Hearle (operator license) writes from K6 land, and says, "The climate — you just can't beat." KNY was promoted to lt. col. Don't forget to send in some news. 73, *Abie.*

MISSOURI — SCM, Mrs. Letha A. Dangerfield, W9OUD — KIK gathered the following items, which we pass along with deepest thanks for Al's help. GHD was pleased with the result of the request for mail in this column. Dave is communications officer in charge of a large number of sets up in the Aleutians — nothing much to do to them as they never break down, but the installation was quite a job. AEJ is kicking because he has been in the Navy 16 months and has not been in combat. MVW, radio operator 3rd class, was recently home on leave after being in the Navy 16 months. ZVJ is trying for a pilot's license at Pensacola, Fla., and his sister, ONW, is back as instructor at Scott Field. TBU joined the merchant marine to get some actual operating, after many months at a monitoring station. T/Sgt. PUV has been a radio instructor over in England for the past couple of years. KIK failed to mention what he was doing when not tracing down news for us. HIC was transferred from the infantry to the Signal Corps. He met 3EYP at Ft. Sam Houston — both are expecting to be transferred. A letter to PYF in care of his ship in San Francisco was returned — no longer with this line. Now what has become of Roy? And TGN has changed oceans — ship and all. Leo says he preferred the Pacific, but would really rather be home. That leave, cancelled on Dec. 7th, is still on the unfulfilled list. Our brother, 4HLN, is off to sea again and we have to send return postage for his birthday present because it did not arrive before the ship sailed as we had expected. BMS says grinding crystals is an awful headache. OUD's victory garden consists of three shamrock plants in a tin can painted orange and black and some parsley in an antique kettle, all doing nicely. Let's have some more letters for the next issue. Thanks for all in the past and the very best of luck and 73 to all.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — SG-WERS news: Units of the 9th Battalion are in operation every Monday night at 8 P.M. Plans are being formulated to have the coast from the Conn. River to New Haven covered. IJ is now working out of battalion headquarters in Middletown to line up units on the coast. Signal officers of other battalions interested in forming a state-wide network are requested to contact Lt. Owen Sheperd, jr., of Madison. CD-WERS news: Middletown District: DBM, district radio aide, has improved the coverage of WKNQ-1 control unit by using "Q" bars to match 600-w. line to double extended Zepp antenna. Torrington district: KXB, district radio aide, advises the town of Winsted is now licensed for operation in his district. New London district: NEK, district radio aide, writes that WKOB-14 has established contact with Westerly, R. I., control unit for a route into that State in the event of necessity. In view of the hurricane of 1938 this ought to prove a vital link. Waterbury district: EER, district radio aide, reports radio aide meetings are still held in his district, which have resulted in more efficient operation of all units. New Haven district: JQD has been acting as net control for A-2 emission test periods held Sundays. TD, IGT, KQY, Miss Desmond and Taber are taking an active part. Miss Hewitt has left WJLH-1 and has accepted a position with the Pan-American Airlines at Washington, D. C., where she hopes to continue WERS operation. After nearly two years of continuous operation, her absence will be greatly felt throughout the district. TD has WJLH-25 working to perfection with new double extended Zepp antenna. EUG and Limoncelli have nearly completed construction of units 55 and 62 respectively, the latter using circuit outlined in Aug. *QST* by Don Mix. KAT, Guilford radio aide, recently experienced trouble at WJLH-47 in communicating with WJLH-1; he found the wind had changed the position of his beam. During a recent test period, WJLH-47 had an unwelcome visitor while three female operators were on duty. A call to KAT who was operating portable-mobile in WJLH-50 was made. KAT informed the police, then proceeded to WJLH-47 and evicted the visitor, which more or less sold WERS operation to the police officials. Stanford, Bridgeport, Hartford and Norwich districts have not been heard from. Club news: GB, whose ranks have been very much depleted because of 32 members in the services, sent notices to former club members requesting their support in order to keep the club operating for the duration and were gratified with the results. Among those responding were EUG, ELG, EWI, FWB and Gaysunas. Briefs: FJE has been advanced to the position of jr. engineer at the G. E. Co. of Bridgeport, where he is in charge of new developments. DDX and JHN were recently home on furlough from the USN and USCG respectively. WKWG-70 reports WKHS-2 is heard regularly at his location. George Leaman, WKWG operator, is now working at WBRY, broadcasting station in Waterbury, and reports that LFL of Wallingford, now in the merchant marines, paid him a visit after returning from a trip to Africa. EAO, state radio aide, advises he is working on a WERS route to regional OCD headquarters in Boston, Mass., via Springfield. 73, *Ed.*

MAINE — SCM, G. C. Brown, W1AQL — The Queen City gang was pleased to learn that FQ has been promoted to lt. col. in the Signal Corps. According to the latest word received here, PQ, formerly chief operator at WABI, is in North Africa. ERO has joined the merchant marine. The Portland Sunday paper recently carried a fine write-up on the marriage of the daughter of Lt. Comdr. Best, BIG. DAS is back from the war zone and is now in New York. KKZ was a recent visitor in Maine after spending some time

in Washington, D. C. A recent card from DHH says that he is "sparks" on a Liberty ship. EBJ is home on shore leave after having been overseas. QH is RM1c, somewhere in the Pacific area. ALZ is still supervisor of radio maintanance for the Northeast Airlines in Boston. BLZ is repairing BCL sets in his spare time. BWI is in the poultry business as a side line. How about a card or letter to your SCM to help build up the column for the Maine section? 73, *"G. C."*

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — Walter Channing, jr., writes to see if any ham or ham-to-be would be interested in helping out in communications work at the First Motor Squadron of the State Guard in Boston. If you are willing to help, write to him at RFD, Needham, Mass., or 'phone Dover 294. LZW received a letter from MME, who is now a s/sgt. in Burma. GEJ is working for Harvey Radio in Cambridge. LRM is working at M.I.T. We hear that the EY twins are now married and living in N. J. AGR's son, who is a ham, is engaged. LZB is in India. IKI sends a letter from Fort Lewis, Wash. He is a sgt. and is taking medical administrative training. LI reports that he is busy with his garden. WERS is on only once a month now. GAG received a letter from MQO, who is somewhere in the Pacific area. EKG reports that he received a letter from NBM, who is RT2c in the Pacific area. The letter was forwarded by K7HZM. The request was in this column in the Aug. issue and about two weeks later EKG had the letter, so if you want to hear from any of the gang, send the dope to me. MAL and AR sent in their EC certificates for endorsement. NKW says that the gang has gone to the White Mountains for a vacation. Lindsay Russell, Needham radio aide, reports that they are keeping WERS ready for emergency use. The South Shore Radio Club held its meeting with the following present: CPD, DPI, WK, ALP, ex-DDO, KBS. AXR says that he is still hoping to get back on the air and would like to hear from any of the gang he used to QSO on 40. To all ECs, it seems to me that it should be necessary only to send one card informing you of the expiration of your EC appointment. As you know, these certificates have to be endorsed annually. I am trying to keep this much of our fine organization going, if you will only do your part. It's up to you. Let's have some news, gang. 73, *Frank.*

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — With this report I begin my fifth term as your SCM, and I'll begin it by repeating my monthly plea, "How about some reports from the gang?" If each radio club or WERS group would delegate one member to drop a card to me on the 15th of each month with news of local activities, together with news from the gang in the services, we could make a lot better showing in *QST*. A nice letter was received from IJL, who is Officer in Charge of the 10th Sig. Maint. Shop of the AAF at Wilmington, N. C. Chris is now a 1st lt. For those of the gang who want his address, here it is: Christos Manitsas, 1st Lt. Signal Corps, OIC 10th Sig. Maint. Shop, MASC, Wilmington, N. C. AZW reports news of the Pittsfield gang. The passing of FK leaves us with a lost feeling in our minds and hearts. Carl, besides possessing many brilliant achievements, was an ardent amateur, liked and respected by hams throughout the country. The Pittsfield Radio Club picnic was a big success, with 38 in attendance. The details were capably handled by a committee headed by Geraldine Sheehan, aided by BKG and Mrs. IZN. FNY and his wife have moved to New London, Conn., where Culver is now working. WERS activites are flourishing in Pittsfield. Special tests have been completed with Springfield WERS and successful communications were established from Washington Mt. to Springfield. From this location several nets have been heard, including WJKA-7; WMHC-33; WKHF-2, 4, 24, 29, 47, 66, 73, and WKKW-2. North Adams WERS is humming also. Tests are underway to establish liaison with Pittsfield. WERS. Listening tests from Mt. Greylock indicate easy contact with Northampton and Springfield. How about a line on the 15th of the month so we will have some news in the column? 73.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ — A nice letter from MMG gives us his new QTH, which we will be glad to pass on to anyone who would like it. Al says he had a chance to meet several hams recently, including 9ILH and her OM, 9ICN, and 1NHN, who is a WAVE with the W6s at present. JDP and YF, MWI, stopped in for a short visit with FTJ. Those hams who knew him will be pleased to hear that GJH is now the proud papa of a YL operator. CFG got home on a short leave not long ago. The host of hams who knew her will be sorry to learn of the death of the mother of FTJ and BII. BFT was in on the invasion of Southern France but writes that he will trade all such excitement for a few days at home again!

VERMONT — SCM, Burtis W. Dean, W1NLO — Company E of Barre gave a demonstration of 2½-meter equipment at the Vt. State Guard maneuvers at Fort Ethan Allen Aug. 12th and 13th. We understand BD was all tired out from handling messages and twisting the dial in making two-way contacts. Forrest L. Adams and Donald P. Harlow have their WERS permits. Huldah McKenny, who attended the NYA radio school, has a Class B operator license. She is a private in the MCWR and is stationed at Camp Elliott, Calif. JPZ has his 2nd telegraph ticket and has joined the merchant marine as radio operator. He was formerly with the FCC in Calif. AAJ is working for the Waltham Watch Co., Waltham, Mass. FSV was home recently for ten days with a bad cold. GAZ is with the AACF in Memphis, Tenn. JDP is working for Raytheon in Waltham, Mass., after being with the Signal Corps for a year and a half. Albert Evans (LSPH) has been promoted to corporal and has his Class A and 2nd-class 'phone tickets. LWN and NLO have been experimenting with f.m. antennas with FB results. About 35 attended the hamfestette at Malletts Bay, Sun., Aug. 6th, enjoying bathing, roller skating and softball. LMO was unable to be on hand to give a talk on cathode-ray direction finding, but will give it this fall at one of the BARC meetings. Joe Levin, one of the s.w.l. members of the BARC, won first prize in the code contest with LWN second. Carrier current and WERS were among some of the things discussed. Even though the attendance was small this year, those present felt it was a good idea to continue to have hamfests to keep ham activity alive in the Green Mountain State until such time as we can have state ARRL conventions at the Hotel Vermont, à la Sugar House. Thanks for those FB letters and cards. 73, *Burt.*

NORTHWESTERN DIVISION

IDAHO — SCM, Don. D. Oberbillig, W7AVP — IY and ABK are working at Mountain Home Airbase. KJ is a proud papa. In his spare time he works with State Guard communications. EX-EES recently visited in Boise. 6TBK paid a business visit to Idaho. AVP has passed his private pilot's examination and flight test. IMT writes from the Pacific area.

OREGON — SCM, Carl Austin, W7GNJ — IBY is still on the job in Italy, and says one can sure tell the ham operator from the "made" operator. ASG is still in India and has made good use of the crystal grinding compound and glass sent by GNJ. He would like to hear from some of the gang. Write the SCM for complete address. HVD has made two ratings in less than two years and is now chief radio technician, aviation. Chuck Webb (LSPH) says he is going to try to switch to radio, since he has his code speed up to 25 w.p.m. Dick Ertle (LSPH) is at sea. HKE, of Baker, enlisted in the AACS in '42, went to Alaska, then back to the States for aviation cadet, then to gunnery school, and then to B-26 training in La. GNJ and HHH had a swell visit with GLK and FRO in Ashland. Dot worries about losing her code speed. Floyd is a WERS operator, and works with Medford WERS 18 miles away. FRO has degenerated from airplanes and autos to a motor scooter. GTW has tried everything to relieve the "ham radio itch," even getting an RT first ticket, and now receiving code on a mill. He has a 35 w.p.m. certificate from ARRL, so should do well with the mill. HVX is now a leaderman, installing radio equipment on warships. The SCM would like to hear from some of the Portland gang. 73, *Carl.*

WASHINGTON — SCM, O. U. Tatro, W7FWD — All WERS activity in this State is now, apparently, the radio aide's secret, but as soon as some news leaks out your SCM will make as full a report as the information will permit. The Olympia Radio Club held its annual field day with a picnic at Athens Beach, home of FWR. It was quite a contrast to the days when several portable generators driven by their gas engines used to hum and put-put their business-like tune, furnishing power for half a dozen or more transmitters in keen competition for the club's top honors. Present were HWG and family, ERU and family, IWM and family, FWR, HGT and FWD. CMX came in for a bit of "ribbing" for reporting AYO with the state patrol; your SCM takes the blame for the error, since Dwight had correctly reported AYO with the CAA at Everett. One thing about CMX, he *does* report to the SCM any information he has about our hams and his "ribbers" are invited to do likewise. These reports are the only means of keeping this

column alive and you would be surprised at the interest our hams in the services have in it. EKW is out on furlough after 18 months in the Aleutians. Their chief recreation is work seven days a week; even though the service grants one day leave each seven days, there is not enough personnel to enjoy such privilege except on rare occasions. This, of course, refers to the communications group. It is reported that ICA has been down with the mumps and flu but that he is now back on the job. CAM has a "flock" of YL operators on his hands. Noel, IXK's old roommate, who is now in the merchant marine, reports that IXK is RM1c in the Navy down in the South Seas. GUI, now in Seattle, reports that Vaughn Richard, 7 lbs. 10 oz. dropped in on them for a permanent stay Aug. 7th. AWX is repairing radios at Yakima and GJJ is manager of an amusement company at Centralia. 73, *Tate.*

PACIFIC DIVISION

NEVADA — SCM, N. Arthur Sowle, W6CIW — Asst. SCM, Carroll Short, jr., W6BVZ. TJI is a warrant officer, recently on furlough in Reno, and now is with the 555th Signal Corps, Camp Bowie, Texas. JYA is also a warrant officer in the Army, and was home recently for a short leave. LDS is active in CAP Communications Section in Reno. UCA is in the Army, somewhere in France. LCJ, of 20-meter fame, is now civilian engineer for the Signal Corps. TPR has been pounding brass overseas in the Signal Corps and is now a staff sgt., somewhere in Arabia, where we understand the Army has him hold an umbrella over his head while standing on two tea cups and they parallel feed him as a ¼ wave around 80 meters because he is so tall. FJB, an old NCR man, visited CW en route from the South Pacific to an East Coast assignment. He is a warrant officer in the Navy. KBZ is still a motion picture operator in Reno. EGA is active at the Hawthorne Naval Base as civilian radio technician. AAX, with Pan-American, was in town some time ago. PDV is just completing a 30-foot sea-going auxiliary sailboat and is planning a super radio installation for South Sea cruising, postwar. RXG recently visited in Reno to confer with CW on police radio improvements in Southern Nevada. AJP is chief operator and engineer at KOH. BIC is on a well-needed vacation down by the sea. GGO, when last in Reno, had been upped to chief in the Navy, radio of course. QKV is in the Navy, not in the Army as reported last month. MVP was recently appointed captain in the Reno Fire Department, as chief of fire alarms. Would sure like to have some reports from you fellows, both at home and abroad. 73, *Art.*

EAST BAY — SCM, Horace R. Greer, W6TI — EC: QDE; EC v.h.f. FKQ; Asst. EC v.h.f.: OJU; OO v.h.f.: ZM. The regular monthly WERS meeting was held Aug. 17th at the Oakland City Hall. An interesting meeting was held including some movies. SSN has a new home. AM was a recent visitor to Greater Oakland. ZM spent a few days in Los Angeles. NZG is still in the So. Pacific. LCG was home on vacation before going to Pearl Harbor. GPY will be in New York for some time. BGY is on vacation at Tahoe. BUY is now the big chief for the Pac. Tel. & Tel. at the Kellogg Exchange. AEX claims he is still pure and simple with nothing much to get in trouble with these days. LCH is now in Europe. IPK is back at M.I.T. QWX is at Memphis. PB is back in the movie business once again. QBU made all the necessary arrangements for a WERS set-up at the Moore Shipyard. SSN built the FB crystal rig and all those that have seen and heard this station on the air claim it is some layout. KFMY-4, Oakland Red Cross station, is working FB with WERS. A set building for one of the scout cars will be in operation shortly. This car proceeds to any disaster and will be of great help to all concerned when this WERS unit is completed. A few members are taking the exam so an operator will be sure to be present when Red Cross takes to the field. ACM, in the Navy 4 years and now overseas in the So. Pacific, wishes to say hello to the gang. CUG reports that EPP writes from Rio regularly. BZY is in Iraq. Please drop me a few lines so I can pass along the dope. Another day closer to victory. *TI.*

SAN FRANCISCO — SCM, William A. Ladley, W6RBQ — EC: DOT. PGB is still at the Presidio as engineer for the Army. Rex is also a member of the San Francisco Aux. Police Dept. and recently captured a three-time loser as he was in the act of robbing a fashionable San Francisco residence. CIS wants to hear from the gang. LV is holding down an important job with Eimac. SZ has moved to 1440 Drake Ave., Burlingame and we lose another good member to Santa Clara. WN is advanced to superintendent of spiral filament department at Eimac. Lt. KJ has been retired from the Navy. R/2 1NHN returned to T.I. from her furlough in Massachusetts, where she attended a family wedding. RBQ entertained 9ICN, 9ILH and 1NHN on the evening of July 29th. Director McCargar's daughter has joined the WAVES and is stationed in San Francisco. DUC is reported recovered from his past illness and back at sea operating. LLW is busy in Salinas. PIV is doing special monitoring. NQJ reports as follows for SARO: SAQ is an ensign in the USN. QWX is a lt. in the USN in Illinois. CBX is now a lt. comdr. in the USN stationed in S. F. IPK is a lt.(jg), USN, located in Massachusetts. QVI is a major in the Air Force and is located at Hamilton Field. OCZ is a lt. in the USN, doing duty in the So. Pacific. IMA is a sgt. in the Air Corps, located at Marcos Field, Texas. AVX is a master sgt. with a post office address out of L. A. EHS is a lt.(jg) with address out of N. Y. C. ZF is now a major. His address is: Major R. G. Martin. Hdq. AACS Wing, City Bldg., Asheville, N. C. NZG is a field engineer for Westinghouse in the So. Pacific. GTY is doing his share with Westinghouse. BEZ is a field engineer in radar work. DMY is with Western Electric, address out of N. Y. C. S/Sgt. JWF, APO 559, c/o Postmaster, New York, is doing a great job in radio. Radio Aide Gene Pera advises continued activity in all WERS drills and states that all 75 members are as faithful in attendance as ever. BUJ is spending his vacation with his family on the Russian River. We need additional ECs in this section, especially in the San Rafael, Santa Rosa and Eureka areas. Please drop me a card if you are interested. Let's try to keep our field organization alive for the big day. 73, *Bill.*

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, H. F. Hekel, W9VGC — Acting SCM, Howard R. Markwell, W9TFP — The Radio Widows Club held their annual picnic on Aug. 7th. Husbands and families were invited. A fine supper and ragchew was enjoyed by all, at least until WERS time. As usual, the men folks deserted for the Cause. Portable-mobile was worked by most of those present. They were 3JIN, 9WYX, CAA, VGC, ACB, TFP, Bob Hawley and Frank Baird, all members of KFND. The following morning VGC, your SCM, suffered a heart attack. At this writing he is doing fine and is expected to be home from the hospital by the time you read this. We expect him to be able to continue the SCM job soon. 7GYY reports a new jr. operator at his house. VIK says he will soon be going to some island in the So. Pacific. TPI, a lt. in the AAF, was home on leave in July. ODV's wife has been very ill in the hospital. CNL is expected back in Denver this fall after spending about a year in Southern California. WYX is still hard at it on that small 2½-meter rig. We hear that EHC, former SCM from Pueblo, is now a captain in the Air Corps and is stationed in Washington on a new job. Some of the newer members of Denver WERS are ACB, Don Wells, Frank Baird and Howard Paustian. 73, *Howard.*

SOUTHEASTERN DIVISION

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — GVU of Orlando has a new EC certificate. He comes through with a fine report as follows: QN at Jax Navair has our hopes for a speedy recovery. CLW is doing OK now that his YF has returned from a Calif. vacation. DWI keeps busy by tuning pianos. 1st Lt. GJO, Air Corps, is back and is with CAA inspecting. ASE is rebuilding his Mimms 10-20 Dual. PEI is back with ACLRR. Maybe he will write. GJI says we are stealing his talent; he has lost DPD but EHZ has helped him some. Tip has a cop teaching the WERS crowd there. From the cold country GEE writes that he is a sgt. in Signal Corps air communications. He wants to know where GGL is located. COZ called me on the 'phone and gave me the dope on DPD. QW is chief warrant here in Miami with RMO Navy. COZ and DPD are getting into WERS with BYF. ANP made a trip to Detroit. ES is making an extended business trip to Chicago then to New York, returning to Miami in November. Alonzo says 3NR of Baltimore is our OPA head here in Miami. NY4AB stopped by to QSO ES and KK. He is on a 120-day leave from the Navy. The ole "Guantanamo Pirate" has earned this leave. KK is having trouble with his receiver. EYI of St. Pete sends me a nice photo. He says: "FHX, CRT Navy, is on a 15-day leave. DBA, now chief engineer for Motorola, was there on a short visit. DHD is back from the Canal Zone and joined the Army. FPC is back in civies with a medical from the C.G. EPW is golfing."

Old Spence covers Dixie like the dew. CNZ has returned from a trip to California. His father has recovered from his illness. Tiny is teaching new procedure to PAA students. ASR, Director of the Southeastern Division, is really hitting the ball in more ways than one. He is one of the many looking out for the interests of the amateur and he is well pleased and happy over the way our interests are being taken care of and guarded in Washington by the right people. Bill comes through with the following information from Daytona. ELA in the last few years has gone from apprentice seaman to warrant officer, USN. He is now on the other side of the pond catching up with Hitler. HYX is back as staff sgt. from Europe with the Purple Heart, Air Medal, DFC, 13 Oak Leaf Clusters, and had 73 missions over Germany. FSS left WMFJ for Buffalo. AHK left FCC for Raytheon and Brooklyn Navy Yard; he has a new jr. operator. BDM is CRM, Navy, Wilmington, N. C., after two years in Panama. BUM is with FCC in Honolulu with the YF and jr. operator. HYQ is now a lt. in the merchant marine. VP, 65 years young, is still going strong as a machinist in Jax. WS, of the K. C. fame, is back in civies after a trip around the world with U. S. Engineering Department. DDB is overseas. 8BUN/4 is working Jax and Blanding from St. Augustine on 2½. He is back from a Blanding trip of instruction. With him in the Sig. Co. were: FWZ, BJF, CQZ BDY, Lt. Brown, Sgts. Todd, Lane and Long. Bill's report shows they sure put them through the ropes up there. He says he met a very pleasant fellow, AQU, the camp signal officer. I visited the local WERS and it is a peach of a set-up. BYF is doing a fine job; he has that ole sky hook 17 stories in the air. Mc and Bill ought to try a St. Augustine-Miami QSO, Bill's sky hook is up 100 feet. Mc is vice chairman of Red Cross communications and is assistant to Arthur Fish, our local FCC R. I. The following make up WKNW with Mc: Henke, Goodson, Mays, Orr, Pursell, Isom, Petruff, Jerguson, Russell, Davant, Carlton and Crotteau. Drop me a line. *Merf.*

WESTERN FLORIDA — SCM, Oscar Cederstrom, W4AXP— One of the happenings of interest this month was the wedding of Ens. Donald Leslie, AQA, and Miss Kathleen Miles of DeFuniak Springs. Donald was well known on 40-meter c.w. He was with Douglas Aircraft Corp. in Calif. before joining the Navy and was a graduate of Georgia Tech. The section wishes him and the missus much happiness. EPT lost his mother recently. This is the second death in his family; his father passed away only a few months ago. The section's heartfelt sympathy goes out to George. MS writes that he is planning things for 56 and 112 Mc. and has swell ideas for a storm net after the war. Eddie is fishing for a DM36 converter for his RME. For the benefit of those who have heard otherwise the OM says that he received a letter from KB stating that after a check-up at a hospital in New Orleans he is back home and well and anxious to see things wind up so that he can be back on the air. The OM is out again after about six weeks in a Naval hospital. He found out the last couple of days he was there that he had been treated by an old-timer in the radio game, Dr. G. R. Smith, who was experimenting with radio back in the old days of spark transmitters. The doctor helped to build old 5YA, which later became WAPI of Auburn, Ala. A pleasant hour was spent talking about old times and the doctor could really tell about such old time gear as rotary spark gaps, glass condensers built from static machine plates, etc. He used to take *QST* and enjoyed looking over our new copy. It shows you can never tell where you will find a radio man; they are in all walks of life. We wish to thank the gang for the letters, visits, etc. UW puts in some time repairing radios when he gets an odd moment away from WCOA. 73, *The Old Maestro.*

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, H. F. Wood, W6QVV — On Sunday, Aug. 6th, the Los Angeles gang played host to all WERS licensees in this immediate area, at Griffith Park. Walt Matney did a swell job in choosing and reserving for us a fine location on Pepper Tree Lane. Over fifty families were present. Cal Tabor promoted a very FB p.a. system and a b.c. receiver for entertainment at lunch time. Rudy Jepsen and Don McCoy did a swell job in posting the roads leading to the tables, but even so RO found it almost impossible to find. Fred Eaton brought along portable power supply that worked better than the a.c. line brought over to us for the checking and frequency-setting that went on during the regular scheduled drill period. Willy Wilson brought most of his gear for the occasion. Several pieces of equipment were on display and put into use. Many mobile jobs were in evidence and in use and it is said that the receiver squeal affected the other animals in the zoo, not too far away. Oh yes, the ball game — well, we are allowed to tell you that Los Angeles won, by default. Long Beach couldn't get up enough to make the trip for a team. Frank Milton did a swell job of talking the officers out of a tag for double or triple parking and, taken all in all, everyone seemed to have a fine time. Sure was good to see so many of the gang together again. Hope we can have more of these affairs. AM reports that three of the KGWE stations now have Alford Romander six-element beams and are getting out 1 to 3 Rs better. All units are still very active under the able leadership of 6RO. Fred Stapp of KGIC is busy shifting frequencies for his gang. Another group is about ready to start training as operators. More equipment is being added. The license is being modified and there is a great deal of activity out there. KGLV controls are working very much better now. The frequencies have been pretty well set so as to cause as little interference as possible with other licensees. Some new equipment is being lined up and new locations found because of changing control centers. KGCL units are holding drills regularly and from what Harlan Martin tells me, his plan for the operation of the county group is working out very well. A little note from RNN of the Inglewood Club, enclosing the envelope in which he sent last month's report to me, shows that it was misaddressed. He made up for it this time by sending in the following personals: SEL is in pre-radio training at Great Lakes. RNQ is in charge of radio maintenance for the Navy at Whidbey Island, Wash. SMG is doing ditto in Oregon. LAO is now in the merchant marine. QIR has been working at Northrup Plant this summer as a respite from his regular teaching activities. SPT is now bowling in the 200 class, and is ready to "take 'em on." Nice report, RNN, and the idea of a club bulletin to be mailed to your members overseas, etc., is a honey and I am sure every one who gets a copy will appreciate the work it takes to compile it. I am told that this magazine is really read and reread in the far-off places and your friends would like to know more about your activities here. Come on, lads and lassies, let's give 'em the news. We understand from Murray Black that PWF is now down in the So. Pacific, in radio of course. UQL's new address is APO 980, Seattle. SCQ is on an extended vacation from regular duties. Mr. Martin J. Ommen writes to say that his son, STX, is now a corporal. His address is: APO 650, c/o Postmaster, New York. Bet he'd like to hear from the gang in Long Beach. Keep up your good work in WERS. 73, *Ted.*

ARIZONA — SCM, Douglas Aitken, W6RWW — The code class of one of the air fields entertained their instructors from the Tucson Short Wave Assn. and showed them around their installations. We understand there were a few red faces after the instructors tried to test their code ability taken from machine tape sending. GS has been taking a vacation up where he could fish. BMQ, who is chief factotum around b.c. station KYUM, writes that he is taking a radio course and finally getting some of the fine points down pat. PDA has gone up to the main line of the Santa Fe and is working out of Winslow. Lt. ILA yearns for ham days again, and in the meantime is doing his bit in the war effort up in Michigan. REO has just finished his flying course and has bought a Piper Cub. KOL is still in Philadelphia helping to install radio equipment in planes. NRP has been home on leave, after enjoying the pleasures of boot camp, and will return for active assignment. ROP is on the sick list again. The Salt River Valley WERS gang had a social with their lady sheriff and sheriff-elect in attendance. A swell time is reported with MAE and NEL as a part of the quartet that helped with the musical portion — keeping the vocal cords in trim for the resumption of 10 meters, I'll bet! KTJ is a very active member of CAP, and takes much interest in the WERS set-up. QLZ is now in Los Angeles and longs for the wide open spaces of the desert country. SOG longs for the resumption of hamming. SQN, from the Verde Valley section, dropped in and we hashed over what we hoped to do "when"! If you want to make a hit with TBR be prepared to talk dogs; Jess owns a fine kennel. Jerry Johnson dropped in on OAS-TBR the day after they'd mailed him a license manual to some So. Pacific address. UKB is in a torpedo squadron. Won't every fellow reading this please sit down and drop a card with his doings and those of any of the AZ bunch? News is tough to get, and we are all much interested in you fellows. 73, *Doug.*

(Continued on page 74)

★ ★ ★

MAYBE you who read this page are one of the many amateurs who have written us giving specifications for your ideal post-war receiver. We asked for your ideas some time ago and we are grateful for the many helpful suggestions that we have received.

In the letters which have come, high performance is taken for granted. Our correspondents likewise expect post-war models to incorporate the radio developments of the war years, wherever they are applicable to amateur work. Since this is precisely what we had planned, it makes the verdict unanimous on both counts.

However, when it comes to details, we find that amateurs are individualists. It was a rare thing to find two letters describing similar equipment. One amateur wants amateur bands only. Another cares little for special amateur ranges, but wants general coverage from 50 KC to 50 MC. A complete array of coils of the HRO variety would meet these requirements, but how about the hams who turn thumbs down on plug-in coils and will have nothing but a switch?

Then there is the man who uses earphones exclusively, and who wants his communication receiver light and compact. He neither needs nor wants much audio output. In the same mail we hear from the fellow to whom anything less than 20 watts audio output, class A, is inadequate. Again, we learn that third harmonic distortion is a serious defect, and that the audio output transformer requires some twenty pounds of iron and copper to give satisfactory results. We are urged by another to make our receivers light and compact enough to be carried anywhere with ease.

And so on. Anything we do will have to have an element of compromise, as you can see. However, by making enough different models and using all our skill, we will be able to meet these varied requirements remarkably well. So if you do not see *exactly* what you had planned when you thumb through our 1946 catalogue, at least we are sure you will find equipment that is superbly suited to your specialized needs.

Amateurs needs *are* specialized, and we expect a divergence of opinion. Only once have we received an unanimous verdict. That was the time we asked whether you preferred pigtail leads or "cotter-pin" terminals on the R-100U choke. Only one amateur wrote to us. He wanted pigtails, unanimously.

W. A. READY

Amateur Activities

(Continued from page 78)

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — Asst. SCM, Gordon W. Brown, W6APG — Thanks, fellows, for the news you are sending in. KW was married June 28th at Santa Ana to Miss Roxanna Martin of Newton, Mass. Mr. & Mrs. Griggs are living at San Pedro, Calif., where Johnny is working. RBY quit the bakery after 15 years and goes into the radio repair business for himself. PBL is civ.lian employee of government radio. EOP is still on the job as a street car inspector. ELL is now with the Daily Journal after 5½ years with Solar Aircraft. MXK is with CAA at Sacramento. AJM is now a lt. comdr. stationed at Washington, D. C. TIX is at Quartermaster School Training Center, San Diego. EDJ and FQB are at Sound Lab., Point Loma. TBI is still in LaJolla and doing well. FTT, who is with Raytheon, is back in San Diego for a vacation. DBV is returning from Phoenix, Ariz., to Hemit, Calif.,to take charge of field for Ryan Co. 8VHN is now in San Diego and would like to see something started toward WERS. How about it, gang? Let us have your comments. CRB is back in the Navy. A nice letter was received from Lt.(jg) AAA, who is supervisor of field training at Naval Air Navigation Radio School, Gainesville, Ga. 73, *Ralph.*

WEST GULF DIVISION

OKLAHOMA — Acting SCM, Ed Oldfield, W5AYL — EIO is employed at Chicago Pneumatic Tool Co. and is keeping cool by sailing on Lake Overholser. EHR is assistant foreman of link trainer department OCAD and travels around repairing trainers. AYL advertised and sold the Oklahoma City club's portable power equipment. Receipts are now in the keeping of the club's able treasurer. CXE and APG attended the CAP meeting recently in order to assist them with their radio problems. The Oklahoma City Radio Club will meet in Sept. to hash over old times and plan for the future. Remember, we still have a convention to put on when things are back to normal. BBL and JPQ are operators at the Douglas Tower, Oklahoma City. EHU, JDB and BYC are flight operators on C-47s at the Douglas Plant. EGC is a 1st lt. doing radar work on the West Coast and has been married a year and a half. JCJ visited Oklahoma City recently. HXR is a flight surgeon in Australia and his brother, HRT, is a prisoner of the Japanese. BKK works at Washington, D. C., and visited JHO, an officer in the Navy. BKS is employed at Bell Labs. HFX joined the Navy recently. HGB is in civil service on the West Coast. IUF is deputy sheriff and dispatcher at KGPH. IQR is teaching radio at Corpus Christi Navy station. AYL is foreman of radio repair section, OCAD. I wish to thank all of you who wrote. Let's hear from more. Regards, *Ed.*

NEW MEXICO — SCM, J. G. Hancock, W5HJF — GSD got his degree in physics from Caltech in June and after a week at home was inducted into USNR with RT training as his first assignment. My two-year term expires in October. Maybe you guys would like to report to a new SCM. Whoever he may be, *report* once in a while. 73, *Jake.*

BRIEFS

Friends of Howard C. Seefred, W6EA, ARRL's first Pacific Coast director and trunk line division manager, may be interested in knowing that he recently completed twenty-five years of service as a meter reader for the Southern California Edison Company.

Sgt. E. H. Nickell, W6FCF, an enterprising ham stationed at Camp Davis, California, wanted to find out how many hams there were around him, so he published the following announcement in the local camp paper, the *Signaleer:* "How would you like to meet other radio amateurs, chew the rag, swap ideas and maybe make plans for a beer-bust or similar gathering? Well, here's your chance. If you hold an amateur radio op's license, any class, we would like to meet you. Just put your name, company, call and home town on a slip of paper and drop it into one of the many *Signaleer* boxes. If we can interest enough hams in a get-together, we will contact you either through your company or thr ugh this column."

We haven't as yet heard what success Sgt. Nickell has had in rounding up the ham brethren, but it seems like a good suggestion to hams in other camps and bases who would like to find out where their fellow amateurs are located.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on twenty-four hour duty with the AACS
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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

The Month in Canada

(Continued from page 66)

The death of W7ABT, Doc Lamb, of Kalispell, Mont., reported in Silent Keys, came as a shock to his many VE4 friends. Doc was a very popular member of the "Breakfast Club" net which hooked up early each morning back around 1935-36.

4BW, Ted Sacker, of Edmonton, has relinquished his commission in the Reserve Army, in which he served as O/C "E" Troop, Cavalry Signals. 4HT, Fred Sterling, of Edmonton, Ted's second in command in the unit, also has given up his commission. 4AEN, George Marion, of Edmonton, as noted here a month or so ago, is with the RCN taking over a ship in South Carolina. George reports that in recent days two hurricane warnings gave them a bit of a thrill. The heat there sort of gets him down. George has met several VE4 hams down there, and mentions 4MD, Ian McArthur, who apparently is a 20-meter hound. 4EA, Roy Usher, of Edmonton, head technician with CKUA, has been more or less tied up out at the transmitter recently while other staff members take a few holidays.

MAILBAG

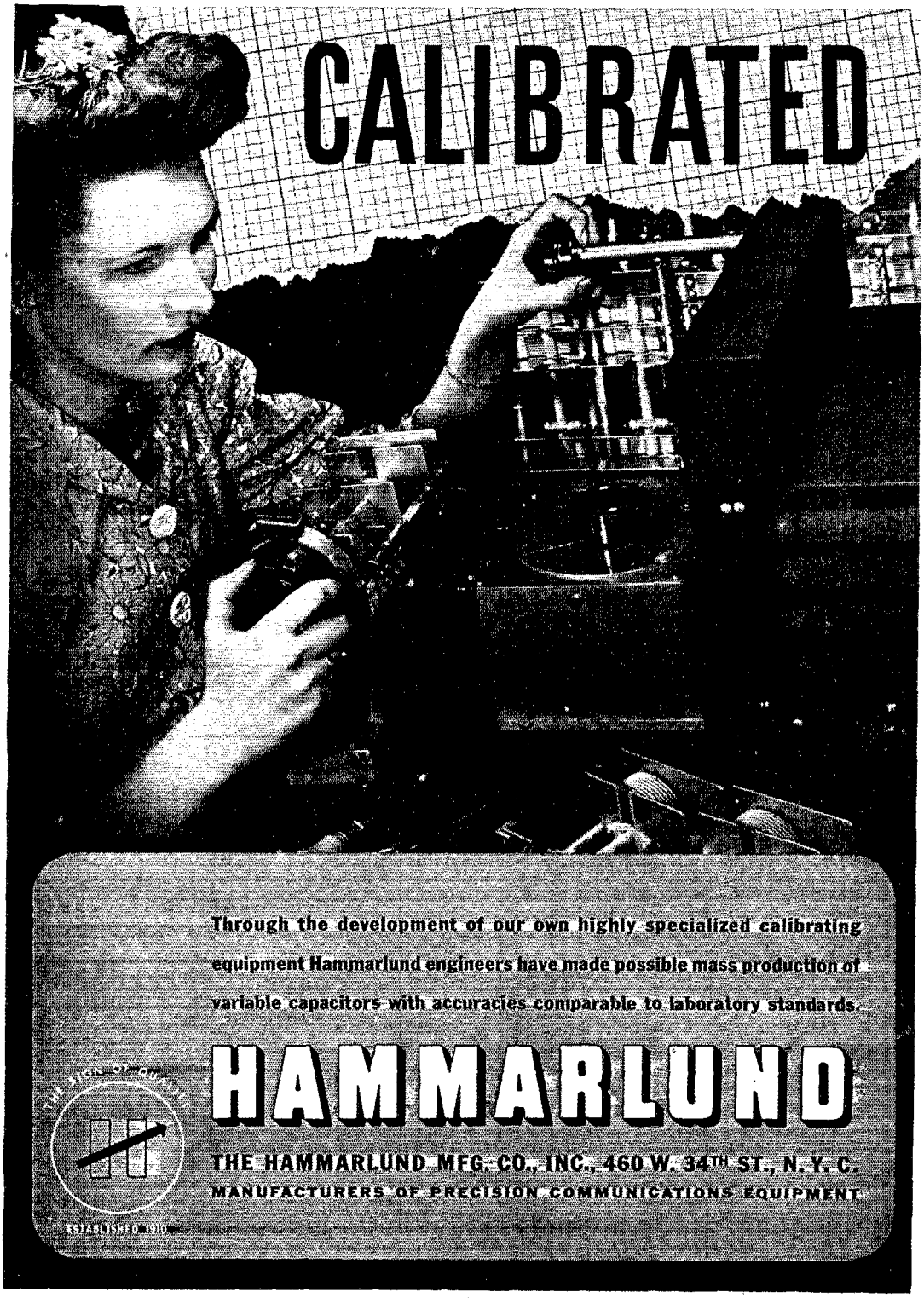
Complaining that, "the VE3 boys seem to be either awfully busy or awfully disinterested," Bob Potter, VE3TO, contributes these news items to help along:

"VE3KM is still busy in the machine shop — very busy, we might say. Ditto for 3JU, although he is not in a machine shop. 3OJ was a squadron leader in the RCAF overseas at last official news, although the grapevine says he has been upped again. 3PG is still chief engineer at CKOC and QRL plus. 3AND has moved to Hamilton from Smithville and is now in a service shop, as is 3TO, who has moved to Burlington from Bromsville. Incidentally, Burlington which never boasted (sic!) a ham before now has three: 3IA, 3TO and 3NP, who was transferred from St. Thomas. 3TO now knows enough to keep his feet dry after six months on the sick list following a very serious case of pneumonia with complications. 3CC has started in the service game following a spell of teaching at Westdale Tech. 3HQ, formerly of Caledonia, is now in Hamilton on a government job. 3IY, of York, is now overseas with the RCAF. 3AWE, of Grimsky, also overseas with the RCAF, got himself hitched to a Scotch lassie. Congrats, Ken. 3JP, of Grimsky, also is in the RCAF, his whereabouts unknown at the present writing. 3ANB, of Bromsville, is now a sergeant in the RCCS overseas. 3AW and OW are QRL on the farm. How are all the goats, Alf? 3FZ is still on the farm and 3FH is still at the garage. 3YB and 3NJ are both in the RCAF. When last heard from, 3YB was in Ceylon. 3QJ is now with Hydro at Tillsonburg. 3PT joined the Veteran's Guard of Canada and when last heard from was in the North Woods. 3AES also is in the armed services. Rumor has it he is in the paratroopers. If so, Heaven help the Huns!"

The following quotations from letters received by PO/Tel. David Scholes, VE5DY, from VE5RM in Italy, and VE5ACE in Ceylon, were included with VE5DY's notes published in the September issue of *QST*. Crowded out of that issue, they are included this month because, as we think you'll agree, they are interesting reading

VE5RM writes from Italy: "There is one guy we'd all like to catch and he is the man who called this place sunny Italy! I've seen more snow this winter than I have ever seen at home. I even got stuck in a blizzard one night and waited to get pulled out in the morning. . . . The visibility was practically zero and the wind was whooping it up around 50 to 60. I even shiver when I think of it. Then inside of about 48 hours it can change to nice warm, sunny weather in which you are able to work in shirt sleeves. . . . It's possible to get vino at almost any house — it's really 'Kickapoo Joy Juice' plus! Spaghetti dinners can be had sometimes. It's not bad stuff, but I still prefer Heins. Eggs come high, about 15 cents each."

Quoting from a letter received from VE5ACE in Ceylon: "We could get up a pretty swell hamfest right here with all the Gs and VEs. . . . The stuff we learned as hams has stood us in good stead out here where you have to improvise so much. . . . We have a p.a. system in our huts now. Chiefly made it up from stuff we had around, with a pair of 807s in the final. They drive a dozen permag speakers with lots of gusto. . . . I'd like to build a good super to get the States. Well, so long, Dave. Sometime I'll send you a pair of matched leopards in push-pull."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ESTABLISHED 1910

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BER, James E. Cole, Ipswich, Mass.
W1FK, Carl H. Biron, Pittsfield, Mass.
W2APH, Hermann H. Primavese, New York City, N. Y.
W3HIH, John M. Larson, Princeton, N. J.
W5FZJ–ex-W2HCP, Albert P. Bloser, Dallas, Texas
W8AEK, John McCulloch, Utica, N. Y.
W8MDZ, T. J. Jeffries, Akron, Ohio
W9ELW, Raymond S. Griffith, Burlington, Iowa
W9MDA, RM3c Hugh A. Middaugh, USNR, Princeton, Ill.
W9YGQ, Irving Berger, Chicago, Ill.
VE3AZE, P. F. Zyvitski, RAFTC, Oshawa, Ont., Canada
VE3PO, J. A. Hudson, Hamilton, Ont., Canada
VE5NB, O. C. McCombie, RAFTC, New Westminster, B. C., Canada

Missing in Action

W9HXF, RM2c Mathew S. Levy, University City, Mo., is reported to have been missing since his ship was sunk off Sicily in July, 1943.

W9MIA, Pfc. Richard E. Pettijohn, St. Paul, Minn., previously reported missing, is understood to be alive and well.

Prisoners of War

W8IYQ, Lt. Henry J. Saborsky, Farrell, Pa., who was reported missing in action in the Italian theater, is now officially reported to be a German prisoner of war.

Correspondence

(Continued from page 62)

could be made. This means that, while Latin Americans have come to this country in increasing numbers and great numbers of our boys have gone to several Latin American countries since the beginning of the war, *contact* with the people still "remains the long problem. . . ."

This is the problem faced by our government. The solution is known, but the method is arithmetically long. The government can solve any problem no matter how tough, and since the war speedy solutions have been attained. Take the radio problem at the beginning of the war. A call to the radio amateurs to help found the boys ready. A call for equipment got quick response. Amateur radio already has helped our government solve some serious problems. At the end of the war the government may call on us to help solve this one. I think amateur radio can offer a

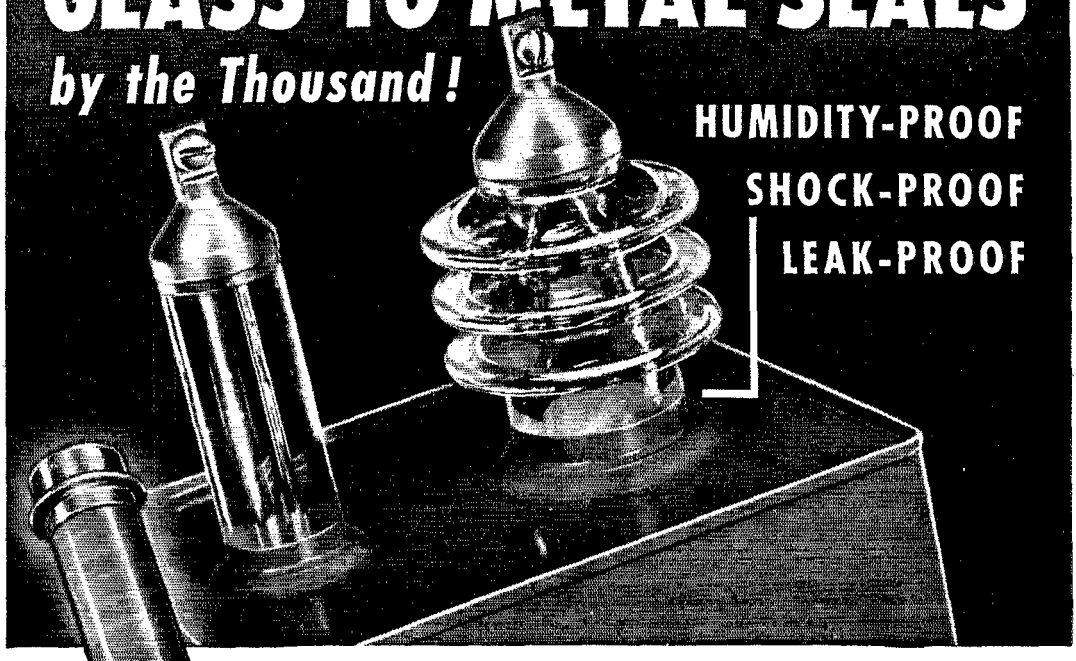
GLASS-TO-METAL SEALS

by the Thousand!

HUMIDITY-PROOF

SHOCK-PROOF

LEAK-PROOF



Another modern electrical development pioneered and perfected by Sprague

Pioneered many months ago by Sprague, glass-to-metal seals for Sprague Capacitors and hermetically-sealed *Koolohm Resistors have progressed far beyond any "laboratory curiosity" stage. Not only are they being produced commercially at better than 10,000 seals per day, but they have proved highly efficient both electrically and mechanically. Seal sizes range from very small up to 3" diameter. They work equally well with practically any metal including steel, brass, and monel metal, and do not require the use of glass bushings and adjacent metal rings with "matched" temperature coefficients of expansion.

There are, of course, plenty of "scientific" reasons why glass-to-metal seals of this type are not feasible. Here again, however, the allegedly impossible has simply provided the incentive for another outstanding Sprague engineering achievement. Actually, the only disadvantage to the seals so far uncovered is the fact that corona voltages are a little lower than we'd like them to be—yet this limitation only becomes a factor at voltages upwards of 25 KV. In all respects, the Sprague glass-to-metal seal answers the old problem of guarding Capacitors and Resistors adequately against leaks and moisture—and without organic bushings or other materials which might be attacked by fungus.

Today, glass-to-metal sealed Sprague Capacitors and *Koolohm Resistors are available in 8,000 electrical characteristic combinations—which is another way of saying that there is a sealed unit for every application that needs one. Details gladly sent on request.

SPRAGUE ELECTRIC COMPANY, NORTH ADAMS, MASS.

(Formerly Sprague Specialties Co.)

ARMY E NAVY

*T. M. REG. U. S. PAT. OFFICE

SPRAGUE

PIONEERS OF ELECTRICAL-ELECTRONIC PROGRESS

(*Continued from page 78*)

method algebraically short. We must be ready. We don't have to be especially trained to talk to people. Our interest is purely and exclusively friendship. We do not serve any business or political interests.

But there is one thing we must do in order to achieve perfect understanding, and that is learn Spanish. Happily, Spanish is the easiest language to learn, but that does not mean that one should take it up lightly. I firmly believe that it takes less time to learn Spanish than any other language, for the simple reason that Spanish is based on only *five invariable* sounds. English has 29 different vocalic sounds, according to a well-known dictionary; French has 14, according to a well-known method. The Spanish consonants offer no problem at all. Pronunciation of the words is ruled by two letter-endings. . . . The verbs, unreasonably feared by many high school students, really are not so tough. Many of the words used in amateur radio Spanish are so similar to the English words that anybody can translate them at first sight without any previous experience. Take these words from my vocabulary of high-frequency terminology for example:

amplificador, condensador, modulador, oscilador, rectificador, transformador; amperio, circuito, faradio, henrio, negativo, positivo, tubo, voltio

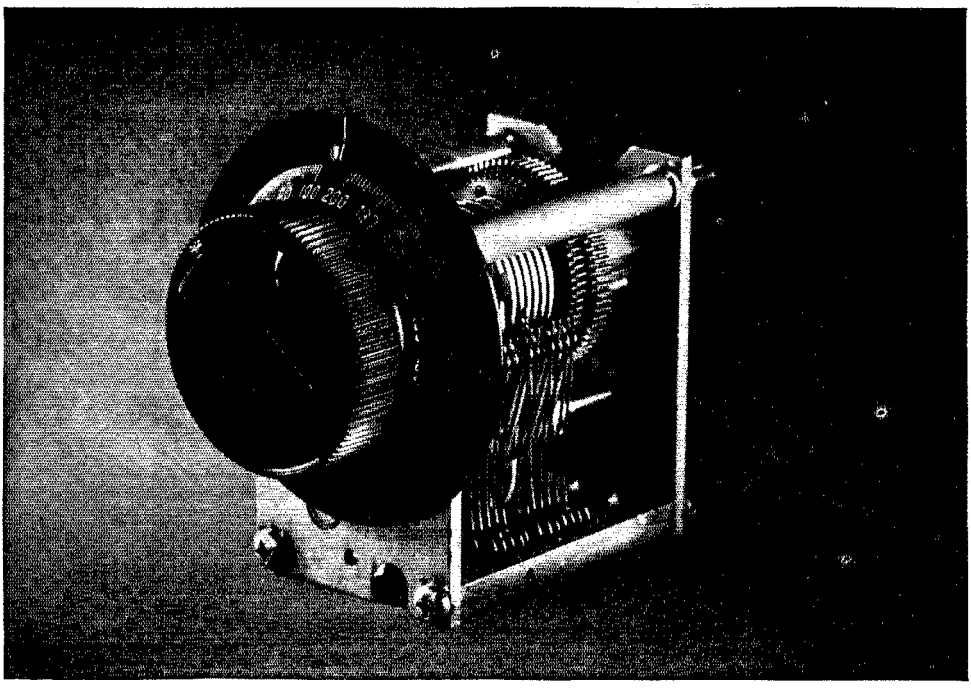
Anybody can pronounce, spell and copy, and also get these words fixed in the head once the five fundamental sounds are known.

One night I listened to a fellow in the Middle West trying to speak Spanish with a telephone operator in Central America. He was having a fight (with the Spanish), but he was determined to conquer the language. And she was getting a tremendous kick out of helping him.

That night I clearly visualized the great potentialities of amateur radio as a means perfecting understanding between the Americas.

Amateurs are a unique group of people who were sought and heard and spoken to by real people at the other end — other amateurs, their families, friends and neighbors. And they are a unique group of people whose mere greeting, "Good evening, Old Man," brought cheer, pride and a profound feeling of expectation wherever and whenever it was heard. No other group of people has that privilege. Unquestionably, amateur radio's position in this particular field is very strong. It can promote real friendship among the peoples of the Americas and bring perfect understanding through personal contacts by radio. That is the algebraically short method that we can offer.

. . . I began to work on a plan to help the boys learn Spanish. I sought a system that would be basically simple; one based on five sounds and two fundamental words. The idea was to go on the air and get round tables, and later on as the boys progressed to add fellows from Spanish speaking countries. It is said that a language is quickly learned by living with the people who speak it. In other words, the sounds do the trick. That might have been the case if the war had not



COLLINS AUTOTUNE*

The Key to Precision Control

THE Autotune was conceived and engineered by Collins many years ago. It was the result of a growing dissatisfaction with slow, haphazard methods of tuning radio equipment and a persistent effort to improve them.

What is it? How does it work?

The Collins Autotune head shown above is a mechanical device for turning a control shaft and stopping it precisely at any one of several pre-determined positions.

The Collins Autotune system consists of a number of Autotune heads, all driven by a single electric motor, each quickly and simultaneously repositioning a separate and non-interrelated tuning shaft to new settings chosen in advance by the operator. At the touch of a button or flip of a dial, the Collins transmitter or receiver is thus completely and exactly tuned to the wanted channel in a matter of seconds.

Collins communications equipment, Autotune controlled, was adopted by American Airlines, Braniff Airways, Tropical Radio Telegraph Co. and others long before the war. Reliability has been demonstrated through the years under all service conditions.

The Collins transmitter design and the Autotune have proved so advantageous to the Armed Services that military authorities have requested other large companies, in addition to Collins, to build them. The Collins Radio Company, Cedar Rapids, Iowa.

ARMY E NAVY

COLLINS

*U. S. Patents issued and pending.

(Continued from page 80)

prevented putting the idea to work, because through radio we would have lived among Spanish speaking people right at home!

Yes, sir, the radio amateur in the new world to come is going to be a very busy man. How can he afford to be the ham of old? He can't! If we were able to help in the war effort, we can help in the peace effort. When it comes, the solution of that problem won't take such a long time as Washington seems to think. I am sure a call to carry out this mission would get many volunteers. How about planning now to organize a special corps for this urgent postwar service to the nation?

— *Chas. I. Otero, W8UPH*

DOC LAMB, W7ABT

Box 422, Livingston, Mont.

Editor, *QST:*

I was very much disappointed in the mere mention of the passing of J. Arthur (Doc) Lamb, W7ABT, of Kalispell, Mont.

Truly, Doc was the dean of Montana hams, and we have lost a grand and noble friend. I don't believe there is an amateur in Montana who didn't know him.

Doc has taught hams for the last 20 years and many of them are now in the services as operators or in commercial work. He started classes in ham radio as far back as 1920 and each year sponsored classes either at his home or in the school until the outbreak of the war.

Doc was known and loved by all. He numbered his ham friends by the hundreds, not only in Montana but in all the northwestern states as well as in Canada. He was the friend of any lad who came along and saw him through to a ticket. . . .

— *Geo. H. Whitfield, W7BWH*

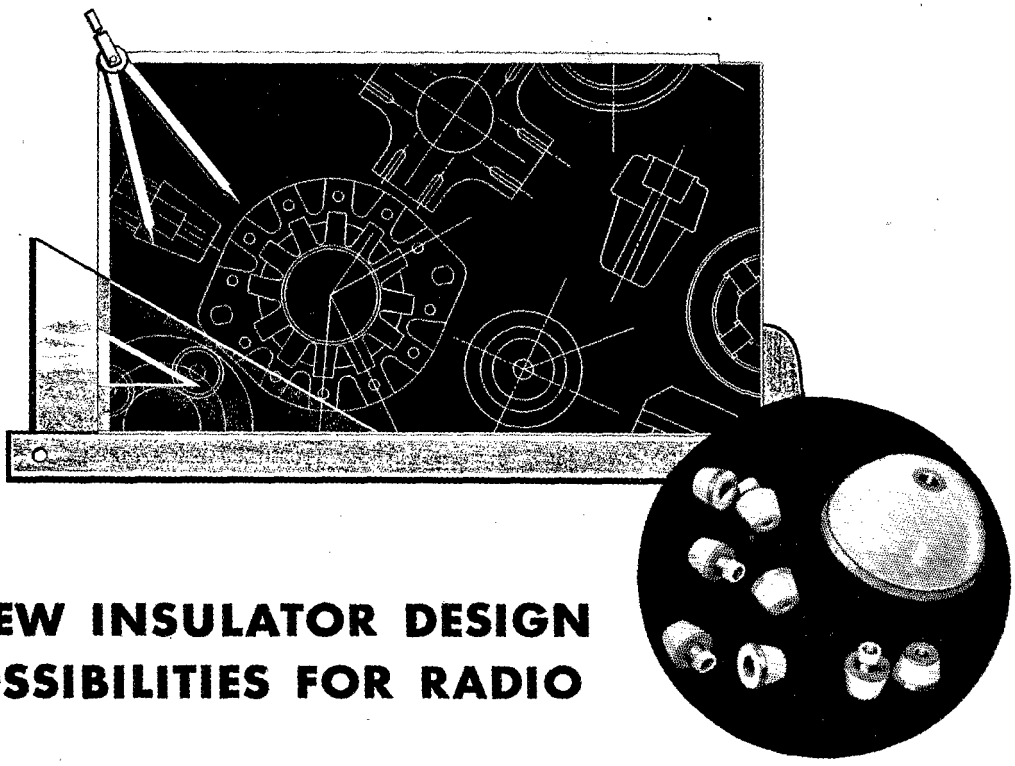
"THE PERFECT COMMUNICATIONS RECEIVER"

Hq. Bty., 612th Field Artillery Bn.,
Camp Carson, Colo.

Editor, *QST:*

Having been a radio enthusiast for about seven years now and having in that time had cause to swear loud and long at all manner of electronic concoctions dignified with the title of "communications receiver," it is a real pleasure to come across a design which to me embodies the finest compromise between stability and gain, and emphasizes the best features that can be built into a fine communications set. From antenna terminals right through to speaker A. D. Mayo's receiver described in the April, 1944, issue of *QST* seems to me to contain every good feature I have ever run across in receiver design, without including any of the things that have struck me as not only unnecessary but often downright detrimental to a set's operation.

In this connection I want to mention one particular point which caused me to leap with joy. Many is the time I have seen large receivers using many tubes which failed to bring in the DX I looked for from such sizable units for a very



NEW INSULATOR DESIGN POSSIBILITIES FOR RADIO

General Ceramics' successful surfacing of steatite with thin films of silver, fired at a high temperature and then built up with an electroplated metal (silver, copper or tin), opens up new insulator design possibilities for very high frequency equipment, as well as for certain applications in the lower radio frequency field.

The metallic film can be applied to the surface of insulators to eliminate corona effect. The use of this combination permits improvement in the design of airplane strain and lead-through insulators.

The addition of a thin metallic surface film also permits soldering of metal parts directly to the steatite insulators. Water-tight seals may be made in this manner where temperature ranges encountered in service are limited.

Your inquiry regarding *Silver Surfaced Steatite* is invited.

ARMY E NAVY

General Ceramics
AND STEATITE CORP.
GENERAL
KEASBEY
NEW JERSEY

(Continued from page 82)

simple reason — over half of the tubes were used in an audio system of a size totally out of proportion to the requirements of the set and utterly irreconcilable to the purpose for which it was intended; namely, bringing in that VK without a lot of QRM. . . .

Personally, there are only three things I would be tempted to change. One is the 500-ohm cathode bias resistor of the 6V6, which I would cut in half (or is there some special reason for using the high value?). Another is the screen voltage, which I might be tempted to raise by putting the common screen supply lead up a little nearer the high end of the voltage divider. And, finally, I have never liked Lamb noise silencers, so I'd probably stick grid No. 3 of the 6L7 down on the bottom of the first i.f. transformer's secondary for extra a.v.c. action, and to heck with silencing. . . .

As to the rest of the set, I was overjoyed at finding such a beautiful design for a homemade tuning system. The simple but effective decoupling used in the r.f. and i.f. plate circuits, together with the a.v.c. decoupling and the omitting of certain stages from the a.v.c. system, caused me to emit silent cheers. And, finally, the design of the mixer and oscillator, not to mention the perfect delayed a.v.c. circuit, completed my delight. Believe me, when this war is over and the dust covers come off my equipment and you can walk into a ham supply shop to buy stuff without being a candidate for a psychopathic ward, then the April issue of *QST* will come out on yours truly's bench and construction will start again — this time on the perfect communications receiver. . . .

— Sgt. Dean S. Edmonds, jr.

W.E.R.S.

Naval Training Schools, Co. 13–218,
Navy Pier, Chicago, Ill.

Editor, *QST:*

. . . Although I'm not a licensed amateur, the training the Navy has given me as an RT will enable me to obtain a call as soon as I can say good-bye to this blue uniform. . . .

I was surprised to open my copy of April *QST* and find the article concerning WERS in Cleveland, with the pictures of the gang and the stations I had worked while with WJJH–20 as a mobile operator.

You are doing a wonderful job of playing up WERS. With a lot of people it has to be played up before they can see the real value of the service. The Cleveland boys certainly proved WERS to the public.

— S1c (RT) John R. Dyar

HAMS TO BE

160th Armored Sig. Co.,
APO 44, Camp Campbell, Ky.

Editor, *QST:*

There are several hams in our Signal company here at Camp Campbell . . . and we are 100 per cent behind the ARRL. Since many soldiers here

WHAT FREQUENCY RANGE DO YOU NEED FOR HIGH FIDELITY REPRODUCTION?

"Frequency Range and Power Considerations in Music Reproduction" is the title of number three JENSEN Monograph, now ready for mailing. With the approach of FM, Television, High Quality Recording and other advances in the audio electric art, calling for new and increased emphasis on the requirements of High Fidelity Sound Reproducing equipment, this subject is both timely and pertinent.

Do you know the maximum, useful audio frequency ranges under actual listening conditions? Do you know how frequency range is limited even if perfect transmission, reception and reproduction were possible? Or how much change in high frequency cut-off is required to be just noticeable to the listener?

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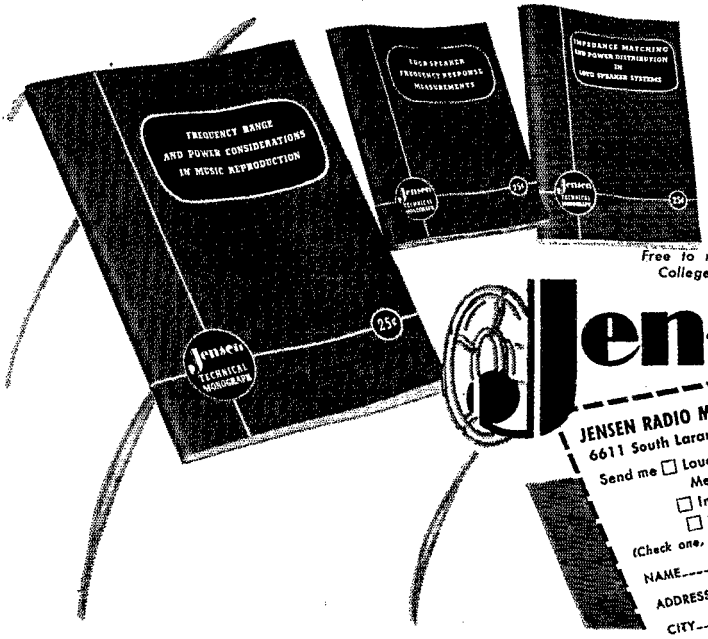

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(*Continued from page 84*)

are interested in radio and read our copies of *QST*, they are being guided by your magazine.

In my section, radio operation, very few of the fellows were familiar with radio theory or the technical aspects of radio, and they were quite interested in getting a little training. As we are being trained to become high speed radio ops, we cannot be alloted school time for a class in radio fundamentals.

I had taught a few classes in civilian life so volunteered my time here. . . . Last week we started our after-duty class. We spend two hours two nights a week and so far we have covered much ground. Many of the soldiers want to gain enough knowledge for amateur licenses and others for commercial licenses. Sixteen have signed up so far and we haven't finished recruiting yet. . . .

— *Pvt. Floyd A. Paul, W6THU*

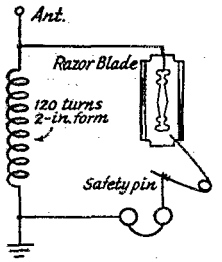
FOXHOLE RADIO

448 Riverside Dr., New York, N. Y.

Editor, *QST:*

Here is some more information on the foxhole radio sets used by the boys on the Anzio beachhead. In the daytime they could receive stations from Rome and at night Nazi propaganda "jive" programs from Berlin.

Here is the diagram:



This idea was tried here in the U. S. A. by, I believe, RCA. They found out that it worked wonderfully, and also discovered that by replacing the pin with pencil lead it worked even better.

Oh, yes, of course it was a ham (from New York), who thought of the idea. It just goes to show what a ham can do. . . .

— *Justin Garton*

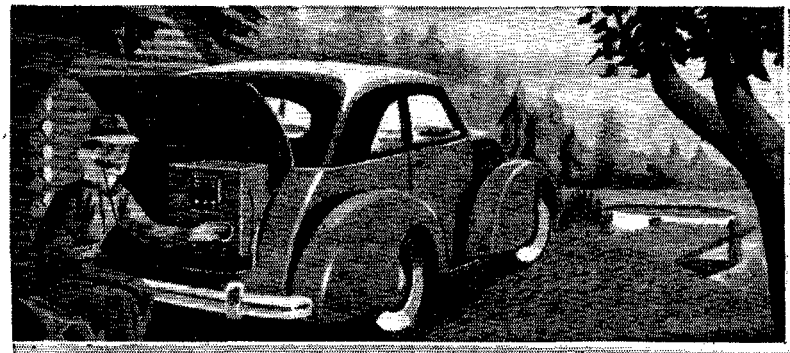
EDITOR'S NOTE: The foxhole radio receiver first mentioned in *QST* for July, p. 62, and described in more detail in the August issue, p. 58, made *Time* for July 17, 1944, although without credit to hams — as usual.

SWEET ESSENCE OF LIVING

At sea

Editor, *QST:*

As your magazine has always furnished yours truly with faithful, tender, mind-soothing comforts during countless years spent rummaging around the shack at home, hunting for this bypass, that variable, the long-unused bottle bearing its indelible cryptic recordings of midnight



E-L VIBRATOR POWER SUPPLIES INCREASE RADIO-TELEPHONE VERSATILITY

ONE of the important unsung factors in our total war for victory has been the War Emergency Radio Service which has performed a vital function in the communications field. E-L Vibrator Power Supplies are assisting in this service with multiple input power packs which are designed to operate both in portable or mobile applications and from 115 volt AC.

E-L pioneered in the field of vibrator conversion of current. Today, the development of this method of power adaptation has led to such exclusive E-L advantages as constant voltage despite wide fluctuations of input voltage, power output of up to 1500 watts, and any wave form, including pure sine wave.

E-L Vibrator Power Supplies have stood the tests of the most rugged combat use in military service. This dependability will be built into your E-L Power Supply when peacetime production is resumed. Give your name to your dealer now for early supply after the war.

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Available today with AA3 priority. See your dealer.

One typical unit for mobile or portable application with such equipment as the 5 or 10 meter rigs is Model 619. This power supply will allow you to operate from your regular 115 volt AC power line and then switch easily to your 6 volt auto battery when you take off on a trip.

Input Voltage: 6 volts DC and 115 volts 60 cycle AC
Output Voltage: 300 volts DC at 100 ma., 6.3 volts AC at 100 ma.
Output Power: 55 watts max.
Dimensions: 9¾" x 5¾" x 6" Max. Wt. 14½ lbs.

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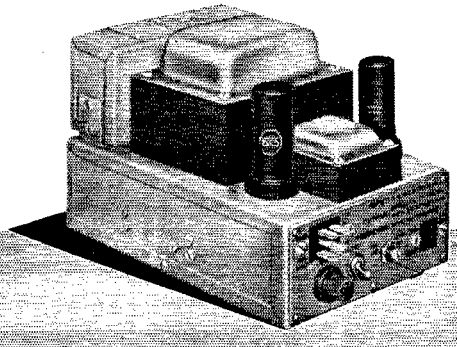

Electronic

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(*Continued from page 86*)

chews of delicious ham-fat, I deem it an impossibility not to make at least a poor attempt to let you hear from one more ham living for the return of those good old days.

I just wrote my espoused luxury to try and find at a local *QST* Station (just a book store to the uninitiated) some lengthy treatise on crystallography, piezoelectric bric-a-brac being somewhat the weakest guy-wire in my tower of electronic intelligence. I doubt, however, if the OW will fully comprehend the language of the inner sanctums of hamdom, but being a sea-going civilian op without any means of revelry in the postponed art, other than daily engravings upon every bulkhead of dainty caricatures of screwball circuits, I could no longer resist a last try at some enlightening material.

Of course, a subscription to *QST* would be best all around, but just to see one — just to turn those gilt-edged pages with reverential awe — would sprinkle the sky-dust over my brain with such effect that I would be anesthetized into a coma of placid dreaming, doubtless rendering my valuable services to Uncle somewhat futile.

Gee! To light the old corncob again, sitting well back into the full plushness of a cane-bottom chair; just to feel the gentle pressure on my temples of those Trimm Featherweights; to have my eardrums caressed by pure c.w. sigs again — avidly viewing a coming schedule with a ZL or two, stopping the seance long enough every now and then to scream at the jr. op to get his diaper-draped ground connection off the filter block! Ah — sweet essence of living, where art thou? . . .

Of course, I miss home itself, too, Mr. Editor, without a doubt. Ah — my little home! I can just vision the beauty of it all now — that little love nest, overshadowed by an intricate maze of copper wires, singing their melancholy tunes in the breezes, accompanied by the endearing but sometimes vigorous remarks of the movie-loving XYL, and blended with the plaintive SOS of the jr. op in three-cornered pants! . . .

— *R. G. Matthews, USMM, W4EAW*

An Electronic Keyer

(*Continued from page 55*)

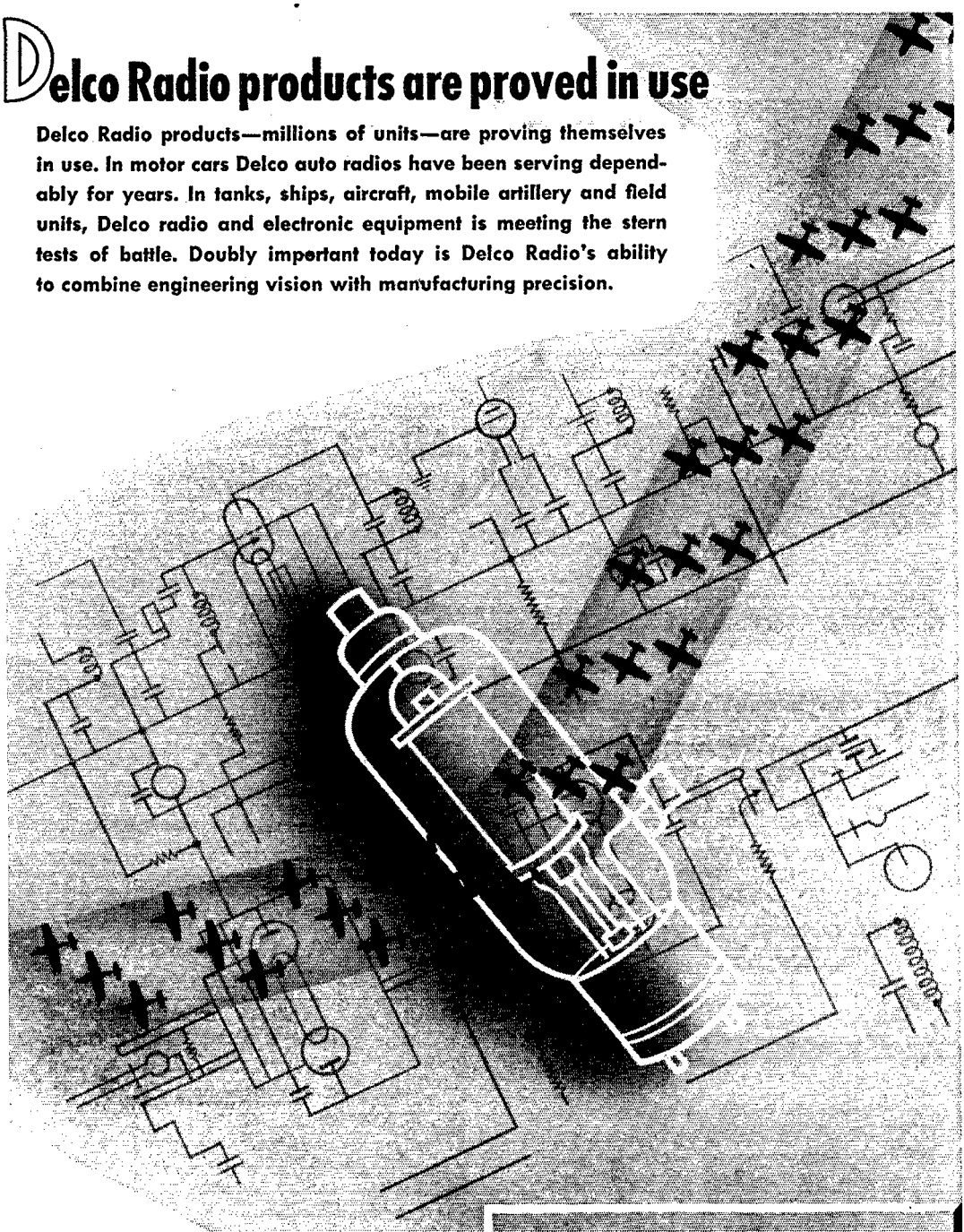
classroom use. Moreover, this outfit will work nicely with the siphon tape recorder which does the reverse job of copying down received messages on inked tape.[2]

So herein lies some thoughts for peacetime work with transmitters. Occasionally, and for brief periods of time, it is necessary to do some testing with the transmitter running as it would be in actual operation. What, then, could be better than a keyer like this one for the purpose? In fact, even in experiments with receivers, we have needed to "blank" and "unblank" the output with a device such as this one. Maybe you will know of another use about which *QST* readers would like to read.

[2] Grammer, "A Code Machine Utilizing Wheatstone Tape," *QST* for Nov., 1942, p. 29, and "A Hand Perforator for Code Practice," *QST*, June, 1943, p. 20.

Delco Radio products are proved in use

Delco Radio products—millions of units—are proving themselves in use. In motor cars Delco auto radios have been serving dependably for years. In tanks, ships, aircraft, mobile artillery and field units, Delco radio and electronic equipment is meeting the stern tests of battle. Doubly important today is Delco Radio's ability to combine engineering vision with manufacturing precision.



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Hints and Kinks

(Continued from page 59)

The following table will provide information concerning core area, wire size and number of turns required for transformers rated from 100 to 500 watts. Data found in *The Radio Amateur's Handbook* will enable the user to compute this information for higher ratings.

Watts	*Core Sq. In.*	*Wire Size*	*No. Turns*
100	2	21	450
200	3	17	300
300	4	15	225
400	5	14	175
500	6	13	150

The job will be simplified if the taps are taken off at the end of each winding layer. In the absence of better insulation, ordinary wrapping paper, doubled, can be used between layers.

Care should be taken to prevent shorting of the windings by contact with the sides of the core. Most cores have room for several windings in the original transformer so that there is no need to crowd the layers close to the core sides.

When the winding is completed, the wooden block is removed and the core carefully fitted back in its place. After assembly and testing are finished, it is well to take the transformer to a shop where armatures are rewound, for dipping and baking. The charge is generally small (mine cost 25 cents). This treatment will waterproof the windings and take the noise out of the core.

The autotransformer may be built into a box with a panel for the switch and outlets. In addition to the switch, tip jacks may be connected to the taps, and jumpers used to connect them to outlets furnishing different simultaneous voltages.

The box should be well ventilated, or the autotransformer mounted on the outside, as shown in the photograph. However, a well-constructed job should not heat appreciably under rated loads. — *Victor I. Brock, W9TUJ.*

Hams in Combat

(Continued from page 48)

assignments they have completed against overwhelming odds. One AACS force was ordered to establish a station at a strategic spot somewhere in India. It was on the Air Transport Command supply line between India and China. Unarmed C-46s, C-47s, C-53s and C-87s needed AACS help in the worst way over the Himalayas, the world's highest mountain range. Sporadic interception by Jap Zeros and howling 100-mile-an-hour winds were taking their toll.

An AACS task force was rushed from the States and worked feverishly for weeks to get the station on the air. Equipment came through in dribbles, but after ninety-one days the station was ready to take to the air. On the night before the transmitter was to officially begin operation the entire installation was swallowed up in flames. A careless native Indian boy had absentmindedly tossed a flaming match on the ground

(Continued on page 98)

(Continued from page 90)

near a fuel tank. Three months of painstaking accomplishment were destroyed in thirty minutes. Yet a station was on the air from the midst of these ruins a week later — thanks to the ingenuity of the ham on duty. He salvaged enough junk from the ashes to set up a transmitter.

AACS stations have since mushroomed into existence throughout the great expanse of the Arctic regions, in the tropics, in the Far East, in Africa and Europe. Hundreds of stations and thousands of operators are maintaining continual contact with tens of thousands of planes — be they in enemy territory on a bombing mission, taking off from a Kentucky cow pasture, or making a crash landing in the South Pacific. These are the men who literally "talk" the fighter, bomber and cargo ships across the treacherous reaches of the northern oceans and the vast stretches of southern seas — in 48 states and 52 foreign countries — through storm and fair weather, by bombers' moon and with ceiling zero!

WKAU Proves Its Worth

(Continued from page 41)

Publicity frequently is given to WKAU through the OCD monthly publication, *The Volunteer*, in which a column written by W8SWI is devoted to all local WERS activities. The local newspapers also cover the special incidents in which WKAU participates; frequent mention is made of WERS activities in the weekly "Ham Column," conducted by Al Allen, W8WA, in the *Detroit News*. Mention should be made of the following individuals and groups, also, for their invaluable assistance and support in the organization of WKAU: Emery Lee, FCC Inspector in Charge; Maurice LaBarre, W8MCD; The *Detroit News* radio station, WENA; The Great Lakes Amateur Radiophone Association; The Edison Radio Club and The Lawrence Institute of Technology.

The amateurs of Detroit, and of WKAU, feel a just pride in having upheld the amateur tradition to the fullest in accomplishing a valuable goal. When the war is over, it is expected that the training received as a result of WERS activity will result in many becoming amateur operators, and good ones, too. The rigorous training in correct procedure has served a useful purpose in contributing to the public weal, but it also has resulted in achievement and education for the individual operator.

New Tubes

(Continued from page 43)

frequencies as high as 225 Mc. The filament current drawn by the 25T is 3.0 amperes at 5.0 volts. Average interelectrode capacitances are: grid-plate, 1.5 μμfd.; grid-filament, 2.7 μμfd.; plate-filament, 0.3 μμfd. The tube measures 4½ inches in length and 1 1/16 inches in diameter.

The 3C24 draws a filament current of 3.0 amperes at 6.3 volts. Average interelectrode capacitances are: grid-plate: 1.5 μμfd.; grid-

(*Continued from page 92*)

filament, 1.7 μμfd.; plate-filament, 0.3 μμfd. Dimensions for this tube are: length, 4⅜ inches diameter, 1 7/16 inches.

General characteristics of the 25T and the 3C24 under typical operating conditions are:

25T

Audio Frequency Power Amplifier and Modulator Class B

	Typical Operation — 2 Tubes				*Max. Rating*	
D-C Plate Voltage	750	1000	1500	2000	2000	volts
Max.-Signal D-C Plate Current, per tube*	....	....	....	....	75	ma.
Plate Dissipation, per tube*	....	....	....	....	25	watts
D-C Grid Voltage (approx.)	−20	−30	−55	−80	....	volts
Peak A-F Grid Input Voltage	205	210	230	270	....	volts
Zero-Signal D-C Plate Current	43	32	21	16	....	ma.
Max.-Signal D-C Plate Current	133	120	94	80	....	ma.
Max.-Signal Driving Power (approx.)	1.4	1.2	0.8	0.7	....	watts
Effective Load, Plate-to-Plate	9200	15800	33700	55500	....	ohms
Max.-Signal Plate Power Output	50	70	90	110	....	watts

* Averaged over any sinusoidal audio frequency cycle.

*Radio Frequency Power Amplifier and Oscillator Class-C Telegraphy**

(Key down conditions without modulation)

	Typical Operation — 1 Tube			*Max. Rating*	
D-C Plate Voltage	1000	1500	2000	2000	volts
D-C Plate Current	72	67	63	75	ma.
D-C Grid Current	9	13	18	25	ma.
D-C Grid Voltage	−70	−95	−130	....	volts
Plate Power Output	47	75	100	....	watts
Plate Input	72	100	125	....	watts
Plate Dissipation	25	25	25	25	watts
Peak R. F. Grid Input Voltage (approx.)	170	195	245	....	volts
Driving Power (approx.)	1.3	2.2	4.0	....	watts

* The above figures show actual measured tube performance, and do not allow for variations in circuit losses.

3C24

Audio Frequency Power Amplifier and Modulator Class B

	Typical Operation — 2 Tubes				*Max. Rating*	
D-C Plate Voltage	750	1000	1500	2000	2000	volts
Max.-Signal D-C Plate Current, per tube*	....	....	....	....	75	ma.
Plate Dissipation, per tube*	....	....	....	....	25	watts
D-C Grid Voltage (approx.)	−20	−30	−60	−85	....	volts
Peak A-F Grid Input Voltage	230	220	250	290	....	volts
Zero-Signal D-C Plate Current	43	32	21	16	....	ma.
Max.-Signal D-C Plate Current	133	120	94	80	....	ma.
Max.-Signal Driving Power (approx.)	2.0	1.7	1.2	1.1	....	watts
Effective Load, Plate-to-Plate	9200	15800	33700	55500	....	ohms
Max.-Signal Plate Power Output	50	70	90	110	....	watts

* Averaged over any sinusoidal audio frequency cycle.

*Radio Frequency Power Amplifier and Oscillator Class-C Telegraphy**

(Key down conditions without modulation)

	Typical Operation — 1 Tube			*Max. Rating*	
D-C Plate Voltage	1000	1500	2000	2000	volts
D-C Plate Current	72	67	63	75	ma.
D-C Grid Current	15	15	17	25	ma.
D-C Grid Voltage	−80	−110	−170	....	volts
Plate Power Output	47	75	100	....	watts
Plate Input	72	100	125	....	watts
Plate Dissipation	25	25	25	25	watts
Peak R. F. Grid Input Voltage (approx.)	200	225	295	....	volts
Driving Power (approx.)	2.6	3.1	4.5	....	watts

* The above figures show actual measured tube performance, and do not allow for variations in circuit losses.

Splatter

(Continued from page 8)

was listening to the ham bands. It was not long thereafter before he obtained his present call. Since that time he has been very active in amateur radio and at present is the assistant radio aide for the City of Detroit. One of his favorite recollections is of a trip he and W8RNC made in 1941, visiting hams along the coast from San Diego, Calif., to Seattle, Wash.

Informing us that he has built dozens of pieces of equipment which have been described in *QST* and, in fact, constructs every interesting electronic device written up in *QST* — just to keep in trim for the days that are coming soon — **H. L. Haskins, W9FWO,** this time is reversing the process, however, and describing (p. 50) a device for others to build. He received his first license in 1923 and held the call 9AZV for six years. He then dropped out of radio until 1935, when the bug again bit hard. He took his Class C exam from W9CEA in Green Bay, Wis., and, not being satisfied with that, he made two trips to Chicago, first for a Class B and later for a Class A ticket. Anxious to do his part in getting the war over with, W9FWO became a code instructor in the U. S. Naval Training School (Radio) at Northwestern University. In the past two years he has taught the art of hand sending to Navy and Naval Reserve men whose numbers add up well into the four figure group.

Oliver Read, W9ETI–ex-9BGV (p. 16) eschewed his duties as a managing editor of *Radio News* long enough to pen for *QST* the article on page 16. Starting with a ham station at Evanston, Ill., in 1922 he joined the service department of the Central Electric Co. in Chicago, one of the original distributors of radio receivers in that area. Later he went with the Commonwealth Edison Co. and was engaged in radio sales. His first attempt at writing technical material came in the early part of 1938 while he was on the engineering staff of Utah Radio Products Co. He joined the staff of *Radio News* as technical editor in the summer of 1938, and has been managing editor since the summer of 1941. A member of ARRL, he possesses a Public Service Certificate for assistance during the Ohio River Valley flood of Jan.–Feb., 1937, holds a Code Proficiency Certificate for 35 w.p.m., and is a member of the Hamfesters Club of Chicago.

All of which brings us back to our old-timers again. Continuing his math series this month (p. 45) is **Edward M. Noll, ex-W3FQJ,** and back with more philosophizing (p. 48) is "**Sourdough**" (Splatter, May, 1943, p. 66).

•••—

FEEDBACK

In the circuit diagram of the "QSL"-type portable receiver which appeared on page 57 of the July issue of *QST*, the connection to the screen of the pentode audio section was omitted. The screen should be connected to the junction between the primary of the audio transformer and the by-pass condenser, C_5.

Book Reviews

(Continued from page 37)

configurations, boundaries and field distributions are discussed. Both rectangular and circular guides are used as examples in developing the theory. Explanation is given of methods of excitation as well as detection of the transmitted waves.

To increase the usefulness of the book as a text, a number of experiments on transmission line theory have been included. Certain derivations and mathematical developments have been placed in the appendix. These include Fourier's analysis, loop equations, Bessel functions, Maxwell's equations and other derivations.

Like the first edition, this is one of the better textbooks offered in the field of communication engineering.

Successful Soldering, by Louie S. Taylor. Published by McGraw-Hill Book Co., Inc., New York. 76 pages, 4½ x 7½. Nov. 1943. Price $1.00.

If you have ever tried to solder aluminum, you have probably given up in disgust and alibied yourself by saying that it could not be done. This little book tells you how to do it with ordinary solder and also gives you the reason why your way was not successful as well as why the successful method works. Just to prove it, the undersigned tried it and the soldering came out just the way the author said it would using 50–50 metal.

Included in the book is a chapter on the various types of solder and their uses. Another covers fluxes, their composition and special uses together with hints on their preparation and care.

Another section is devoted to the soldering iron, its shape, construction and general care. Various sizes and shapes of stove and electrically heated copper irons are described. Methods of heating the irons are explained, including natural-gas furnaces, the blow torch, the blowpipe and the welding torch.

The final chapters of the book explain methods of soldering various metals and alloys. These include zinc and galvanized iron and steel, tin and terne plate, stainless steel, copper and its alloys, aluminum and its alloys, pewter, lead and Britannia metal.

The volume has been written by an author who evidently knows his business. It would be valuable to the craftsman or technician who uses metals in his work. It might also be used as a textbook in vocational schools and industrial arts colleges.

Written in simple, terse language, the book is a blessing to the beginner as well as a good working tool for the professional.

Radio Direction Finders, by Donald S. Bond. Published by the McGraw-Hill Book Co., Inc., New York. 298 pages, 5¼ x 8¼. March, 1944. Price $3.00.

The author of this book has brought together in a single volume enough material to serve as a text and reference book for training electrical engineers specializing in direction finders for aircraft, ship and fixed stations.

Qualitative descriptions of the systems in use are coupled with an analytical study of the underlying phenomena. Particular attention has been given to the current trends of interest toward u.h.f. and reception of ionosphere waves.

The book opens with general considerations of the requirements of direction finders. Standards and definitions are set up for finders and various types of indicators.

Under the subject of propagation many pertinent topics are covered including field radiation patterns of ideal antennas in free space near ground, ground and sky waves, ionospheric behavior, critical frequencies, properties of ultrahigh-frequencies, effects of plane and spherical earth, reflection characteristics of horizontally and vertically polarized waves, and ionization.

Considerable space is devoted to directive antenna systems. Patterns of long antennas, horizontal fields of vertical antennas with respect to heights, radiation-resistance variations with antenna elevation, the theory of simple loops, voltages from more than one source, bilateral and unilateral bearings, parallel loop arrays, the Adcock and other special antennas are discussed.

Shipboard applications require an explanation of sense antennas, adjustments for accuracy and corrections of the fields about the finder.

High-gain circuits introduce effects which cannot be ignored — fluctuation of signal, thermal agitation, tube noises, shot and other effects. These are treated descriptively and analytically. A table shows the noise equivalent resistance of certain amplifier and converter tubes.

Two types of visual direction finders are discussed — the automatic 360-degree finder and the right-left zero-center indicator. Three models are described in detail and methods of testing and calibration are explained.

The final chapter discusses radio navigational aids. The plotting of direction-finder bearings is explained and relative, magnetic and true bearings are discussed.

The appendix gives further development of the mathematical concepts brought up in the text. The bibliography is very complete and throughout the book are many diagrams, pictures and charts.

The book appears to fill a very definite need in a very satisfactory manner.

Industrial Electronic Control, by W. D. Cockrell. Published by the McGraw-Hill Book Company, Inc., New York. First edition. 247 pages 5¼ x 8¼. Feb. 1944. Price $2.50.

The war has taken from industry many of the more recently graduated electrical engineers, thus creating a shortage of men trained in electronic tube-control devices. This book is intended for engineers whose formal education was completed before the new controls came into existence. It is a compilation of material which has appeared in various places during the last decade. While it makes no attempt to cover the entire field of controls, it does contain enough information to make it a desirable addition to the libraries of industrial men.

Using a non-mathematical approach, the author begins by taking up rectifiers, both vacuum and gaseous. He makes no attempt to treat all of the fundamental concepts, preferring to assume a certain previous experience. Enough theory is included to enable the reader to understand the functioning of the circuits. Some attention is paid to special types of tubes such as the "magic eye," photo and cathode-ray tubes.

A discussion of grid-controlled vacuum tubes and their characteristics calls for an explanation of amplification factor, transconductance and plate resistance. From the vacuum types he turns to the gas-filled types and the uses of such tubes in control circuits.

Circuit components are divided under the subheadings of instruments and meters, resistance and capacitance, inductance and transformers, and miscellaneous components.

The next section of the book describes the basic electronic circuits useful in control devices, including rectifier circuits and filters, various types of amplifiers, the usual types of oscillators and stabilizing or anti-hunt circuits. Also described here is one of the most useful of all control circuits — the timing circuit. In this connection alternating-current switches, relaxation oscillators, multivibrators, ignition contactors and phase-shifting control circuits are discussed.

The book concludes with the description of commercial models of controls, starting with the simple photoelectric circuit, and going on to smoke detectors, fast-acting photoelectric relays, motor-voltage speed controls, the thymotrol — an important device which uses a.c. as a prime mover in connection with d.c. motors and special controls — a.c. power circuits, saturable reactors and servo-mechanism controls. Last but by no means least is the treatment of welding controls and current regulators. — *T. A. G.*

Strays

Since Pearl Harbor the workers in the six plants of the Victor Division of RCA have submitted a total of 48,000 suggestions for job improvements. 17,000 of these ideas have been adopted to save time and material in the production of radio, radar and other electronic equipment.

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QUARTZ — Direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond Drill Carbon Co., 719 World Bldg., New York City.

COMMERCIAL radio operators examination questions and answers. One dollar per element. G. C. Waller, W5ATV, 6540 Washington Blvd., Tulsa, Okla.

WHY NOT turn your unused equipment into ready cash which may be applied towards new and better equipment after the war? Leo, W9GFQ, offers you the best cash prices for communications receivers and test equipment. Write today for large illustrated catalog. Wholesale Radio Laboratories, 744 W. Broadway, Council Bluffs, Iowa.

CRYSTALS available — all types, including 100 kc, 465 kc and 100 kc. Broadcast and Aircraft given prompt attention. Scientific Radio Products, Council Bluffs, Iowa.

USED TELEPLEXES, Instructographs, bought, sold. Ryan's Hannibal, Mo.

PROMPT Repair Service on Meters and Electronic instruments. Braden Engineering Company, 3317 Kenmore Ave., Dayton 10, Ohio.

WANT *QST*s, February and July, 1916, and old Government Call Books. F. E. Norwine, 7405 Hiawatha, Richmond Heights 17, Missouri.

RADIO TESTS — Pre-examination Tests for Radio Operators. Tests your knowledge before you appear for commercial radio operator license examinations. Avoids failures. Guides your preparation. Saves your time. Worth investigating at once. Also books for home study. Write for free circulars 5Q. Nilson Radio School, 51 E. 42 St., New York 17, N. Y.

TUBES at OPA prices. Abbott, 2101 Grand Concourse, New York City 53.

PREPARE NOW for tremendous opportunities in new fields of radio after the war. Training for Federal licenses. Write for particulars. Radio code classes, all speeds. American Radio Institute, 44 East 23rd Street, New York 10, N. Y.

WANTED: Radio operators for merchant marine. Commercial license. Must join union. Wages, $310 monthly. Radio Officers Union, 265 West 14th Street, New York City.

IMMEDIATE SHIPMENT on priority: New SX-28As, $223.00, SX-25s, $94.50; PU-23s, $15.00. In stock without priority: Trimm No. 65 Dependable head-sets, $2.28, No. 100 Featherweight $6.00, meter rectifiers, $1.95, coils, transformers, panels, chassis, radio supplies of all sorts. Your inquiries and orders invited. Henry Radio Shop, Butler, Mo.

HIGHEST prices paid for used receivers, test equipment, bugs, oscillators. What have you? W9ARA, Butler, Mo.

BUILD a radio, complete kit with tubes, $9.95. Details. Radio, 911 New York Ave., Brooklyn, N. Y.

WANTED: 810s, 813 socket, oscillograph, 250-ohm attenuators and kw auto-transformer. SELL: 100th. W8CVW, 2113 18th St., North, Arlington, Va.

FOR SALE: Hammarlund Comet Pro, complete. Triplett combination v-o-m oscillator, Model 1175A. Triplett Model 1510 combination v-o-m tube checker. RCA condenser microphone. National HRO broadcast band coils. Joseph Tabor, 20420 Riopelle, Detroit, Mich.

SELL: QST 1937 through 1943 complete and 6 1936; give offer. W3CJR. Steinberg, 3568 Eleventh St., NW, Washington, D. C.

TUBES: Slightly used but in excellent condition. 5-in. cathode ray tubes No. 5BP4, $12.00; 832, $9.95; 24-G, $2.75; 866, 98¢. Limited quantity. Send your order today. Free list of transmitting and receiving tubes at money-saving prices sent on request. Headsets — 4000 ohm new army-navy (less headbands) $16.00 value for only $4.95. Stark's Distributing Service, 509 South State Street, Chicago 5, Illinois.

WANTED: One SW-3 receiver either old or new. Quote price. Ens. A. T. Corbin, NAS(LTA), Elizabeth City, No. Carolina.

FOR SALE RME69D, with noise silencer and matched speaker, $70. Also Electro-Voice hand mike Model 2025. Want National 1-10, National PWO dial and drive, and 815 tube. Haynes, 2413 Mallery, Flint 4, Mich.

WANTED: QSTs 1915-1924: March, July, 1925. QRU? EDC 38 LaSalle Rd., W. Hartford, Conn.

METERS: Panel instruments 3½" size, microammeters, voltmeters, ammeters, R.F. meters, milliammeters. Large variety. Multi-range small portables. Prompt deliveries. Advise what you want for quotation. Hallicrafters SX-28, 25. Hatry & Young, 203 Ann St., Hartford 3, Conn.

SELL National speech modulator. W3QP.

SKY Buddy receiver. G.E. pole transformer, 1500 kva 110/220 v. 60 cycle. G.I. record changer. Francis Beecher, 801 Emerson St., Madison 5, Wis.

WANTED: FM-AM tuner, Hallicrafters S-31 or equivalent. Also all-wave communication receivers on standard relay rack panels. AA-1 priority available. Write details and price to Schulmerich Electronics, Inc., Sellersville, Pa.

CRYSTALS: Prompt delivery of those time-proven dependable Eidson crystals in the 100-10,000 kilocycle range. New units available for Marine, Geophysical, Police, Aircraft and other services; also repair and regrinding service. Send for folder L-5, mentioning needs. "Eidson's", Temple, Texas.

SELL: First class Triplett 1612 tube tester. Solar CB-1-60 capacitor analyzer, Jackson, 420 Universal oscillator, Jackson 523 oscillograph. L. Green, Tupelo, Miss.

WANTED: Wireless record player, changer or single record. Good Condition. G. H. Leavitt, Millinocket, Me.

FOR SALE or swap: 1 HRO with power supply and coils from 50 kc to 30 Mc; 1 Howard 460 receiver; 1 GR type 200 c. Variac; 1 Broadcast type power transformer pri. 115/230, sec. 3125/3125, 3440/3440, 100 mils (Thordarson); 1 pair new HK54s; 2 RCA 829As; 2 Eimac 304Ts; 1 833A; 2 Nat'l. type PW-O dials; 1 Weston multi-tester type 697. Want 3 or 5" 'scope, signal generator, audio oscillator, etc. L. Jezorek, 88 E. Franklin, New Castle, Delaware.

WILL sell: Almost new 6V. vibrator power supply with 300V at 100ma. output. R. T. Ackley, 1017 N. First St., Banning, Calif.

SERVICEMAN liquidating custom-built 2½ meter transceiver with 6J5GTX, 6J5GT, 6L6, 5W4, Federal anti-capacity switch; Thordarson transformers, milliammeter, handwheel dials, deluxe cabinet, A.C. $25; New Shure crystal desk mike, $6.58. L. Carini, Wethersfield 9, Conn.

WANTED TO BUY: several pairs of Brush crystal earphones, single or double units. Write W6TIW, or ship C.O.D. Willing to pay good price. Riley, W6TIW, 3095 Sutter St., Oakland 2, Calif

SELL: Radio equipment of late W2APH. Transmitter, power supply, modulator, Vibroplex, Sr., meters, etc. Send for list. Spencer, 601 West 184th St., N.Y.C. 33, N. Y.

WANTED: Super-Skyrider SX-11 or later; also Abbott DK-3. Give complete information and lowest cash price. Cooke, 21 St. Pauls court, Brooklyn, N. Y.

WANTED: SW3 coils, #18, 19, and 21. W1BB

WANTED: Howard 650 preselector in A-1 condition, RME LF-90 inverter. Bill Duggan, Goshen, N. Y.

FOR SALE: 1 RCA radio operating correspondence lessons and course. Original value over $100. Will accept the first reasonable cash offer. Lewis, 1127 College Ave., Elmira, N. Y.

WANTED: One Hallicrafters Sky Buddy or Sky Champion. Must be in good condition. R. Grob, Jr., 528 S. Wood St., Fremont, Ohio

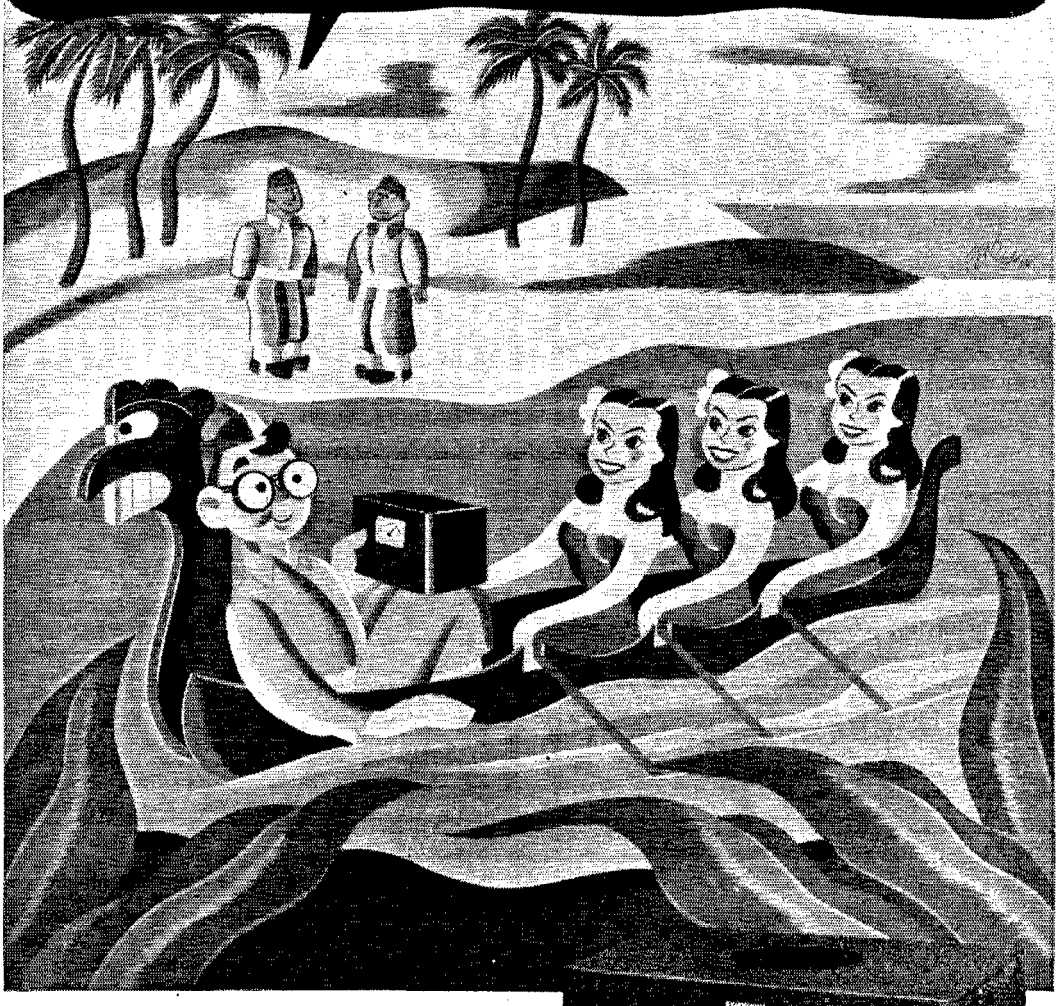
WANTED: One vibrator pack, in good condition, care of G. R. Wisbey, 1902 Crown Ave., Norwood, Ohio

WANTED: Jensen 15" coaxial speaker, Model JHP-52 complete. W1MXV, 22 Richardson St., Wakefield, Mass.

WANTED: Hammarlund Super-pro with standard broadcast band. Write E. Hoffman, 4919 Tower Ave., St. Bernard, Ohio.

FOR SALE: Hallicrafters DD-1, diversity receiver. Used total 50 hours, $460.00. A. L. Chaplin, 369 East Meehan St., Philadelphia, Pa.

NOW HOGARTH IS ADMIRAL OF THE LOCAL FLEET. HE PROMISED THEM AN **ECHOPHONE EC-1** AFTER THE WAR!



ECHOPHONE MODEL EC-1

(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on 3 bands. Electrical bandspread on all bands. Six tubes. Self-contained speaker. 115-125 volts AC or DC.

ECHOPHONE RADIO CO., 540 NORTH MICHIGAN AVE., CHICAGO 11, ILLINOIS

Index to Advertisers

All of the above advertisers are coöperating with the A.R.R.L. to permit publication of an editorially adequate *QST* during this period of war-rationing of paper. Using less advertising space but at higher rates, they continue their customary support of *QST*. Some are using smaller space in each issue and some are using space only every second or third issue. Of the latter, those whose advertising does not appear in this particular issue are indicated by the ** above.

Mathematically, here's the inside story

THE FORMULA in the picture above is an expression of *bunching* as it takes place in the Klystron tube.

This Sperry tube converts DC energy into radio frequency energy by allowing an electron beam to become bunched, or pulsating, between spaced grids.

► The ultra-high-frequency micro-waves thus generated can be concentrated into a narrow beam and directed with great accuracy.

Various other forms of the Klystron have been developed by Sperry to aid in the amplification and reception of ultra-high-frequency waves. Today they are vital parts of many a device used by our Armed Forces.

The name "KLYSTRON" is a registered trademark of the Sperry Gyroscope Company, Inc. Like other Sperry devices, Klystrons are also being made during the emergency by other companies.

► Klystrons are now being produced in quantities, and certain types are available. Write us for information.

Sperry Gyroscope Company INC.

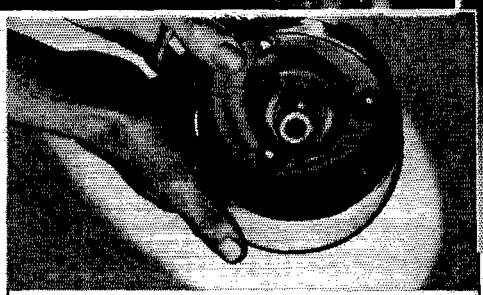
GREAT NECK, N. Y. • DIVISION OF THE SPERRY CORPORATION

GYROSCOPICS • ELECTRONICS • AUTOMATIC COMPUTATION • SERVO-MECHANISMS

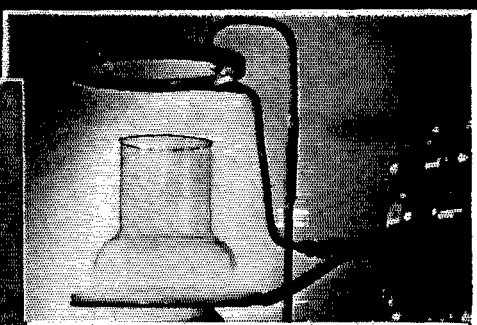
Many complex glass structures go into a modern vacuum tube

In vacuum tubes many complicated shapes, large and small, must be made within very close tolerances. Eimac's know-how of handling glass is just one reason why electronic engineers throughout the world submit their special problems to Eimac with complete confidence in Eimac's ability to do a superior job.

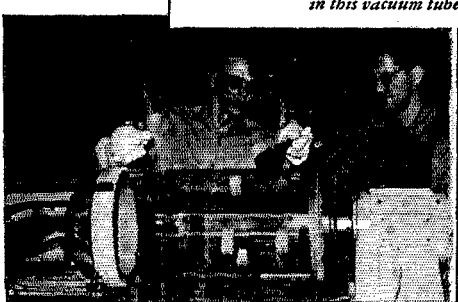
Forming special quartz part at 1800° Centigrade



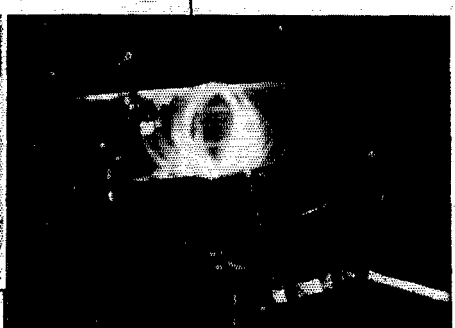
There are four complicated glass to metal fields in this vacuum tube part



The use of R. F. heat in making glass to metal seals simplifies and speeds many such sealing operations



Making very large glass seals requires expert handling. Two 17" glass cylinders are being joined



Heavy glass tubing is accurately and rapidly sealed with a Radio Frequency Arc

Electronic Telesis—a sixty-four page, completely illustrated handbook has been designed especially to assist you in explaining the fundamentals of Electronics to laymen. Send for your copy today.

Follow the leaders to

Eimac REG U.S. PAT OFF

TUBES

EITEL-McCULLOUGH, INC., 872 San Mateo Avenue, SAN BRUNO, CALIFORNIA

Plants located at: San Bruno, California and Salt Lake City, Utah

Export Agents: Frazar & Hansen, San Francisco 11, California, U. S. A.

672

PRINTED IN U.S.A.
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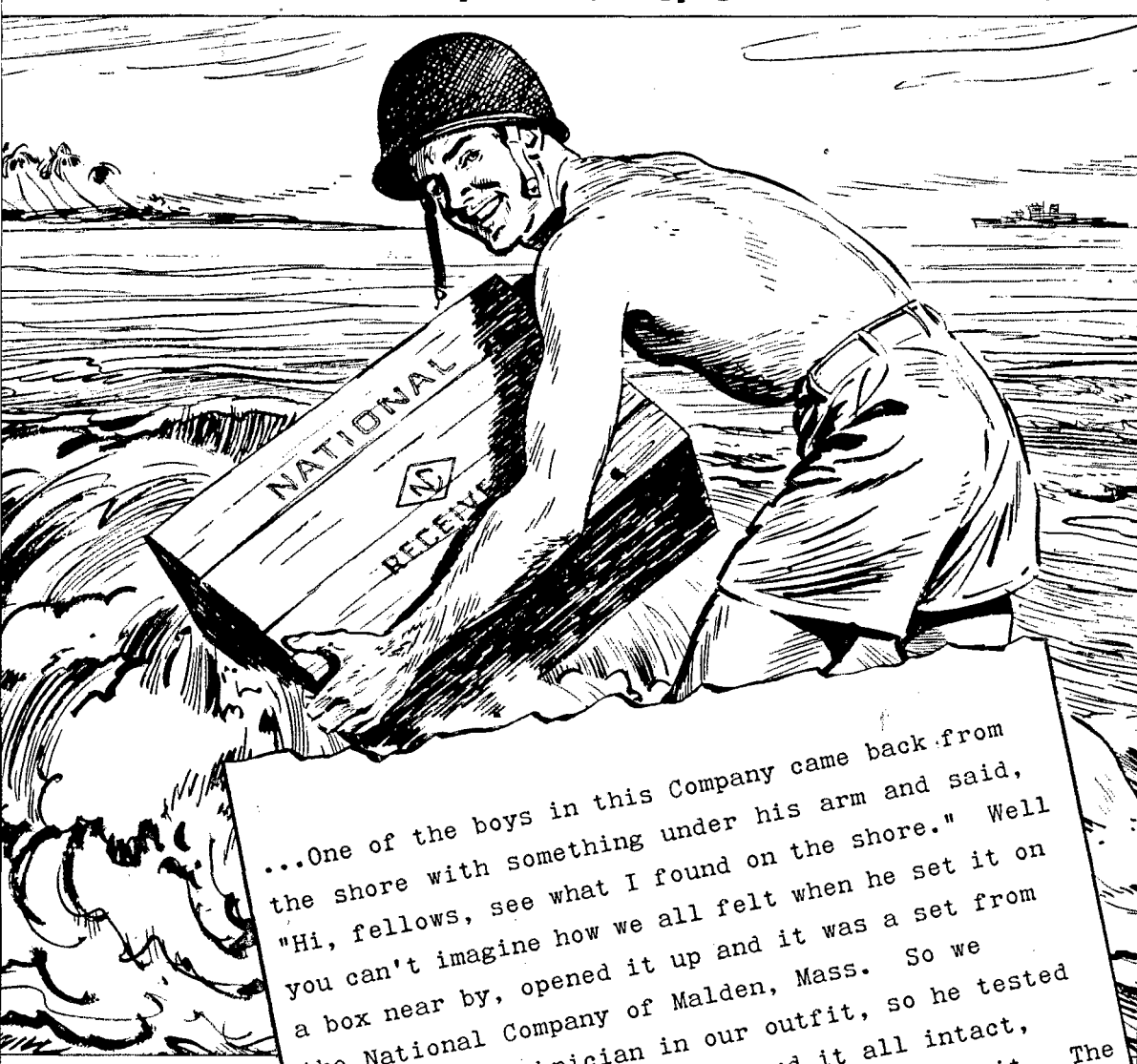
"HI, FELLOWS, SEE WHAT I FOUND"



...One of the boys in this Company came back from the shore with something under his arm and said, "Hi, fellows, see what I found on the shore." Well you can't imagine how we all felt when he set it on a box near by, opened it up and it was a set from the National Company of Malden, Mass. So we had a Radio technician in our outfit, so he tested it, looked it all over and found it all intact, closed it up again, grounded it, then tried it. The salt water had not hurt it one bit—it gave us grand reception and each night, we, or about 12 of us, listened in and it seemed like a message from home.

(Excerpt from a letter we received from a soldier in the Pacific)

NATIONAL COMPANY, INC.

MALDEN MASS, U. S. A.

NATIONAL RECEIVERS ARE IN SERVICE THROUGHOUT THE WORL

3 NEW RCA MINIATURES

(All on the Army/Navy Preferred List)

EACH of these 3 new tubes meets an important need in the miniature field:

RCA-6J4 as a high-gain triode for frequencies up to 500 Mc

RCA-6AL5 as a high-perveance double-diode for efficient broad-band circuits

RCA-6AQ6 as a duplex-diode/triode to combine several functions in one miniature envelope

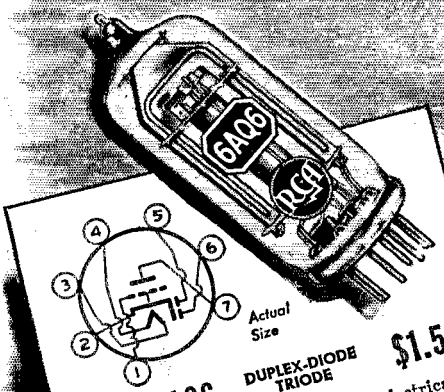
All 3 combine sturdy construction with small size and high performance.

All 3 are on the Army/Navy Preferred Type List!

All 3 were completely engineered by RCA!

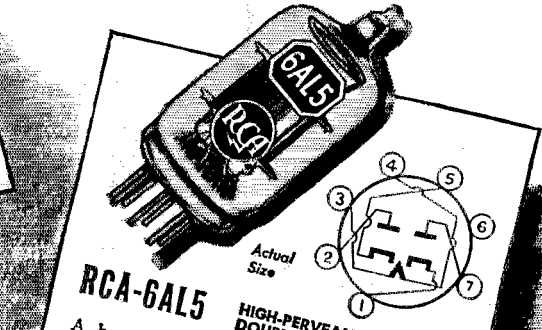
Additional technical data is available on request. Ask for it by tube type number. Radio Corporation of America, Tube & Equipment Dept., Harrison, N. J.

The Magic Brain of all electronic equipment is a Tube . . . and the fountain-head of modern Tube development is RCA.



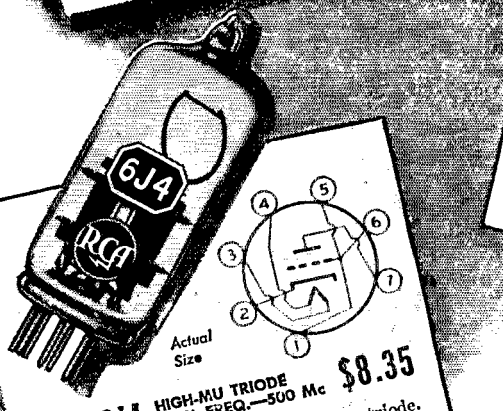
RCA-6AQ6 DUPLEX-DIODE TRIODE $1.50

A multi-purpose miniature electrically similar to the metal 6SQ7, but with half the heater-power requirement. Primarily for use as a combined detector, amplifier, and avc tube. Diode biasing of the triode unit is not suitable. Interelectrode capacitances are low. Heater: Volts, 6.3; Amp., 0.15. Max. overall length, 2⅛ in.; seated, 1⅞ in. Triode Characteristics (class A1 Amplifier): Plate volts, 250; Grid volts, −3; Amplification factor, 70; Plate resistance, 58,000 ohms; Transconductance, 1200 micromhos; Plate current, 1.0 ma.



RCA-6AL5 HIGH-PERVEANCE DOUBLE-DIODE $.75

A heater-cathode type of miniature twin-diode. Its low tube-drop, 10 volts at 60 ma. per plate, permits the design of high-efficiency broad-band circuits. Diodes can be used separately or in parallel. Heater: Volts, 6.3; Amp., 0.3. *Max. Ratings* (Design center values): Peak inverse plate volts, 420; Peak current per plate, 64 ma.; D-C output current per plate, 9 ma.; D-C heater-cathode potential, 300 volts. Max. overall length, 1-13/16 in.; seated, 1-9/16 in.



RCA-6J4 HIGH-MU TRIODE MAX. FREQ.—500 Mc $8.35

A heater-cathode type of miniature triode. Excellent as a grounded-grid u-h-f amplifier (up to 500 Mc); provides high signal-to-noise ratio. Amplification factor, 55. Transconductance, 12,000 micromhos at plate current of 15 ma. Useful in conventional circuits with ungrounded grid. Heater: Volts, 6.3 (a-c or d-c); Amp., 0.4. Max. overall length, 2⅛ in.; seated, 1⅞ in. *Max. Ratings* (Design center values): Plate volts, 150; Plate dissipation, 2.25 watts; Plate current, 20 ma. Mounts in any position.

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RCA

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION • CAMDEN, N. J.

62-6431-9