In This Issue:

A Simple Beginner’s Receiver that Laughs at Parts Shortages

A Single-Tube WERS Transceiver

Cathode-Ray Tube Principles and Applications

A New Electronic Keyer

Hams in the RID
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.

*Might we cooperate with you on design savings for your application... war or postwar?*
"What about post war plans at Hallicrafters?"

That's the subject of many inquiries we get every day. For many reasons, including the prime one of military security, we can't go into all the details of what your post war short wave radio equipment will be able to do. But although most of the details must be withheld, we can and do make this promise: All of our attention and the best of our efforts will continue to be focused on the amateur — the ham, the fellow who actually helped us develop Hallicrafters equipment to the high pitch of perfection it enjoys today.

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.

When the big "all clear" signal sounds for the resumption of Amateur Radio, Hallicrafters will be ready — ready for the ham with new and finer equipment, a tougher kind of equipment that has been tried under fire and found to have what it takes.

At Hallicrafters, you can be sure, the ham will continue to be the key man in our post war plans and his wants will be the prime object of our peace time production.

William J. Halligan
$200.00 in prizes every month
$100.00 first prize, $50.00 second prize, $25.00 third prize, $15.00 fourth prize, $10.00 fifth prize, plus $1.00 for every letter received.

Here we go again. Another great Hallicrafters letter contest for service men. Wherever you are, whenever you see this announcement, drop us a line. Write and tell us your first hand experience with all types of radio communications built by Hallicrafters, including the famous SCR-299.

There is gold here! Write today to get your share. Tell us your story in your own way. You can't lose and you can win as high as $100.00.

Rules for the Contest
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.)

For every serious letter received, Hallicrafters will send $1.00 so even if you do not win a big prize your time will not be in vain. Your letter will become the property of Hallicrafters and they will have the right to reproduce it in a Hallicrafters advertisement. Write as many letters as you wish. V-mail letters will do.

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.
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All material involving military security has been reviewed by ap-
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### DAKOTA DIVISION

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### Pacific Division

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### Van Alstyne Division

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<td>VE4S5Y</td>
<td>Arthur Chesworth</td>
<td>1084 Redland Ave.</td>
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BUY MORE WAR BONDS . . . KEEP THEM UNTIL MATURITY

ON LAND and SEA

STATIONARY or ROLLING

. . . it prepares accurate tapes for transmission at speeds up to 300 words per minute.

McElroy WHEATSTONE CODE TAPE PERFORATOR

MODEL PFR-443-A

High speed radiotelegraph transmission achieves a new high in efficiency with the McElroy Model PFR-443-A. Comprising two easily set up units—the Keying Device and Electronic Drive—it perforates tapes that may be passed through any make of automatic transmitter at any speed for which the transmitter was designed. Requiring little or no attention, the Model PFR-443-A can be operated by skilled or unskilled typists, at speeds from 30 to 40 words per minute, in all Morse combinations of the Russian, Turkish, Greek, Arabic and Japanese alphabets and languages.

Wireless transmission problems requiring our specialized knowledge are welcomed. McElroy engineers never copy . . . never imitate. We create . . . design . . . build. We are never satisfied with mediocrity.

McElroy MANUFACTURING CORP.

82 BROOKLINE AVE. BOSTON, MASS.
THE AMERICAN RADIO RELAY LEAGUE, INC.

is a noncommercial association of radio amateurs, devoted to 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.

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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, W4UIZI-ex-W5BAZ-W9GBH-W7IBV, whose discussion of volts-peres 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 RBA 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's 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, O.t., 1943, p. 8), and, on p. 57, Paul J. Pulmer, 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. Gordon R. Abell, jr., W2IXK (p. 30), tells 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 corpse 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, S.W. Following the completion of high school he constructed superhetodyne 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 90)
A Versatile Two-Tube Regenerative Receiver

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

BY WALTER E. BRADLEY,* W1FWR

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.

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.

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. $C_5$ 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.

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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.
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-µfd. b.c. tuning condenser is used as the band-set or general-coverage condenser. A 100-µfd. 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.

**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 the feedback from plate to grid to provide oscillation for c.w. signals or regeneration on modulation. The amount of feedback is controlled by \( R_1 \) which varies the by-passing effect of \( C_s \).

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 \( C_s \) 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, \( C_4 \), 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.

### Parts List

- \( C_1 \) - 3-30-µfd. mica trimmer.
- \( C_2 \) - 365-µfd. 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-µfd. mica.
- \( C_5 \) - 100-µfd. midget variable (National EX-100).
- \( C_6 \) - 0.01-µfd., 400-volt paper.
- \( C_7 \) - 50-µfd. mica.
- \( C_8 \) - 10-µfd., 25-volt electrolytic.
- \( C_9 \) - 0.1-µfd., 400-volt paper.
- \( R_1 \) - 5000-ohm variable. (See text.)
- \( R_2 \) - 1-megohm, ½-watt carbon.
- \( R_4 \) - 50,000-ohm, 1-watt carbon.
- \( R_5 \) - 50,000-ohm variable potentiometer.
- \( R_6 \) - 250-ohm, 1-watt carbon.
- \( R_{RFC} \) - 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.)

\( L_3 \) 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 \( C_s \).
the amount of audio voltage developed, but the operation will be less stable. Since audio frequencies are present across $R_5$, the grid-blocking condenser, $C_5$, 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 $C_6$ 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, $L_a$, 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, $L_a$. 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, $C_6$, and the volume control, $R_6$. 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, $C_{16}$, 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 $C_{19}$ 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, $R_8$, 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 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 amperes drawn by the tubes in the receiver, but is standard for most transformers.) Filter condensers, $C_3$, $C_5$, and $C_6$, should be at least 8 µfd. at 450-volt ratings. A dual condenser may be used for $C_3$ and $C_5$ 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 ma. 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, 7½ X 7½ X 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 X 7 X 2-inch metal chassis. The final layout for both receiver and power supply

![Fig. 2 — Power-supply wiring diagram and parts list.](image-url)

QST for
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 cross 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 ¼-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 dopes 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 C3, and go in the same direction as the wire coming from the pin which connects to C4, 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, R4, 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. Insufficient 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 1QS/GT requires 4.5 volts for bias; a 1C5G, 7.5 volts.

**Tube Combinations**

It is perfectly satisfactory to mix a local-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 7IF7, for the 1Q5 a 6V6G, for the 1N5GT a 6J7GT, and for the 1LA4 a 7C5GT. 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.
- **Detector heater-type tubes** — 606, 6D7, 6E7, 6G6G, 6V6GT, 2A5.

The 6.3-volt alternate for a 1LN5 is the 7H7, for a 1Q5 a 6J7GT, for a 1N5GT a 6J7GT, and for a 1LA4 a 7C5LT. Socket connections for all tubes are given in the tube-data section of the Handbook.

### Choice of Parts

- **Power tube, filament-type** — 1F4G, 1F5G, 1G5G, 1J5G, 1T5GT, 1LA4, 1LB3, 3Q4, 3Q5GT.
- **Power tube, heater-type** — 7C5LT, 7C5, 7B5LT, 7BS, 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 5X4G is recommended as the rectifier tube for the power supply. However, the following heavier-duty tubes may be substituted: 5U4G, 5V4G, or 5X4G.

### 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, S1, 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, S1, is snapped on. The volume control, Rs, 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, R4, 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, C1, to the maximum capacity permissible.
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 the regeneration control until this condition is obtained. 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, $L_p$. 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 coordinate 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 free-hand sketching. Nor are the changes between the old 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 typify 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.

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New Standard Schematic Symbols

- Fixed Condenser
  (See footnote 1)

- Variable or adjustable condenser
  (See footnote 2)

- Air-core inductor
  - Fixed coil or r.f. choke
  - Coil with fixed tap
  - Coil with variable tap
  (Small circles indicate plug-and-jack or binding post terminals)

- Iron-core inductor or choke

- Air-core transformer or inductively-coupled coils
  (Arrow used only if coupling is variable)

- Iron-core transformers
  - Laminated core
  - Powdered-iron core
  (Arrows indicate variable core or permeability tuning)

- Microphones
  - Single-button
  - Double-button
  - Condenser
  - Dynamic
  - Velocity
  - Crystal

- Phonograph pick-ups
  - Electromagnetic
  - Crystal

- Switches
  - S.p.s.t.
  - D.p.s.t.
  - Rotary

- Vibrators
  - Non-rectifying
  - Self-rectifying

- Power-plug symbols
  - A: Non-polarized
  - B: Polarized

- Neon bulb or voltage regulator
  - A: Albicron lamp
  - B: Illuminating

- Plate

- Grid

- Filament tube

- Plate

- Grid

- Microphones

- Grid (also beam-confining or beam-forming electrodes)

- Diode plate

- Electron-ray tube target plates

- Cathode-ray-tube deflecting plates

- Meter (with proper identification - V, MA, etc.)

- Battery

- Single cell

- Rectifier
  (Usually dry disk)

- Crystals

- Fuse

- Indicates gaseous tube

* 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.

- 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 capacitors, and the negative electrode in electrolytic capacitors.

- In the new symbol, the curved line indicates the moving element (rotor plates) in variable and adjustable air- or mica-dielectric capacitors. 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.
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 Atema, WSCLL; 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; L. Felderman, 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

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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.

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. Felderman, 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"

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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.

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 (Al, 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 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 "II" 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.

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 ½-inch deviation will upset their calibration.

We had the thrill of operating one of the d/f's. 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 interroom 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.

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/f's 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.

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 "sniffer." 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.

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.
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 Memorex 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.

October 1944
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...
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 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.

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 serve 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

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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 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, \( R_3 \) in Fig. 2, provides the principal means of adjusting the focus. However, in practice it is necessary to juggle slightly the two controls, \( R_4 \) and \( R_5 \), 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: 51,458
- 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

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IN THE SERVICES

NOTHING much to rag-chew 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

1KXW, Powell, R.Mt, foreign duty
2KZ, Pachangkat, RT3c, Groton, Conn.
1MQO, Beam, CRT3c, foreign duty
2BLZ, Cochran, CRT, New York, N. Y.
2HIV, Buffalo, St, Groton, Conn.
31IM, Poinaskanis, S/Sgt, Silver Spring, Md.
4QFJ, Garrett, ARMt, Lindberg Field, Calif.
4LJR, Hiers, CRMt, foreign duty
73L, Heattle, WO, foreign duty
8RSL, Silliro, R.Mt, foreign duty
8UYE, Herker, CRMt, foreign duty
9KJC, Holmes, Lt, Portsmouth, Va.
9RLE, Johnson, S/Sgt, Silver Spring, Md.
9QFJ, Jeppesen, RT3e, Buffalo, N. Y.

Operator's license only:

Houseal, R.Mt, foreign duty
Lavan, R.Mt, foreign duty
Logan, RT3c, foreign duty

MARINE CORPS

2NKO, Shreeve, Cpl, foreign duty
ex-IAVH, Harris, Pfc, Clarksville, Ark.
4EFT, Eggett, Pvt, Parris Island, S. C.
4GQG, Budein, Pfc, Santa Ana, Calif.
5DQO, Smith, 2nd Lt, Quantico, Va.
5KPF, Hillmer, Pvt, San Diego, Calif.
5XJX, Young, Cpl, Washington, D. C.
6CL, Stevensont, Lt, San Mateo, Calif.
6RJ, Ellis, foreign duty
6OS, Harvey, S/Sgt, Camp Lejeune, N. C.
6OS, King, Cpl, San Diego, Calif.
6JII, Holland, Lt, Corpus Christi, Texas
8RDD, Coffe, CRO, foreign duty
8ZP, Faulkner, address unknown
8VPN, Croon, Sg t, Camp Lejeune, N. C.
8R8, Oller, Pfc, Oceanide, Calif.
9DUX, Ferguson, Pvt, Clarksville, Ark.
9Z1D, Neill, 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 Japanese bases in the Southwest Pacific. He has been an active operator for over ten years and at the time of entering the Marine Corps in 1940 he was the Georgia SCM.

ARMY—SIGNAL CORPS

1JR1, Simonds, Cpl, Ft. Monmouth, N. J.
2ND, Starr, Pvt, Camp Blanding, Fla.
2JMT, Novack, T/4, Santa Monica, Calif.
3GWU, Wolberg, Pvt, Camp Crowder, Mo.
3BHD, Mabry, Lie, foreign duty
3BXM, Conner, T/Sgt, foreign duty
3JMP, Saber, Pfc, Baltimore, Md.
3NERA, Lambey, Art, foreign duty
3MOP, Monger, Pvt, foreign duty
ex-5OS, Yatko, T/Sgt, foreign duty
ex-5007, Jasper, Pvt, Ft. Monmouth, N. J.
ex-6LH, Cady, Pvt, Camp Crowder, Mo.
K7TM, Ritchie, T/4, foreign duty
ex-5008, Feix, S/Sgt, foreign duty
ex-5009, Lauby, T/4, foreign duty
ex-5010, Curtis, Pvt, Ft. Monmouth, N. J.
ex-5011, Roodes, Pvt, Camp Crowder, Mo.
7JL, Peterson, Maj, Camp Coke, Texas
90CZ, Clark, 2nd Lt, address unknown
9EDO, Gentry, Sgt, Camp Bowie, Texas
9KPL, Bennett, Lie, foreign duty
9Y2Z, Brawley, Pvt, foreign duty
9HF7, Dunn, 2nd Lt, San Francisco, Calif.
9KFK, Engelbrecht, Pvt, Pine Camp, N. Y.
9MM, O'Shea, Sgt, foreign duty
9SKU, Ward, Pvt, foreign duty
9SVU, Clifford, Lt, foreign duty
9T9G, Fleming, 2ndLt, foreign duty

Operator's license only:

Mead, Cpl, foreign duty
Pendall, Pvt, Petahome, Calif.
Sawyer, T/1, Barkdale Field, La.
Strickland, S/Sgt, Camp Gruber, Okla.

NAVY—SPECIAL DUTY

1HIC, Tavare, RTe, foreign duty
2KXP, Bech, Bainbridge, Aligence, Calif.
2MIZ, With, CRT, foreign duty
3DFJ, Newell, RICe, Chicago, Ill.
3RMC, Jones, ART, foreign duty
4GLA, Rhoden, RTe, Chicago, Ill.
5LKT, Stur, RTe, foreign duty
6BN, Edward, CRT, Treasure Island, Calif.
6XKJ, Landow, RICe, foreign duty
7TK, Boye, RTe, foreign duty
7M7T, Canea, CRT, foreign duty
8DUD, Keller, RT3c, Treasure Island, Calif.
8T7V, Dodge, RTe, foreign duty
8NM, Cohen, CRT, foreign duty
9SMOT, Hume, Lt, Comdr, Honolulu, Hawaii
9SWC, Fredrick, RT3e, foreign duty
9VNN, Rogers, RT3e, Washington, D. C.
9SWU, Campbel, RT2e, foreign duty
9ZQG, Lauren, CRT, foreign duty
9PBC, Howard, RT3e, Treasure Island, Calif.
9VWL, Senzel, RT2e, Bellevue, D. C.

Operator's license only:

Barry, RdMt, foreign duty

NAVY—AERONAUTICS

ex-1DFK, Marroco, CRT, foreign duty
3DXM, Kulp, ACRM, Norfolk, Va.
4QGI, Williams, C/A, address unknown
4HGV, Oster, ACRM, Ft. Lauderdale, Fla.
5CRT, Connor, BE, Algonac, Calif.
6MDT, Kech, ART3c, foreign duty
6T1L, Hoffman, Lt, Miami, Fla.
8BNT, Demidoff, ART, Lakehurst, N. J.
8PBC, Lahn, ACR, West Atlantic City, N. J.
9QKV, Sander, ART3c, address unknown
9SYT, Boudreau, ART3c, foreign duty
9URF, Barumian, ACR, Evanston, Ill.

When these radio amateurs got together to have their picture taken for QST, they were attendants at the Coast Guard Radio Matricul School near Silver Spring, Md. Left to right: S2e J. Poinikowski, W3H1M; S2e E. Johnson, W3K1E; S2e L. Lyon, W3NOQ; RT3e W. Weingart, W2LUC, and S2e L. Lyon, WSK1O.
Lt. Comdr. F. T. McAllister, W8HKT, 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!

Shot down over enemy territory in the South Pacific and reported missing for nine months, Captain F. C. Harpe-heimer, W2O7U, was found. The show was. The former star of the Merchant Marine Radio Club, Captain Harpe-heimer has made forty-eight recce and photo missions over such hot spots as Rabaul, Wewak and Kavieng. W2OU has been a ham for ten years, has a B.S. in EE and was a radio engineer working on F.M. before enlistin in the AAF.

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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. Kesmesner, 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, W8UPH, and Lt. A. Lephaski, W2MFC.

9UNF, Weed, 2nd Lt., Alliance, Neb.
9WZZ, Dykeham, Srgt., 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, Srgt., Campburn, N. M.
Underwood, Cpl., Sioux Falls, S. D.

MERCHANT MARINE AND MARITIME SERVICE
12BP, Masterton; 2DXW, Fischer; 2HNY, Hill; 2JN, Grober; 2JCS, Nielson; 4HYK, Pierce; 5K8D, Lewis; 5KLB, Tidwell; 6YB, Barrett; 6WO, Carpenter; 7DS, Melner; 8TU, Nelson; 8SFW, Rmina; 9BDR, Baker; 9JMM, Anderson; 9NWV, Kraw; 9PPF, Kortum; and 9UQZ, Hota, Bink, Britton, Copeland, Hayes, Neukranz, and Stratton hold operator's license only.

CIVIL SERVICE
17BS, Gibb, OWI, foreign duty
2BAI, Cogtsign, SC, inspector, Newark, N. J.
2LSP, Karter, War Dept., radio engineer, foreign duty.
3GBS, Wolskill, SC, radio engineer, Ft. Monmouth, N. J.
3IY, Hoover, AAF, Middletown, Pa.
3JTY, Esokidge, FBI, radio engineer, Washington, D. C.
3MV, Stone, OWI, foreign duty
4BSM, Cromwell, CAA, Sildell, La.
3DRY, Harrell, SC, radio engineer, East Point, Ga.
4DSF, Palmitale, SC, radio engineer, Atlanta, Ga.
4EDC, Rowsey, CAA, aircraft communicator, Jacks Creek, Tenn.
4HQB, Pemberton, inspector, foreign duty
4HFO, Chandler, SC, radio repairman, Camp Stewart, Ga.
4IFM, Pike, engineer, North Beach, Md.
5AAAM, Smith, Navy Dept., radio inspector, DeKalb, Ill.
5MCO, Hites, OWI, foreign duty
5ICR, Richards, AAF, instructor, Amarillo, Texas
5S6B, Groob, radio operator, Barkdale Field, La.
5P8K, De Bardeleben, FCC, Kingsville, Texas
5W6E, Wood, FCC, jr monitoring officer
6CA, Ellis, OWI, foreign duty
6PDV, Vassoy, CAA, aircraft communicator, Reno, Nevada
6GPJ, Chadwick, OWI, foreign duty
6KZ, Chacek, OWI, foreign duty
7JF, Drenan, OWI, foreign duty
7GKS, Layton, CAA, inspector, Seattle, Wash.
7BBY, Allen, FCC, Spokane, Wash.
7K, Walker, CAA, aircraft communicator, Yakima, Wash.
7O, Ryno, SC, radio engineer, Seattle, Wash.
7N8, Nichols, CAA, aircraft communicator, Everett, Wash.
7JDW, Heip, CAA, Garden City, Kansas
8K, Benny, OWI, foreign duty
8KD, Manola, SC, inspector, Carlisle, Pa.
8JX, Bannon, OWI, foreign duty
8KGW, Penobacker, OWI, foreign duty
8KQ, Hutnick, SC, inspector, Jersey City, N. J.
9F8S, Ritten, OWI, foreign duty
9GM7, Harbat, CAA, radio electrician, foreign duty
9JOW, Hauers, OWI, foreign duty
9KCI, Mann, Navy Dept., radio mechanic, foreign duty
9NHQ, Kiefer, OWI, foreign duty
9NQ1, Beringer, FCC, Allag, Michigan
9XG, Mehlbrecht, CAA, Kansas City, Mo.
9YFE, Veldt, FBI, San Francisco, Calif.
9ZHS, Galtmann, AAF, radio mechanic, Madison, Ohio
9WJX, Ursuh, radio mechanic, Orlando, Fla.
9YO8, Nungeiser, OWI, foreign duty
Operator'slicense only:
Hugley, CAA, aircraft communicator, Greensville, S. C.
Koczenak, Navy Dept., aircraft radio mechanic, Pensacola, Fla.

1AAV, Winchell, radio engineer, Scovill Mfg. Co.
1CPI, Siglin, FBO, Consolidated Aircraft Corp.
1EFK, Lanane, Northeast Airlines
1LMO, Pattee, FBO, Northeast Airlines
1LPY, Moore, Air Transport Command
1MCG, McDermott, Air Transport Command ex-2OYK, Randall, inspector, Chance-Vought Aircraft
2BHG, Savola, FBO, American Airlines Inc.
2GHE, Smith, FBO, American Airlines
2GPY, Braun, RO, Eastern Airlines
2HJL, Nickell, RO, Eastern Airlines
2HST, Stuart, RO, SUNOCO
2IRY, Horne, Grumman Aircraft
2JB, Jones, aircraft radio technician, Eastern Airlines
2LEI, Hillis, RO, Eastern Airlines
2KFS, Kaysberg, CBO, Continental and Western Air, Inc.
2MRY, Gillen, FBO, Naval Air Transport
2NOA, Davis, CBO, Continental and Western Air, Inc.
2OCF, Voelker, aircraft electrician, Kellett Aircraft Corp.
2WGE, Clarke, SFRO, Continental and Western Air, Inc.
2WAX, Anderson, assistant radio engineer
2WPS, Glenn, L. Martin Co.
2ZMA, Whiting, aircraft radio engineer, Taylorcraft Aircraft
3ZG, Berkner, RO, Eastern Airlines
4BIA, Brannen, inspector, Bell Aircraft Corp.
4EFL, Russell, radio engineer, Bendix Aviation Corp.
4EWA, Brookes, RO, Eastern Airlines
4FY, Griner, radio inspector, Lockheed Aircraft
4GBF, Mehfill, FBO, Chicago and Southern Airlines
4GSD, Jupe, RO, American Airlines, Inc.
5DD, Brown, RO, Delta Airlines
5DAD, Moore, Lockheed Aircraft
5DEI, Gordon, Douglas Aircraft Corp.
5DNO, Rigby, radio inspector, Lockheed Aircraft
5BYG, Cox, Douglas Aircraft Corp.
5DLF, Smiley, radio inspector, Lockheed Aircraft
5DRN, Hayden, Lockheed Aircraft
5SHA, Bracken, Aircraft Radio Lab., Wright Field
5SHU, Snyder, Douglas Aircraft Corp.
5SPY, Travis, Lockheed Aircraft
5TEC, Hawkins, Douglas Aircraft Corp.
5SFT, Patterson, FBO, American Airlines
5FRM, Dariott, radio inspector, Lockheed Aircraft
5GKB, Robinson, FBO, Continental and Western Air
5LDD, Wood, inspector, Lockheed Aircraft
5LPF, Irwin, Douglas Aircraft Corp.
5MCH, Keen, Lockheed Aircraft
5SM, Davis, Lockheed Aircraft
5MCO, Wood, Douglas Aircraft Corp.
5JDB, Hinson, Lockheed Aircraft
5MJK, Hayes, Lockheed Aircraft
5MM, Bergzi, FBO, American Airlines Inc.
5MJK, Sullivan, RO, Lockheed Aircraft
5MSU, Savage, Braniff Airways
5OFG, Malmin, FBO, American Airlines
6R0, Dory, Douglas Aircraft Corp.
100 PER CENT—AIRLINES AND AIRCRAFT COMPANIES
When Linwood M. Pat­
tee, 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.

1AIV, Winchell, radio engineer, Scovill Mfg. Co.
1CPI, Siglin, FBO, Consolidated Aircraft Corp.
1EFK, Lanane, Northeast Airlines
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5LDD, Wood, inspector, Lockheed Aircraft
5LPF, Irwin, Douglas Aircraft Corp.
5MCH, Keen, Lockheed Aircraft
5SM, Davis, Lockheed Aircraft
5MCO, Wood, Douglas Aircraft Corp.
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, VE3QO, 1645 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 lady. 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. Claricoats, G6CL. One of the hams who has taken advantage of this opportunity is W7IXX, who tells us that Secretary Claricoats 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 Pica-dilly Circus, and from all reports it's well worth any ham's time to drop around.
A Single-Tube WERS Transceiver

"Cathode" Modulation Applied to Portable Gear

BY GURDON R. ABELL, JR.,* W2IXK

SIMPPLICITY 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.

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, C3, while not absolutely necessary, is an inexpensive refinement. During transmission, the 'phones and R3 are shorted out, and the tube is biased by the IR drop through the microphone. Resistor R2 is not a grid leak, but is used for the sole purpose of suppressing parasitic oscillations of the Hartley type. In this case, RFC1 and RFC2, tuned by C5, form the tank circuit for such parasitics. The lowest possible resistance which still will do the job should be used for R2.

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.

**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 ½-turn antenna coil, L1, may be seen near the upper right-hand corner of the transformer shield. To the right of L1 is the tuning condenser, C1, a mica trimmer which is operated by the tuning dial in the manner outlined in "Hints and Kinks" in QST for June, 1943. Farther over is L2 which is mounted and connected between the plate prong of the tube socket and the junction of C1 and C2. Connected to the center of L2 is RFC1 which is shown standing on L3. C4 consists of a piece of tinfoil, one end of which is connected to the socket to the cathode, while the other end merely is wrapped around the case of C2. Above and to the left of the R1C2 combination is RFC2, which leads over to the send-receive switch. Out of sight in the lower right-hand corner is C6. Resistor R3 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 L1 to move closer to L2, 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 L1 may be moved smoothly from a minimum to a maximum distance from L2 (and back to minimum again) for one complete rotation of the cam.

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*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.*

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*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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C6</td>
<td>3-30-µfd. mica trimmer.</td>
</tr>
<tr>
<td>C2</td>
<td>50-µfd. mica.</td>
</tr>
<tr>
<td>C4</td>
<td>0.005-µfd. mica.</td>
</tr>
<tr>
<td>C5</td>
<td>250-µfd. mica (see text).</td>
</tr>
<tr>
<td>C6</td>
<td>0.1-µfd. paper.</td>
</tr>
<tr>
<td>R1</td>
<td>5 megohms.</td>
</tr>
<tr>
<td>R2, R3</td>
<td>(See text).</td>
</tr>
<tr>
<td>L1</td>
<td>½ turn, No. 12 wire, ½ inch in diameter.</td>
</tr>
<tr>
<td>L2</td>
<td>3½ turns No. 12 wire, ½ inch in diameter, ½ inch long.</td>
</tr>
<tr>
<td>M</td>
<td>Single-button microphone.</td>
</tr>
<tr>
<td>RFC1, RFC2</td>
<td>V.h.f. choke; 1-inch winding No. 30 enameled wire, ½ inch diameter, close-wound.</td>
</tr>
<tr>
<td>S</td>
<td>D.p.d.t. toggle switch.</td>
</tr>
<tr>
<td>V</td>
<td>6J5GT/G, 1LE3, 1G4GT/G, or 1E4GT oscillator. (See text for discussion of other types.)</td>
</tr>
</tbody>
</table>

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*Hints and Kinks, QST for June, 1943. 1*
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 \( \frac{3}{16} \) 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.

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

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**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.
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 UHF hearings that occurred in 1938. 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 easing; 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

This 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 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 same requirements obtained for alternate as for director. 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 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 ____________________________________ as a candidate for DIRECTOR; and we also nominate ____________________________________ as a candidate for ALTERNATE DIRECTOR; from this division for the 1946-1947 term.

(Signatures and addresses)

The signatures 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 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 in 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

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<th>Name</th>
<th>Call, present or ex, or grade of op-license only</th>
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<td>□ Maritime Service</td>
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<td>□ Merchant Marine</td>
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<td>□ Civil Service</td>
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<td></td>
<td>□ Radio industry, 100% war</td>
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36 QST for
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. Duelland, W7GBG; alternate, Everett H. Gibbs, W5AQ. Baltimore Division: director, Robert A. Kirkman, W2DST; alternate, George Ruffin, Jr., W2CY. New England Division: director, Ferret C. Noble, W1BYR; alternate, Clayton C. Gordon, W1HGC. Northwestern Division: director, Earl W. Weinert, W7GBG; alternate, R. Rex Roberts, W7CPY. Roanoke Division: director, Hugh L. Caviness, W4WD; alternate, J. Frank Key, W3AZ. Rocky Mountain Division: director, Raymond Stedman, W9CA; alternate, William C. Wright, W9GOO. Southeastern Division: director, John E. Bigel, W6BK; alternate, Eldridge E. Wyatt, Jr., W9ARW. Southwest 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 choice. Members are urged to take the initiative and to file nominating petitions immediately.

For the Board of Directors:

August 1, 1944. K. B. Warner, Secretary

BOOK REVIEWS


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 is followed by a description of simple circuits and circuit elements. Another chapter deals with algebra. This is followed by an explanation of the principles and details of operation of meters. The idea developed is that by the use of ammeters 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 into a description of vector addition, impedance, phase angle, apparent power, power factor and series and parallel circuits. Resonance and its affect 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.


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. F. F.


This book is offered as a textbook for those interested in communication engineering. The basic principles of communication and their associated networks are presented, covering the range from audio through ultra-high 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 — Thévenin'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 Z0 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 and novel 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
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 3ST final amplifier running approximately 15 watts input on 175 kc. It is modulated by a pair of 6L6s in Class AB1. The rig here is a 6L6 oscillator and an 809 final running approximately 15 watts and modulated by p.p. 6L6s, Class AB1. 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 8-0102.

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, WOYLL, 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.

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. Howlum, W7FIIB.

![Fig. 1 — Modulating circuit for light beam transmission. The resistor should be 6 ohms or larger.](image-url)
WKAU Proves Its Worth

Detroit Amateurs Score A Round For WERS

FRED A. CHEVILLOT,* W8S WI

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 cooperation 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 cooperative 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 dty 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 preclude 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, W8T KL, 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. Vaucea, W8SPJ; R. McDonald, W8BXV; Arthur Lyman, W8SPJ, radio aide; Harold Feighner; J. Gareau, W8VAF, and R. Hudson, W8SYX. Standing: L. Taylor, 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 WSSPJ appointed the following deputy aides, in charge of one of each of the defense areas: Steve Vaucea, W8SSP; 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 Los 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 Hallcrafters 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.)

BERS 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 coordinated 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 QSA-5 reports. Apparently much is to be said for the station locations and antennas.

(Continued on page 98)
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.

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 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 range made possible by the new tubes. It may be said, however, that many very-high and ultrahigh 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,
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 µfd.; grid-filament, 1.40 µfd.; plate-filament, 0.30 µfd. The glass envelope is 2¾ inches in length and 1¾ 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 µfd.; grid-filament, 3.6 µfd.; plate-filament, 0.4 µfd. Maximum over-all dimensions of the 53A are, length, 5½ inches; diameter, 2½ 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 µfd.; grid-filament, 3.3 µfd.; plate-filament, 0.3 µfd. Over-all dimensions of these tubes are: length, 6½ inches; diameter, 3½ 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-plate operation.

The average direct interelectrode capacitances of the 527 are: grid-plate, 12 µfd.; grid-filament, 19 µfd.; plate-filament, 1.4 µfd. The 527 is 13 inches in length and 2¾ 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 98)
Hams in Combat

The Great Spiderweb

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

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 nascent 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 H2O, 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 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...

October 1944

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 revels or retreat, for the AACS soldier may be on duty or call twenty-four hours a day — week in, week 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!"

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 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
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 $N_p$ is the turns ratio, $N_s$ 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

$$R_t = \left( \frac{N_p}{2N_s} \right)^2 R_s = 0.25 N^3 R_s.$$

By substitution in the previous equation we find that

$$4 R_t = N^3 R_t = R_t \text{ and } R_t = \frac{R_t}{4}$$

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.

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

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

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

The value for $I_n$ 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.

*15 Locust Drive, Asbury Park, N. J.*
**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 HH. 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 280 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 algebraically. 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 coordinate (see Fig. 2). Thus the effective composite currents for the zero-bias characteristic are 187 - 14 = 173 and 14 - 15 = 155 and are plotted on the proper voltage ordinate.

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 HH to be drawn, representing the -14-volt bias line. Observation of line HH shows how straight the characteristics 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 characteristics 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 \( \frac{R}{4} \). 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. 5 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 \( \text{AB} \) for one tube and curve \( A'B' \) for the other. The average plate cur-

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**Fig. 2**

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**Fig. 48**

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**QST for**
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 0 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.

**Power Output**

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

\[
P_1 = I^2 R_l = \left(\frac{(0.145)(0.707)}{2}\right)^2 (2500) = 6.5 \text{ watts}
\]

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 ZW, 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

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

\[
P = \frac{[(0.160 - 0.014)(0.707)]^2}{2 (1250)} = 12.5 \text{ watts, or double the output of a single stage.}
\]

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

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

\[
P = \frac{[(0.160 + 0.160)(0.707)]^2}{2 (1250)} = 16 \text{ watts}
\]

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.

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**Strays**

Bob Carter of Carter Motor Co., Chicago, whose dynamos 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 wasn’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 corn cob, 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. 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 whoopers 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 bluster 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 trip he 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 F’s 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 wasn’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 wasn’t furiners—they 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 headphone, 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 saw what he meant was that 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 hamming 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 globes 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 Zucks 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.

Octobe1· 1944

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**Gold Stars**

Sgt. Frank P. 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.

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.
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. 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 amateur 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.

An Electronic Keyer
Making Use of Inked Tape for Code Practice
BY H. L. HASKINS, W9FWO

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, $R_5$, which, together with $R_6$, 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 Rs. However, when light strikes the photoelectric cell, it conducts and current flows through the grid resistor, Rs, in a direction which develops a voltage across Rs in opposition to the voltage drop across Rs. 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, Rs. Since the screen of the second tube receives its voltage through Rs, 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 Rs and Cs 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, Rs, 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,

![Circuit diagram of the electronic keyer](image)

*C1* - 0.1-µfd., 450-volt paper.
*C2, C6, C4, C9, C10* - 8-µfd., 450-volt electrolytic.
*C5* - See text.
*C7* - 0.02-µfd., 450-volt paper.
*Cb, C11* - 0.01-µfd., 150-volt paper.
*R1* - 20 megohms, 1/2 watt.
*R2* - 150 ohms, 1 watt.
*R3* - 10,000 ohms, 1 watt.
*R4* - 5,000 ohms, 2 watts.
*R5* - 2,000 ohms, 10 watts.
*R6, R19* - 50,000 ohms, 1 watt.
*R7, R8, R3* - 5,000 ohms, 1 watt.
*R9* - 100,000-ohm bias potentiometer.
*R10* - 25,000-ohm volume control.
*R11* - 200 ohms, 1 watt.
*R12* - 100,000-ohm potentiometer (sensitivity control).
*R14* - 1 megohm tone control.
*R15* - 15,000 ohms, 1 watt.
*R16* - 5,000 ohms, 50 watts. Powersupply variable bleeder.
*L1* - 250-henry center-tapped audio choke.
*L2, L3* - 3-henry, 100-ma. filter chokes.
*T1* - Universal audio output transformer.
*T2* - Power transformer, 300 volts each side of e.m.f. 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 R14. 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, C9, may be shunted across the audio choke. However, changing of the shunt resistance of the oscillator circuit through such a control as R14 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, R15, 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 R17, the variable bleeder in the power supply. Excessive plate and screen voltages may cause the dots and dashes to lack cleanliness, no matter how the sensitivity and bias controls, R5 and R12, 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.

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 transformer, 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.

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 laid 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 1/8-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.

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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 if one not “perk”, here is the chance to experiment with values of C6 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, R5, 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 R2 had little or no effect on the output. Try various positions of the R3 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 R5, then take the best of the lot and start in on the sensitivity control, R12. 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 R5 except of course that R5 is left alone this time. A point should be found on R12 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 R3 and R12 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 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)

October 1944
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 phone 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 sound 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 Directors 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," with the promises 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 make room for an emergency sheet to go into every QST, and that we would sound 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!"

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

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

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.

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?

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. — Askme News.

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.

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.

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

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, molybdenum, 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 2½ 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 Aid, WKNQ.

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 µfd. These had to be drawn from a stock rated at 250 µfd., but actually varying from 200 to 300 µfd. 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-µfd. 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-µfd. 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, A.AFTTC, Sioux Falls, S. D.

CALIBRATION FOR CRL DIAL
OF IMPEDANCE BRIDGE

When constructing the impedance bridge described by Athan Cosmus in the July issue of QST, I was confronted with the problem of calibrating the CRL dial (R3R14 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. 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 was 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.

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:

$$I = \frac{E}{R_{\text{total}} + R_v}$$

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-Carrier, 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 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.

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

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)
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 OOS who is the best Army radio operator-mechanic I have ever met. Upon graduation he will become my communications officer. I think 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 Hand book.) 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, W3PDU

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 what a good ham was until we wudduf done widout 'em, as the usual run of radio ops rightly are sumpin' in dis 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. Hau 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 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.

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. Penis, 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. Hii!

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

PERSONALIZED DX

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

In being 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.

... 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...
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, W2KTV

FILAMENT REDUCTION—A REBUTTAL

S3 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 thorium content obtaining at low filament temperatures, and the high emission efficiency obtaining at high temperatures. Other factors, such as the balance between thorium 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 thorium, 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

4188 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 customs 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).
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 coordinated 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 grunting 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 SAACO, San Antonio, Texas. Here's hoping that they stay put for another month at least. Hi!

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.

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 was 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 did and did it in a most beautiful manner. 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 enthusiastically 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, WJHH 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 WJHH 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 operators were passed without further word from him. Then, when WJIB 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 and immediately shown during a meeting. If the 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 WJHH were asked to participate. This is an example to show how WJHH has had to "take the bull by the horns," locally, to offer assistance in any way to the various disaster and relief agencies. WJHH 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 well up in 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 WJHH

BRIEFS

WESMHD, now in Ceylon, reports that in a recent rag-chew W7REZ, WSSOO, W8JNN 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 TAs 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.

W8HTK 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!"

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. WJHH 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 well up in 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."

-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 Winifred Shaw. "Duke" says he got "messed up" in North Africa a year ago, but expects to be walking again shortly.
Ham Yarn No. 1
BY VICTOR C. CLARK,* W9AVO—EX—W6RKC

Looking back upon ten years of thrills and surprises in ham radio, one experience stands out in my mind as the most astounding of 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 w.u. until an early hour. Since 80 meters was unsatisfactory for other than local communication purposes at that time of day, I changed over to 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 radio amplification), and commenced the regular routine 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. Suddenly I 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 modulations. As I paused to listen to it, I discovered I 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, querying in a somewhat weak and muffled manner, "What thing?"

My words came through the headphones clearly, after being picked up by the microphone tube and amplified by the receiver. As this incident 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 that sound as though it came through my headphones. Seeing no one, I ventured a weak and tremulous "Hello" into the realest detector compartment. Then, as a voice cheerfully replied, "Hello, is that you, Vic?" I slumped into a chair, aghast.

It was then that the problem of microphone detector tubes which was characteristic of both of our receivers, which I 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 our open receivers, trying to eliminate the intermodulation of both sets.

About the time that I discovered that the drone 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-65, CAA, Washington 25, D. C.
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 term of office. Where a petition has already been received, the notice supersedes previous notices.

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 election subject, of course, to the provisions of the rules. In cases where no valid nominating petitions have been received, the closing date for receipt of nominations at ARRL Headquarters is hereby specified as noon, Monday, October 16, 1944.

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. Below is a table listing each of the Sections, the term of office starting on the date given.

- **Illinois**: David E. Blake, W6NUX - August 15, 1944
- **Ohio**: Carl F. White, W8DII - August 17, 1944
- **W. Mass.**: William J. Barrett, W1JAH - August 17, 1944
- **Oklahoma**: Ed O. Oldfield, Jr., W5AYL - August 15, 1944

The Month in Canada

**ALBERTA - VE4**

From W. W. Butchart, VE4LQ:

As noted last month, Reserve Army camp at Sarcoe attracted several hams from around the Province. R.T. (radio telephony to you), commonly known as "R-Toe" 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 RCOS net which was just getting organized for the afternoon, so decided to "crash the net." As the equipment we use to transmit on the receiving frequency, it was a simple matter to perform the deed. Who do you think came back? Would "Figure Four Geraniums Daffodilla" mean anything to you boys? Yep! It was our old pal Jim Smalley of Calgary. During the ensuing week or so we ran across 4X, Dick Bannard, of Edmonton; 4CY, Sam Litchinsky, of Calgary, and several Army instructors we have known for all it was a lot of fun, and we were able to get our "nips" in shape for postwar hamming! JFP, Reid Elliott, of Alliance, also was at Sarcoe. He imparted the information that 4HQ, Bill Stauden, of Calgary, was no longer employed 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 reply "free-wheeling" was also right on tap. He led a "scrounging party" over to L.Q.'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 Sarcoe 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 signalers 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 to us of another equipment which is about to be delivered to us. 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 too far into great 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 70)
Atlantic Division

Eastern Pennsylvania — SCM, Jerry Mathis, 962 Oxford St., Philadelphia 33, Pa., greets us from Hilo, Hi. 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 sinuses operation. We trust he will improve rapidly. JBF is home on furlough. He is attempting to transfer to the merchant marine. 3JNQ got married before shipping out to the Middle East. Dick Hanak (LSPH), over Africa way, writes that was probably a very interesting letter, but the censor was strong with the shears.

Bob Stevens (LSPM) is in Cairo. 3JNQ is attending Lehigh University. Experimenting with antennas is going on at present. Their relations clothes-line type of antenna to whereby the output of the 150 watts allowed them by the control tower, and his address is Det. 104 AACS, RAAF, Hamilton, N. J. His QTH is 249 Bruce St., Syracuse 3, N. Y. RVM is with RCA in Camden, N. J. His QTH is 26 Paterson St., New Brunswick, N. J. His QTH is 362 E. Brown St., Trenton 10, N. J., for information. JNO has acquired a very nice wood-working outfit. ITS has recently returned home on furlough. We would like to hear from EBTZ on his vacation on Aug. 19th to get himself a rest after working so hard on WERS. Teresa Lanzalotti (LSPH), of Philadelphia, was recently home on a short leave. Ed's sons are both in the Navy. We would like to use that Class B ticket that he has at GRAnite 7388. 3JKC raised 3BSB of Virginia on a short visit to Detroit. He is in the Navy. We would like to give complete addresses of these men. Anyone interested please write W. R. Tomlinson, SCM, 623 E. Brown St., Trenton 10, N. J., for information. JBO has a new jr. operator. 3TZ is an 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 3JBC and four mobile units so far. Hamilton Twp. had excellent demonstration during Monday night test periods. ABS, Hillsboro Twp., was recently home on a short leave. His QTH is Owings Mills, Md. The boys from WERS had a big picnic at Ellion 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 munching in plenty of good food and talks and prize-giving. OGC walked off with the laurels in the hidden receiver hunt with some neat work with mini-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. KKO exhibited his new compact WERS unit. WNNH-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. DPN, 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 freer than ever to push along that of war job. Let's hear from you all soon. 3U, BIL.
MICHIGAN — SCM, Harold C. Bird, W8DPF — While compiling this report we received news from the DARAR
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 DARAR club recently some very interesting sidelights were given by FX on his experiences while sailing the lakes this summer. Tate finished the mail for the European theatre, which was heavier 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 QM/QM, is stationed 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 Pontiac City, has sent us 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 but the opposite part of the system can be reached if necessary. The controller at the WERS control tower would be able to get messages out to the various agencies through the establishment of their radio control right in the same room, so part of M/G, the controller, 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 idea and is interested in hearing from you 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, etc., etc.

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 MRA was recently home on furlough from Sampson, N. Y. where he is radio instructor at the Naval base. Sgt. Wilbur Kuure, formerly a radio operator in the submarine service, is convalescing from rheumatic fever and would like to hear from his friends down here. He would like to hear from his friends in the submarine service. There are more Indians hats in that branch! ABB receives QST and the Brixton regularly at his advance base, Central Dakota. TQY is pleased to report his new receiver is a key to his home on July 16th both coasts and southern states came in on the ultra highs on both a.m. and f.m. NTV and QLZ picked a nice warm (100 in the shade) opening to cut down a tree near the Starved Rock Radio Club shack. A cold winter is expected and the SRRG is all set with plenty of fuel for the fireplace. OTD comes through with a report on continued WERS activity in the Joliet area, KKK, of Chicago, is finishing up a course at Camp Crowder. The WERS gang has been assigned to the Experimental Station at Pine Camp, N. Y. His address is: Pvt. E. Engbreth, 3133rd Signal Service Company, Pine Camp, N. Y. 73, Geo.

D DELTA DIVISION

LOUISIANA — SCM, Eugene H. Treadaway, W9DDER — 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. H3F, 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 c.w. man in electrical work at Swan Island Navy Yard, Portland, Ore. RNY visited at Platte last month. Come on with the WERS reports, etc, 73, Phil.
Hudson Division

Northern New Jersey — SCM, Winfield G. Crowder has been kicked because he has been in the Navy some time.

Sister, ONW, is back after many months at a monitoring station. T/Sgt. PUV-RIK gathered the following items, which we pass along.

Gang from HPA. Ken Hearle (operator license) writes has not been in combat. M VW, radio operator 3rd class, was never break down, but the installation was quite a job. AEJ, communications officer in charge of a large number of sets with deepest thanks for Al’s help. GHD was pleased with the up in the Aleutians — nothing much to do to them as they recently home on leave after being in the Navy.

KCS is still holding down the fort at the school at Gulfport, Miss. Several hams are there, so he CrowderCamp Crowder newspaper tells of a meeting of Camp Crowder for his car. 73.

Boeing confidential radio lab. KG sends greetings to the About 90 per cent of KN Q’s ham gear has been turned over to keep the club operating for the duration and were gratified with the results. Among those responding were EUG, MIG or LFH. His address is T/5 George H. Cooke, ASN 12135229, SE 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 untraceable 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 FJY location, 1223 56th St., Des Moines. At present there are no operator permits with mail expected to arrive 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. OCC, Army radio operator 1st class, is formerly in Des Moines on leave. UAD, in Navy V-12, is at Purdue Univ. PKN, recently home on leave, has gone back to the Great Lakes Naval training station. AEP, 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. Velvet 112 Mo. OLT plans to use that as his War Mo. portable for his car. 73.

Kansas — SCM, A. B. Unruh, W9A WP — VPK, formerly a pfc. in field artillery in Oregon, is now in the Signal Corps at Camp Crowder. His assistant area radio officer, KOS, 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 plans, which have already been started, will be held at Camp Crowder and 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 KQN’s ham gear has been turned over to keep the club operating for the duration and were gratified with the results. Among those responding were EUG, MIG or LFH. His address is T/5 George H. Cooke, ASN 12135229, SE Service Co., Camp Crowder, Mo. 73, gang, and let’s hear from you. Win.

Missouri — SCM, Mrs. Letha A. Dangerfield, W9OUD — For much of the summer the mail from Kansas City has been more or less untraceable.

Don Mix, KAT, Guilford radio aide, recently experienced a hurricane of 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 company on his hill from a radio station on the other hill. The station was WJLH-1, which uses a position which is in line with most of the stations in the area.

The police and the ham radio people both have their eyes on this station. WJLH-47 is using a position which is now occupied by a police station and a radio station.

Comdr. Best, BIG, is in charge of new developments. DDX and JIN were recently home on furlough from the USN and USCG respectively. WKW-70 reports WKWH-8 is heard regularly at his location. George Leaman, WKW operator, is now working at WBG as radio aide in Waterbury, and reports that 1YL of Wallingford, now in the merchant marine, paid him a visit after returning from a trip to Africa. EAG, state radio aide, advises he is working on a WERS route for VKD headquarters in Boston, Mass., via Springfield. 73, Ed.

Maine — SCM, G. C. Brown, W1AQL — The Queen City gang was pleased to learn that QV has been promoted to 1st. col. in the Signal Field, Vic. and has returned to the Maine Signal Corps. He met 3EYP at Ft. Sam Houston — both are expecting to be transferred. A letter to PFP in care of his ship in San Francisco was returned — no longer with this line. Now what has become of Roy? And QAG has changed ocean home on a ship which he has not been able to get on yet. BMS said the grinding crystals is an awful headache. OJD’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 more letters for the next issue. Thanks for all the past and the very best of luck to all.

New England Division

Connecticut — SCM, Edmund R. Frater, W1KQY — SG-WERS news: Units of the 9th Battalion are in operation every Monday night at 8 P.M. Plans are being forged for a WERS operation, which 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 KQN’s ham gear has been turned over to keep the club operating for the duration and were gratified with the results. Among those responding were EUG, MIG or LFH. His address is T/5 George H. Cooke, ASN 12135229, SE Service Co., Camp Crowder, Mo. 73, gang, and let’s hear from you. Win.

October 1944

69
in Washington, D.C. A recent card from DHJ says that he is now on the invasion of Southern France but writes that he will make as full a report as the information will permit. We hope 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, 1 Sugar House. Thanks for those FB letters and cards. 73, Burt.

NORTHWESTERN DIVISION

IDAHO — SCM, Don D. Oberbillig, WTAVP — ITY and ECs. The IYs are busier than ever. All ARRLs are now handling traffic for the invasion of Southern France but writes that he will make as full a report as the information will permit. We hope 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, 1 Sugar House. Thanks for those FB letters and cards. 73, Burt.

WASHINGTON—SCM, O. U. Tatro, W7FWD — All ARRLs are busier than ever. All ARRLs are now handling traffic for the invasion of Southern France but writes that he will make as full a report as the information will permit. We hope 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, 1 Sugar House. Thanks for those FB letters and cards. 73, Burt.
column and you would be surprised at the interest your letter the services have in it. EKW is out on furlough and is working there seven days a week. He is working now in the department, working 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, IXX's old roommate, who is now in the receiving end of that "flock," reports that IXX is down in the South Seas. GUI, now in Seattle, reports that Vaughn Richard, 7 1/2 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 Sommers, W6CTW—Asst. SCM, Carroll Short, Jr., W6BZV. TJ 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 now 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. AQ, who serves as an operator in the Signal Corps, understands that he has been held an umbrella over his head while standing on two tea cups and they parallel feed him a 3/4 wave around 80 meters because he is so tall. FEB, an old NCR man, visited CW on route from the South Pacific. DJM is a warrant officer in the Navy. KEZB 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 recently, and we received a most complimentary letter from his auxiliary sailboat and is planning a super radio installation.

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 is a resident of Nevada. AII is chief operator and engineer at KOHL. BIC is on a well-needed vacation down by the sea. GQO, when last in Reno, had been upped to chief in the Navy, radio, course. QVX is in the Navy, but not in the Army as reported last month. JRV 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.

EASTERN FLORIDA—SCM, Horace R. Greer, W7TT—EC; QDE; EC v.h.f. FQK. Asst. EC v.h.f. OJU; OJU 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 is a resident of Nevada. AII is chief operator and engineer at KOHL. BIC is on a well-needed vacation down by the sea. GQO, when last in Reno, had been upped to chief in the Navy, radio, course. QVX is in the Navy, but not in the Army as reported last month. JRV 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.
Old Spence covers Dixie like the dew. CNZ has returned from a trip to California. His father has recovered from his illness. He is teaching new procedures to PAA students.

TINY is teaching new procedures to PAA students. He is now on the other side and happy over the way our interests are being taken care of. Old Spence covers Dixie like the dew. CNZ has returned to his old post. Jerguson, Russell, Davant, Carlton and Crotteau have been brought in to help. Drop me a line on how they sure put them through the ropes up there. He is 65 years young, is still going strong as a machinist in Jax. 8BUN/4 is working Jax and Blanding from St. Augustine. BUM 650 is working Jax and Blanding from St. Augustine. BUM 650 is working Jax and Blanding from St. Augustine. BUM 650 is working Jax and Blanding from St. Augustine.

BYF is doing a swell job of getting the>y in to the A-1. Mr. Mike is in charge of the A-1. Bill's report shows they sure put them through the ropes up there. He signs off and adds that this is a pleasant way to pass the time for the PAA students. I visited the local WERs and it is a peak of a setup. BYF is doing a fine job; he has that old sky hook 17 stories in the air. Mike and Bill ought to try a St. Augustine-Miami QSO. Bill's sky hook is up 100 feet. Bill's wire is being modified and he is assistant to Arthur Fish, our local FCC R. I. The following make up WKNW with 13 Oak Leaf Clusters, and had 73 missions over Germany.

Previously, the 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 Me, and has ideas for a station not far away. A pleasant hour was spent talking about old times and the wide open spaces of the desert. SOG longs for the wide open spaces of the desert. SOG longs for the wide open spaces of the desert. SOG longs for the wide open spaces of the desert.

WESTERN FLORIDA—SCM, Oscar Cederstrom, W4AXP—One of the happenings of interest this month was the wedding of the Don L. Leal, AQA, and Miss Kathleen Miles of Delphian Park, Delphian 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 moon much happiness. L. M. 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 past period as a result of his regular tasks. SFT 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 pleasant idea.

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 road blocks after the flight and we wish 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 his plane was crushed and finished by an old radio man. Dr. G. R. Smith, who was experimenting with radio back in the old days of spark transmitters. The doctor helped to build old SY, which later became WAPI of Auburn, Ala.

A pleasant hour was spent talking about old times and the wide open spaces of the desert. The doctor could really tell about such old time gear as rotary spark gaps, glass condensers built from static machine plate, 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 W6QVV licenses in this immediate area, at Griffith Park. Walt Matney did a swell job in choosing and reserving our fine location on Pepper Tree Lane. Over fifty families were present. Cal Tabor promoted a very FB p.a. system and a b. g. check-up device for entertainment. Murder, Jerry Johnson, Rudy Jensen and Don McCoy did a swell job in putting the roads leading to the tables, but even so RO found it almost impossible to find. Fred Eaton brought along portable power supply that would work inside the house and was able to put us through and check 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 mobiles were in evidence and in use and it is said that the receiver squeal was the most animated of all, for a far away signal. Oh yes, the ball game—well, we are all allowed to say 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 in all. Jerry Fusco is going to the States for a short 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 KGW stations now have Alford Hammerschmidt air pick-ups and will get out 1 to 3 Re better. All units are still very active under the able leadership of GRO. Fred Stapp of KCIG is busy shifting frequencies for his gang. Another group is about ready to start training as operators and QRM equipment 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 trouble and my gear is machined up. This new equipment is being lined up and new locations found because of changing control centers. KGLV controls are holding drills regularly and from what Harlan Martin tells me, his gang is doing a swell job.
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
The Design Problem
That Isn’t There

WHETHER contemplated production runs to one or a million, experienced engineers have one problem solved before they start. They specify Mallory 2000 Series Single Push Button Switches to provide the reliability and ease of operation that is so necessary and important in war-time test equipment.

The chances are, too, that standard stock types from the shelves of an authorized Mallory Distributor will take care of all switching requirements. Sixteen stock types in eight spring combinations handle almost any circuit requirement; but for unusual applications, special spring and contact arrangements can be built to order.

For momentary switching, use non-locking types Mallory 2000 Series Single Push Button Switches. On these, the button returns immediately on the release of pressure. When connections are to be maintained, use the locking type. Here the button maintains its depressed position until released.

Save time. Assure maximum acceptance of your product by using Mallory 2000 Series Single Push Button Switches. See your Mallory Distributor or write direct.

P. R. MALLORY & CO., Inc.
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Buy More War Bonds

Amateur Activities
(Continued from page 72)

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — Aet. SCM, Gordon W. Brown, W6APG — Thanks, fellows, for the news you are sending in. KW was married June 29th at Santa Ana to Miss Roxanne LaRusso, 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 civilian employee of government radio. EOP is still on the job as a street ear inspector. ELL is back on the Daily Journal after 5½ years with Solar Aircraft. MXK is with CAA at Sacramento. AJM is now at a base, stationed at Washington, D.C. TIX is at Quarter master School Training Center, San Diego. EJBJ and FGB are at San Diego Lab., Point Loma. TBI is still in L.A. and doing well. FFT, who is with Raytheon, is back in San Diego for a vacation. DBV is returning from Phoenix, Ariz., to Homit, Calif., to take charge of field for Ryan Co. SVHN is now in San Diego and would like to see something started toward WBS. How about it, gang? Let us have your comments.

CRB is back in the Navy. A nice letter was received from Lt. (jg) AYL, a Naval Air Navigation Radio School, Gaineville, Ga., 78, 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 line truck 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 AFG attended the CAP meeting recently in order to assist them with their radio problems. The Oklahoma City Radio Club will meet in Sept. to back 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 JFG are operators at the Douglas Tower, Oklahoma City. EBU, JDB and YBG are flight operators on C-47s at the Douglas Plant. EGG is a Lt. doing radar work on the West Coast and has been married a year and a half. JG 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 JIO, 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. IUJ is deputy sheriff and dispatcher at KEPFI. IQR is teaching radio at Corpus Christi Naval 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 — SOM, J. G. Hancock, W5HJF — MXK is employed at Chicago Pneumatic Tool Co. and with Solar Aircraft. MXK is a meter reader for the Southern California Edison Co. and goes into the radio repair business for himself. RBY quit his degree in physics from Caltech in June 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. IUJ is deputy sheriff and dispatcher at KEPFI. IQR is teaching radio at Corpus Christi Naval 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.

BRIEFS

Friends of Howard C. Seedro, 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, W6FOF, an enterprise 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 Signalter. "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, eat, just put your name, company, call and home town on a slip of paper and drop it into one of the many Signalter boxes. If we can interest enough hams in a get-together, we will contact you either through your company or the usual local column.”

We haven’t as yet heard what success Sgt. Nickells 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.
Behind bombing missions and dog fights
at every one of our invasion points
you'll find Super-Pro receivers
on twenty-four hour duty with the AACS
under almost impossible
operating conditions.
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 least there sort of got him down. George has met several VE4 hams down there, and mentions 4MD, Ian McArthur, who apparently is a 20-meter ham. 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. 3QJ was a squadron leader in the RCAF overseas at last official news, although the grapevine says he has been moved again. 3IG is still chief engineer at CNOC 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. Incidentally, Burlington is a town from which 3TO has never boasted (sic!) a ham before now has three: 31A, 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. R3C 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. 3IV, of York, is now overseas with the RCAF, 3AWS, of Grimsky, also overseas with the RCAF, got himself hitched to a Scotch lassie. Congrats, Ken. 3JNP, of Grimsky, also is in the RCAF, his whereabouts unknown at the present writing. 3ANB, of Bromville, is now a sergeant in the RCCG overseas. 3AW and 3OW are QRL on the farm. How are all the goats? 4HF 3F2 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. KCWPT joined the Veteran’s Guard of Canada and when last heard from was in the North Woods. 3AES also is in the ornate 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 Scholtes, VE5DY, from VE3KM 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’l agree, they are interesting reading:

VE3KM 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 shivered 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 Heinz. Eggs come high, about 0.15 cents each.”

Quoting from a letter received from VE5ACE in Ceylon: “We could set up a pretty swell hamfest right here with all the 0s and 0Es. . . . 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 807’s in the final. They drive a dozen perimeter speakers with lots of static. . . . I’d like to build a good super to get the static off. Well, so long, Dave. Sometime I’ll send you a pair of matched leopards in push-pull.”
Through the development of our own highly specialized calibrating equipment Hammarlund engineers have made possible mass production of variable capacitors with accuracies comparable to laboratory standards.

HAMMARLUND

THE HAMMARLUND MFG. CO., INC., 460 W. 34TH ST., N.Y.C.
MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT
Radio transmitter manufacturers believe that the very best components are not too good for their high power equipment.

Such manufacturers are using Cardwell condensers typified by the Type WX-95-VS heavy duty transmitting capacitor (illustrated).

The customers of these manufacturers know that a component, embodying master craftsmanship of such superior quality, is the finest money can buy and, indeed...

The Standard of Comparison

Specifications:

Type WX-95-VS
Capacity—100-42 mmfds.
Airgap—1 Inch.
Peak Voltage—20,000 volts.
Size—15⅞" x 15⅞" x 13¼" long.
Frame—Cast aluminum and plates with brass tie rods.
Rotor—⅛" brass plates pressed and soldered into solid brass barrel.
Stator—¼" brass plates pressed and soldered into massive brass stator blocks; equipped with electrostatic shields, on blocks and stator studs, to minimize corona losses.
Rotor Contacts—Laminated phosphor bronze self-cleaning brush.
Finish—Polished lacquered brass—End Castings satin finish aluminum, lacquered.
Bearings—Ball thrust rear—shoulder front bearing.
Shaft Extension Diameter—⅜ inch.
Insulation—Mycalex

CARDWELL CONDENSERS
THE ALLEN D. CARDWELL MANUFACTURING CORPORATION
41 PROSPECT STREET
BROOKLYN 1, N. Y.

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. Primavose, 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. Zyviteki, RAFTC, Oshawa, Ont., Canada
VESPO, J. A. Hudson, Hamilton, Ont., Canada
VE5NB, O. C. McCombie, RAFTC, New Westminster, B. C., Canada

Missing in Action

W9HXXF, 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. Pettjohn, 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 61)

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
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 mgmt, 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.)
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, henio, 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.
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.

*U. S. Patents issued and pending.
to Crystal Cleaning

THIS is an actual photograph of the centrifugal air drier, or "spinner," used in Bliley production to facilitate clean handling of crystals during finishing and testing operations. Quartz blanks are dried in 5 seconds in this device which is powered with an air motor and spins at 15,000 r.p.m.

Little things like lint or microscopic amounts of foreign material can have a serious effect on crystal performance. The "spinner" eliminates the hazards encountered when crystals are dried with towels and makes certain that the finished product has the long range reliability required and expected in Bliley crystals.

This technique is only one small example of the methods and tests devised by Bliley Engineers over a long period of years. Our experience in every phase of quartz piezoelectric application is your assurance of dependable and accurate crystals that meet the test of time.

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Bliley Electric Company - - ERIE, PA.

Bliley Crystals

---

(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, W7BWII

"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
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— W. K. Barry, Tucson, Arizona, 401102

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(Continued from page 38)

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 6V3, 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 Lam noise silencers, so I'd probably stick grid No. 3 of the U17 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 de-coupling used in the r.f. and i.f. plate circuits, together with the a.v.c. de-coupling 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 WJJI-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.

— 31c (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
"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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Name

Address

City and State

Position

Company

QST 10-44

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

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 by-pass, that variable, the long-unused bottle bearing its indelible cryptic recordings of midnight...
NE 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.

E-L STANDARD POWER SUPPLY
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: 65 watts max.
Dimensions: 9¾" x 5¾" x 6" Max. Wt. 14½ lbs.

E-L Converters can provide plate and grid supply from 6 volt or other battery power in a variety of output voltage. Vibrator Power Supplies are also available which permit operation of 115 volt AC equipment from 110 volt DC, 110 volt 25 cycle AC, or 32 volt DC as well as other power sources. Applications are found in any field where current characteristics of the power source need to be changed. Economy is assured by long, efficient service with minimum maintenance.

Replacement vibrators are available for mobile P.A. systems.
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 Trim 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 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 enduring 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. Mathews, USN, W4EAW

An Electronic Keyer

(Continued from page 85)

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.

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.

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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BUY MORE WAR BONDS
Today flasher signal lights and invasion-barge searchlights are more important than battery-powered lights on the home front. Burgess Batteries go first to the men who need them most, so we'll all have to take better care of what batteries we may have. Keep them cool and dry... use them as little as possible and rest them as often as possible. For Free Battery Hints—Write Dept. Q-2, Burgess Battery Company, Freeport, Ill.

Hints and Kinks
(Continued from page 69)

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.

<table>
<thead>
<tr>
<th>Watts</th>
<th>Core Sq. In.</th>
<th>Wire Size</th>
<th>No. Turns</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2</td>
<td>21</td>
<td>450</td>
</tr>
<tr>
<td>200</td>
<td>3</td>
<td>17</td>
<td>300</td>
</tr>
<tr>
<td>300</td>
<td>4</td>
<td>13</td>
<td>225</td>
</tr>
<tr>
<td>400</td>
<td>5</td>
<td>14</td>
<td>175</td>
</tr>
<tr>
<td>500</td>
<td>6</td>
<td>13</td>
<td>150</td>
</tr>
</tbody>
</table>

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 J. 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 dribs and dibs, 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 absent-mindedly tossed a flaming match on the ground.

(Continued on page 88)
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2" - 3" - 4" - 5" - 6" - 7"

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D. W. ONAN & SONS
1956 Royalston Avenue
Minneapolis 15, Minn.

(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 expanses 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, WBN A; 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 45)

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 µfd.; grid-filament, 2.7 µfd.; plate-filament, 0.3 µfd. The tube measures 4½ inches in length and 1¾ 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 µfd.; grid-
Re-designed in the light of wartime conditions and re-styled to meet present-day needs, the 1944 Edition of The Radio Amateur’s Handbook contains more pages and more information per page than any Handbook yet published. Greatly expanded, the revised and re-written section on theory and fundamentals is basically the same highly successful treatment that made the Handbook the world’s outstanding radio training text. In addition to the established features, the new edition includes an enlarged chapter on the War Emergency Radio Service and an entirely new chapter on carrier-current communication, plus other useful new material — all added without sacrificing any of the essential information in previous editions. Every subject encountered in practical radio communication is covered, arranged for maximum convenience to the reader, sectionalized by topics with abundant cross-referencing and fully indexed. More than ever the ideal reference work, the 1944 edition also contains the practical constructional information on tested and proved gear which has always been the outstanding feature of the Handbook.

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AMERICAN RADIO RELAY LEAGUE, INC.
WEST HARTFORD 7, CONN., U. S. A.
filament, 1.7 μfd.; plate-filament, 0.3 μfd.

Dimensions for this tube are: length, 4 5/16 inches diameter, 1 3/16 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>750</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max-Signal D-C Plate Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plate Dissipation, per tube</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D-C Grid Voltage (approx.)</td>
<td>20</td>
<td>30</td>
<td>45</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Peak A-F Grid Input Voltage</td>
<td>205</td>
<td>210</td>
<td>230</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>Zero-Signal D-C Plate Current</td>
<td>43</td>
<td>32</td>
<td>21</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Max-Signal D-C Plate Current</td>
<td>133</td>
<td>120</td>
<td>94</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Max-Signal Driving Power (approx.)</td>
<td>1.4</td>
<td>1.2</td>
<td>0.8</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Effective Load, Plate-to-Plate</td>
<td>9200</td>
<td>15800</td>
<td>33700</td>
<td>55500</td>
<td></td>
</tr>
<tr>
<td>Max-Signal Plate Power Output</td>
<td>50</td>
<td>70</td>
<td>90</td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

* Averaged over any sinusoidal audio frequency cycle.

### 3C24

**Audio Frequency Power Amplifier and Modulator Class C Telegraphy**

Typical Operation - 1 Tube Max. Rating

<table>
<thead>
<tr>
<th>Parameter</th>
<th>750</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-C Plate Voltage</td>
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<td>Plate Dissipation, per tube</td>
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<td>70</td>
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* Averaged over any sinusoidal audio frequency cycle.

Radio Frequency Power Amplifier and Oscillator Class C Telegraphy:

Typical Operation - 1 Tube Max. Rating

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</table>

* Averaged over any sinusoidal audio frequency cycle.

The above figures show actual measured tube performance, and do not allow for variations in circuit losses.

Ever Alert

In devotion to the ideals of hambom — the radio amateur is famed for instant, effective action in every emergency.

So too, the National War Fund gives prompt aid to suffering peoples in every land, and offers comfort to our service men and women at home and overseas.

Your support of this Fund is action in the highest amateur tradition. Give generously — today — through your Community War Fund.
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HAMS OF TOMORROW
When victory is won, amateurs again will find the familiar standard UNIVERSAL microphones of pre-war ham days. There will also be new styles designed from wartime experience in communications. But, whatever the style or type, they will always embody the usual UNIVERSAL excellence in precision engineering, material and workmanship.

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The HARVEY Regulated Power Supply 206 PA
RANGE 500 to 1000 VOLTS
This new Harvey development fills the need for a Regulated Power Supply in upper voltages. It may be operated in two ranges, 500-700 at ¼ of an ampere and 700-1000 at ½ of an ampere. Both ranges have accurate regulation to one per cent or less.

The 206 PA is a model of efficiency and operating convenience. All parts are readily accessible. It is equipped with spare fuses, a 6 ft. heavy duty Tyrex cord with a handy two prong plug. The HARVEY 206 PA is fused on the primary side and has both an overload relay and time delay. Two interlocks on the chassis afford the operator complete protection.

Now is the time to get the complete story on this important new contribution to the radio-electronics field. Write, phone or wire.

HARVEY RADIO LABORATORIES, INC.
451 CONCORD AVENUE, CAMBRIDGE 38, MASS.
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 — II. 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 Hamfester 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, C6.
An Exceptional Opportunity for Research Scientists

One of America's largest organizations engaged in conducting research for industrial corporations and governmental agencies is expanding its present staff of 300 people.

Research-minded engineers and scientists, who can measure up to this organization's high standard, are invited to investigate the wartime and postwar opportunities of the Armour Research Foundation.

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Men and women who can be released from present duties and meet the above qualifications are assured salary and opportunity commensurate with ability. And, future research commitments promise postwar permanence. If you are interested, please write immediately.

Applications are also invited from scientists who are on leave of absence from educational institutions for the duration.

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Successful Soldering, by Louis S. Taylor. Published by McGraw-Hill Book Co., Inc., New York. 76 pages, $1.00. If you have ever tried to solder aluminum, you have probably given up in disgust and alleviated 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 flame 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 store 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 courses.

Written in simple, terse language, the book is a blessing to the beginner as well as a good working tool for the professional.


Qualitative descriptions of the systems in use are coupled with an analytical study of the underlying phenomena. Particular attention has been given to the present 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 ionisation.

Considerable space is devoted to directive antenna systems. Patterns of long antennas, horizontal fields of vertical antennas with respect to height, radiopropagation, antenna-antenna 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.

Book Reviews

(Continued from page 87)
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.


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 contacts and phase-shifting control circuits are discussed.

The book concludes with a 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 thyratron — an important device which uses a.c. as a prime mover in connection with d.c. motors and includes 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.
Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products advertised.
NOW HOGARTH IS ADMIRAL OF THE LOCAL FLEET. HE PROMISED THEM AN ECHOPHONE EC-1 AFTER THE WAR!

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The use of R.F. heat in making glass to metal seals simplifies and speeds many such sealing operations.

Electronic Telescias—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.
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)
**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-6ALS** 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.

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**RCA-6AQ6**

DUPLEX-DIODE TRIODE

$1.50

A multi-purpose miniature electrically similar to the metal E807, but with built-in heater-power requirement, smuggly use as a combined detector amplifier, and serve as a combined detector amplifier. Diode biasing of the triode unit is tube. Diode biasing of the triode unit is
desirable. Inter-electrode capacitances are low. Insert: 25, 0.15.

**RCA-6ALS**

MAXIMUM OPERATING DATA

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. output power</td>
<td>0.5 watt</td>
</tr>
<tr>
<td>Max. plate current</td>
<td>0.5 ma</td>
</tr>
<tr>
<td>Max. plate voltage</td>
<td>150 volts</td>
</tr>
</tbody>
</table>

**RCA-6J4**

HIGH-GAIN TRIODE

M.A.X. FREC. 500 Mc

$8.35

A heater-cathode type of miniature triode, excellent as a grounded-grid a-c-f amplifier (up to 500 Mc). Provides high signal-to-noise ratio. Amplification factor: 50. Transconductance: 2,000 micromhos at plate curr.

**RCA-6ALS**

HIGH-PERVEANCE DOUBLE-DIODE

$0.75

A heater-cathode type of miniature twin-diode. Its low tube-drop (10 volts at 50 ma.) permits the design of high-efficiency broad-band circuits. Diodes can be used separately or in parallel. Heater Volt.

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