QST

march, 1944
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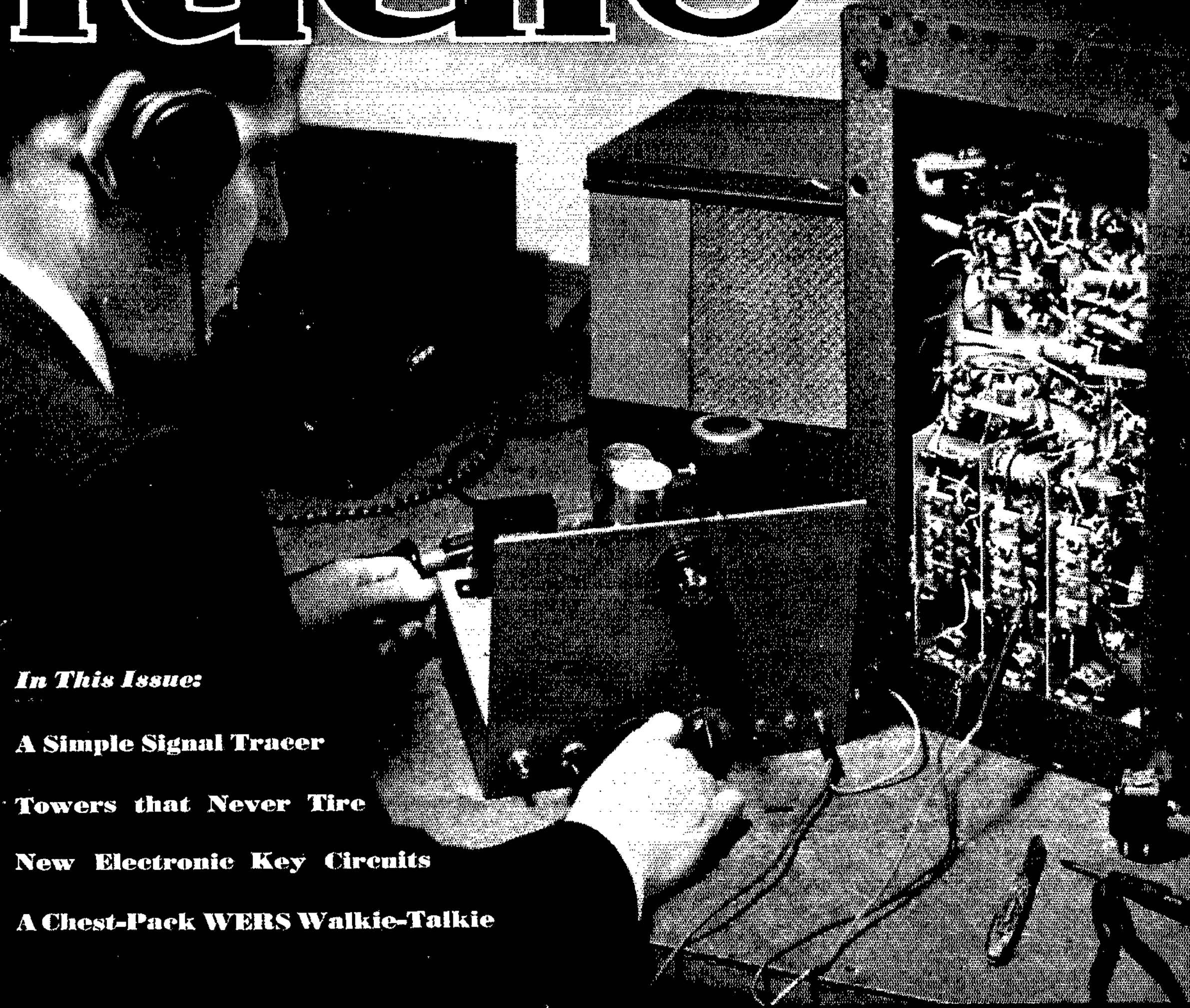

In This Issue:

A Simple Signal Tracer

Towers that Never Tire

New Electronic Key Circuits

A Chest-Pack WERS Walkie-Talkie

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

"HEY MAC - GET IN ON THIS!"

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

MARCH 1944

VOLUME XXVIII

NUMBER 3

★

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CONTENTS

THE ANSWER TO A

Challenge

AR-10-A
Dust cover removed, showing layout and treatment of dual crystal holders.

Check Points

- 3 BANDS
  195-425, 2500-4500, 4500-8000 KC.
- 12 CRYSTAL CONTROL FREQ.
- 2 BEACON BAND SPOT FREQ.
- REMOTE MANUAL TUNING
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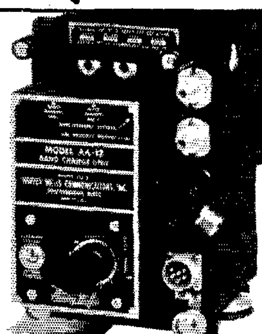
  24 Pounds
- SIZE
  One Half ATR
- DEPENDABLE
  Simple to Service
- APPROVED TYPE
  Certificate #770

A challenge — to place in the hands of the United States Air Lines an instrument of destiny. A challenge — to radio engineers, designers, and fabricators. A challenge — to produce an instrument capable of operating on present frequencies and ready to function on the high frequencies to come... operate manually or on spot frequencies, and yet light in weight and small in size.

This has all been accomplished by HARVEY-WELLS in their new AR-10-A aircraft receiver!

We here at HARVEY-WELLS are always ready to put forth every ounce of our energy, experience, and enthusiasm, and cherish a desire that we may play some small part in helping you take your place in the future destiny of air supremacy. As you grow and continue to grow we should like to be with you. Wherever and whenever we can help — we'll be there.



LEFT — Front of model AR-10-A with dust cover in place, showing Model AA-12 Channel and control selectors, loop and antenna connections.

RIGHT—Close-up view of model AA-15 Electric control unit for remotely controlling all functions of the AR-10-A Receiver. A separate manual tuning unit is also provided.

HARVEY-WELLS
Communications
INCORPORATED
PLANNING FOR TOMORROW—TODAY
SOUTHBRIDGE, MASS.

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

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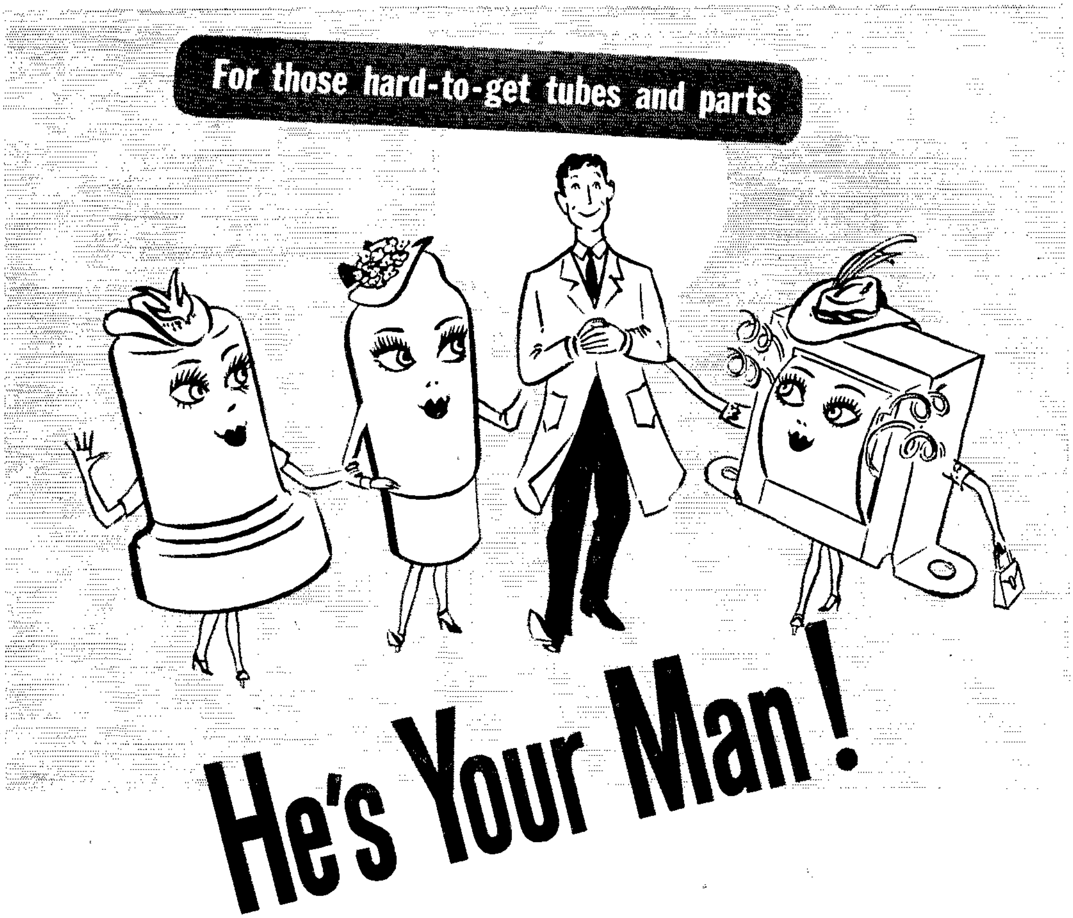
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He's Your Man!

THE AMERICAN RADIO RELAY LEAGUE, INC.,

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

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

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

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

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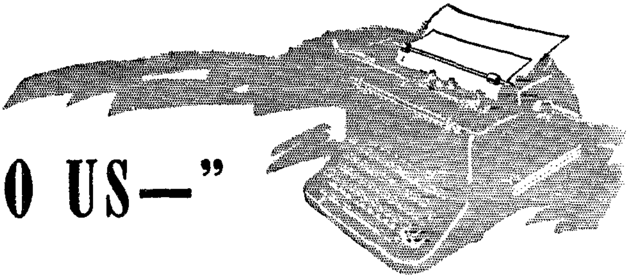
"IT SEEMS TO US—"



POLICY

SOME of the gang — a very few — write to us that they think we are premature in engaging in any postwar planning talk in *QST* and unwise in permitting discussion of controversial subjects which might display us before the world as of divided opinion on our own future. Some of them deplore even the publication of letters on the power question, on the grounds that some of the opinions will indicate an apparent willingness on the part of amateur radio to give away a right before it is even challenged.

We think we ought to make a statement, a sort of declaration of policy. It has seemed to us that there are some topics on which we could begin profitable discussion, in a preliminary sort of way, always remembering that a majority of our most active people are away at the fighting fronts and can participate in these talks only with difficulty or not at all. Thus we invited discussion on our ultimate institutional objectives and on the matter of power — on which, to be sure, we shall show some divergence of views, but never to an extent that could injure our cause. However, we have no slightest intention of permitting the discussion in *QST*'s pages at this time of any issues capable of becoming seriously controversial and weakening our position, nor do we intend to treat such matters editorially until the time is ripe. For the time being we have adopted the policy of deleting from our published correspondence all references to subjects of that nature. You will all know the kind of subjects we mean. The time for them has not yet come. There is scarcely anything that any person could say on such a topic that would not be an invitation to some one else to hop on him; we should be tearing ourselves wide open in print, and with perfect futility. This is no high-handed and unwarrantable censorship on *QST*'s part; it is simple prudence, in our common good. Prudence, plus a realization of the footlessness of such examinations at this time. If you have wanted to sound off on some such subject, bear with us and try to see that we are wise in not opening up on them in print at this stage.

But it seems to us that the question of power is not in that category. It is common to all amateur stations, not to particular classes, and is therefore basic. The war isn't won and any power decision is a long way off. For some years there has been sizable amateur opinion to the effect that a lowered limit would give us a more desirable structure. If that argument isn't sound, every one of us wants to know it. If it overlooks other considerations, we want to know it. And if it's true, we want to know it in that event, too. There is no reason why an examination of it should result in controversy or a division of our strength. Nothing is up for decision and nothing is being bartered away. The eventual decision is between us and government. We can have a clean and healthy discussion, in which we shall learn something. That is the attitude in which we have approached the matter. Our editorial on power resulted in more letters than we have received at Hq. on any one topic in many a month. We cannot begin to publish them in their entirety. To permit expression by the greatest possible number, we shall have to make excerptions from these letters, with an endeavor to preserve the *why* behind each man's opinion. As they are still rolling in every day, we have decided to wait another month before publishing them, to have the widest possible representation. They will appear in our correspondence section next month. We ourselves have found them greatly stimulating and immensely interesting reading, and we hope you will find them so, too.

PRESSURE

YOU should see the claimants for frequencies as the postwar planning begins to move. Of course you're sort of prepared for broadcasting, but it totes up pretty impressively when there's audio and video and fax, and low frequencies, intermediate, high and very high, and both a.m. and f.m. Then there's point-to-point, and aviation and the maritime services and the aids to navigation. And police and the other emergency and experimental services. And government. And relay services for everybody. And the new stuff such as ranging and obstacle-detection. And more questionable items, such as allotted frequencies for diathermy instead of shielding the animals. And industrial r.f. heating. Then there is a horde of new ideas ranging from the useful to the nut fringe: walkie-talkies for firemen, public-service telephony from moving trains and planes, a national mutual-aid network for exchanging municipal facilities in emergencies, trucking associations wanting contact with all their trucks on the highways, railroads caboose-to-locomotive, this and that for small boats, doctors' calling services wherever-you-are, radio burglar alarms, radio fire-alarm boxes for small towns that can't afford wiring. *Ad inf.*, *ad abs.* and *ad naus.*

Just thought you'd like to know some of the things your representatives are up against. The best minds in radio are going to find it a difficult enough job to plan the brave new world. Thank your stars that the record of amateur radio clearly establishes its permanent value. And, by the way, we *are* on the job. Often we can't tell you in detail how things are getting along; frequently it's wiser not to, until some fresh development permits releasing the information.

But ARRL is at work.

K. B. W.

★ SPLATTER ★

OUR COVER

"MAKE it do; make it last" — that's the theme of this month's cover. When radio receivers, whether communications or b.c.l., break down these days you have to patch them up and keep them playing — or you just don't listen. That's where a simple test gadget like W1FWH's signal tracer (p. 28) comes in — low-priority on parts, high-priority on use.

• • • —

FOOTNOTES

PASSING in review this month are these new recruits to the ranks of *QST* authors:

Robert J. Donaldson, W8JWF, whiled time away whilst awaiting those familiar "Greetings" by penning the piece on p. 38. Appropriately enough (since he hopes to land in the Navy), he chose masts for his subject. When he had finished and still no word from F. D. R., he started drawing plans (he's a structural draftsman by profession) for an 80-foot tower. By mid-summer it should be up — if the draft board holds off on him that long. . . . **William M. Gardner** (p. 15) holds no ham call at present, but he learned about keys — and sending — in ham shacks from North China to Quantico. That should be enough of a hint to tell you that he was once a Navy op. Now he's associated with the same crew as Ed Tilton, W1HDQ — whose guarded remarks about their work in "On the Very Highs" may give you another hint. . . . **Seymour Lobel** (p. 49) on the other hand, comes closer to being a simon-pure professional — although traces of amateur yearnings are distinguishable. Born a native New Yorker 29 years ago, his career in radio includes work under such titles as supervisor of production and testing, technical advisor and instructor, design and research engineer. Now he is engineering wartime electronic products for Air-King Radio Co. . . . Although he doesn't say so, in the case of **Chester H. Page, W3IKI,** it's easy to guess that early miscues with that "IKI" combination on a conventional bug led to his development of an electronic key (p. 17). Although W3IKI was not his first call (he got it when he went to Lafayette College at Easton, Pa., in 1938), his previous operation on W1CHP had been on five meters, where the idiosyncracies of bugs would have been no problem. At that, his solution seems a logical one for a senior physicist in the Ordnance Development Division of the National Bureau of Standards, which he is. . . . **Charles W. Sumner, W4EJ,** co-author with *QST* veteran A. D. Mayo, W4CBD (Splatter, November, 1943, p. 10), of the report on f.m. peculiarities on p. 34, has been fifteen years a ham and five a b.c. engineer — and equally successful at both. After absorbing all that Wake Forest College and Alabama Polytech could teach him he went to work, first as chief engineer of WISE, then as assistant chief engineer of WWNC. . . . **Sgt. Wm. A. Wildenhein** obviously is an eminently practical, level-headed individual with his feet firmly planted on the ground. This is evidenced by the fact that he is a machinist by trade, has model railroading for a hobby (together, of course, with eleven years of radio), was graduated as top man in his Army radio class, and has been an aviation radio instructor at the Sioux Falls AAF school for the past year. If further proof is needed, see p. 52.

• • • —

FEEDBACK

RECENT correspondence:

Memo: "In Fig. 1, December *QST*, p. 54, there should have been no connection shown between the lower left and the upper center terminals on S_2. — *D. H. M.*"

Letter: "Reference is made to the article 'Radio Aids to Navigation,' by Sgt. Peter K. Onnigian, W6QEU, in February *QST*, describing modern airlines equipment.

"Being a Link instructor at the U. S. Naval Air Station here made me appreciate the article more than those who are not closely associated with radio range work. However, I detected an error in three sketches illustrating the principles of radio ranges. Fig. 2, p. 26, depicts the 'N' quadrants as being east and west of the station instead of north and south. True north always runs through an 'N' sector except in a pattern like Fig. 4, p. 27, where the north leg of a range has a magnetic heading of 360° or 0; then the 'N' sector is located west, or to the left of the north beam. Fig. 5, p. 27, shows the sectors reversed like Fig. 2. — *'Jerric' (Bessie) Cunningham, W4HWS.*"

A Walking WERS Station

A Self-Contained 112-Mc. Transmitter-Receiver

BY HOLLIS M. FRENCH,* W1JLK

One fault common to many types of equipment designed for the "infantry" in WERS service is failure to make the gear entirely self-contained. The trans-receiver described here is complete in a single unit which can be snapped on and put into service at a moment's notice. Antenna, power supply and microphone are attached and ready to use. Ordinarily nothing ever is detached from the basic assembly except the headphones. Yet it is not a transceiver, since the receiver tuning is independent of the transmitter setting. It is offered as a one-man walking WERS station with a reliable range of from one to five miles, depending upon transmission paths.

EVERY amateur has dreamed of being able to carry a complete transmitting and receiving station with him wherever he goes, whether or not transportation is available, other than that which nature has provided. While the goal is still distant if operation on the lower frequencies is desired, the compactness of equipment for the very-high frequencies has made the "walkie-talkie" practicable, with limitations.

Stimulated by the need of such equipment for WERS applications, as well as by recent developments in military communications equipment, a number of designs have been described. The one offered here is an attempt at a compromise between those rigs which feature extreme reduction in weight at the cost of very short battery life as well as sharply curtailed operating range, and those which must be a heavy burden to the operator who is compelled to pack 40 or 50 pounds of equipment, including heavy-duty batteries, on his back.

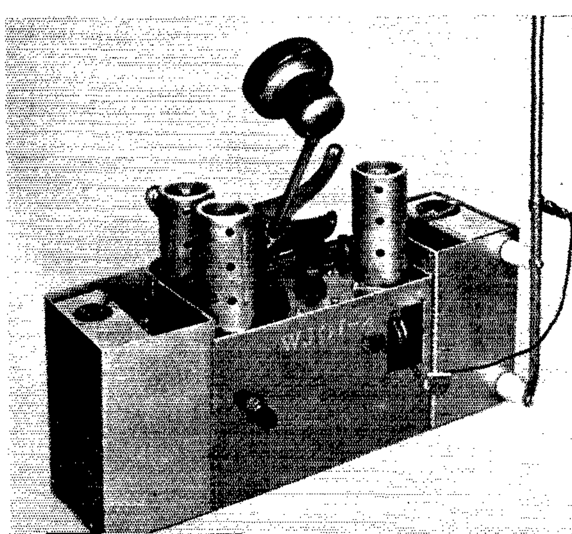
Some of the objectives achieved are medium weight (11½ pounds including *everything* required); assembly of all components, including power supply, in one unit; support of the unit in such a way as to leave both hands free; elimination of entangling wires and cables; maximum power and coverage with a minimum of battery weight and battery drain (made possible through the use of efficient tubes, selective filament switching, and Class-B modulation); separate circuits for receiver and transmitter r.f. sections (with a common audio system); minimum receiver radiation; simplicity and convenience of operating controls; and ease and speed in "installation."

Circuit Arrangement

The circuit, shown in Fig. 1, includes a self-quenched superregenerative detector of the "Minute Man" type, covering a range of from 110 to 120 Mc., using an HY114-B triode, a unity-coupled modulated oscillator built around a 1G6G dual triode, and a common audio system consisting of a 1G4G transformer-coupled to another 1G6G which is operated as a Class-B modulator and second audio amplifier.

Change-over from receiving to transmitting is effected by a 3-p.d.t. anti-capacity switch with an "off" position, salvaged from a discarded transceiver. When the receiver is in use the filament circuit of the 1G6G oscillator is opened, while in transmission the detector filament is cut out of the circuit. The microphone battery circuit is opened during receiving periods. Two points on the switch are used for disconnecting the antenna from the receiver circuit when the transmitter is on the air. The switch wiring diagram included in Fig. 1 represents the connections found most convenient in the present layout, but it need not be accepted by constructors who wish to vary the arrangement of circuit components or by those using a different type of switch, such as a wafer-type rotary switch.

Some may question the practice of leaving the antenna connected to the transmitter tank circuit at all times. This was done to avoid the necessity of using another switch or a relay, and in operation under the circumstances for which this equip-



The entire transreceiver assembly complete with battery power supply and antenna is supported from a W.E. microphone breastplate. The 1G4G driver and 1G6G modulator tubes are at the right, with the change-over switch on the front panel below. The 1G6G oscillator tube is at the left, with the detector tuning condenser and regeneration control knob behind it. The knob at left front on the top panel is on the volume control. The unity-coupled tank coil can be seen through the oblong opening on the front panel.

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ment was designed it has not been found to detract from satisfactory operation of the receiver. The superregenerative detector appears to have sufficient sensitivity to make up for such losses as arise in the parallel circuit. Naturally, the receiver should be disconnected from the antenna when transmitting currents are flowing in it; this is taken care of in the change-over switch employed, as mentioned.

Of two available means of providing necessary bias for the 1G4G first audio tube, a stack of four 1.25-volt Mallory bias cells was chosen for its light weight and compactness. Properly, five of the cells should have been used in order to comply with the tube manufacturer's recommendation of 6 volts bias for operation with a 90-volt plate supply. The manufacturer's holder requires the application of insulating strips to prevent the possibility of the cells being shorted out by the shielding used in this rig. As an alternative, four penlite cells in series could be employed. Automatic bias is not desirable in this circuit, since the difference in total "B"-battery current drain between the receiving and transmitting conditions is too great and the same audio circuit conditions must be maintained because of the tubes' dual function as receiver amplifier and transmitter modulator.

The transmitter tank circuit, shown as a single turn in the circuit diagram to simplify the drawing, actually is 2 turns of 3/16-inch copper tubing, 1 inch in diameter. It is soldered directly to the plate prongs on the oscillator tube socket, the coil plane being at right angles to the plane of the bottom of the socket. The grid coil, consisting of two turns of No. 18 wire, is threaded through the tank coil, from which it is insulated by varnished cambric tubing. This push-pull unity-coupled circuit, often used in transceivers in the attempt to diminish "creeping" caused by differences in "transmit" and "receive" circuit conditions, was adopted for this rig for another reason. It was felt that its compactness of design and convenience of mounting justified its use with the 1G6G dual triode. No other tube in the 1.4-volt series, of those at present available to the amateur constructor, will yield equivalent power without a sacrifice of compactness. The 1G6G is equivalent to a pair of 1G4Gs and is well suited for operation as a push-pull oscillator.

Mechanical Arrangement

The entire equipment is designed to be supported from the breastplate and webbed shoulder-harness of an old-style Signal Corps type Western Electric microphone. The only external wiring is in the headphone cord, which may be made very short. An adjustable aluminum tubing antenna, cut down from an earlier 5-meter telescoping antenna, is supported by stand-offs on the wearer's left-hand side of the case. As may be seen in the "live" photograph, the microphone is always at the "ready" and requires no handling. The operator's right hand is at the change-over switch knob and his left hand is adjusting the receiver tuning knob or the regeneration control, both of which are on the top of the case. The oblong opening over the oscillator coil permits a wide range of adjustment of the antenna tap, as well as access to the tank condenser, C_5, for frequency setting.

In the closer view of the unit, the 1G4G audio driver tube is at the right rear with the 1G6G Class-B modulator in front of it. Next are the headphone jack and the knob for the volume control, R_3. The 1G6G oscillator tube is at the left front, and behind it are the regeneration control knob for R_2 and the

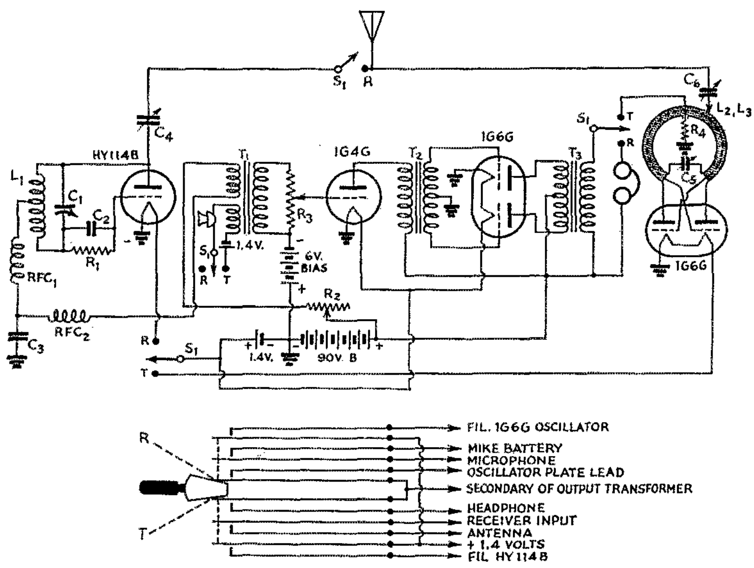
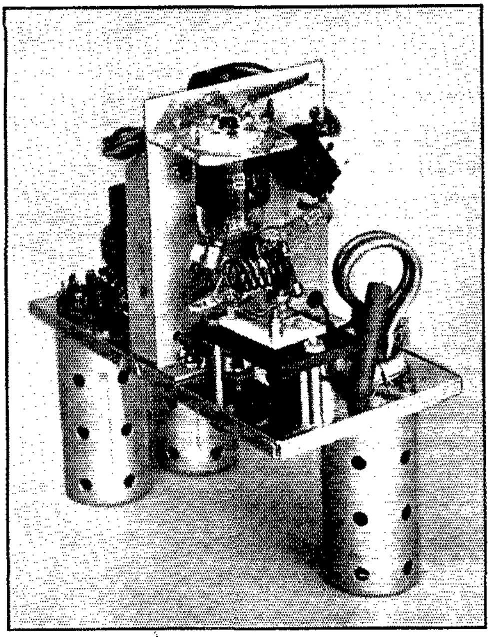


Fig. 1 — Circuit diagram of the "Walking WERS" transmitter-receiver.

- C_1 — 10-μμfd. midget variable.
- C_2 — 50-μμfd. mica.
- C_3 — 0.005-μfd. mica.
- C_4, C_5, C_6 — 3-30-μμfd. mica trimmer.
- R_1 — 20 megohm, ½-watt.
- R_2 — 50,000-ohm midget variable.
- R_3 — 500,000-ohm midget variable.
- R_4 — 500-ohm wire-wound, 10-watt.
- L_1 — 7 turns No. 14 enameled, ½-inch diameter, 1-inch long.
- L_2 — 2 turns 3/16-inch copper tubing, 1-inch diameter.
- L_3 — 2 turns No. 18 enameled (wound inside L_2 and insulated from L_2 with spaghetti).
- RFC_1 — Ohmite Z-0.
- RFC_2 — 80-μh. r.f. choke (preferably shielded).
- S_1 — 3-p.d.t. anti-capacity switch with neutral position.
- T_1 — 3-winding transceiver transformer.
- T_2 — Midget Class-B input transformer.
- T_3 — Midget Class-B output transformer.



R.f. end of the subpanel assembly, with the detector circuit at the left and the oscillator tank coil at the right. The large resistor in the foreground is the grid resistor for the unity-coupled coil. The 80-μh. interruption-frequency choke, RFC_2, is at the right of the HY114-B, behind the fixed condenser, C_3, used in the grid-blocking circuit. An insulated shaft coupling was used on the receiver tuning condenser to avoid body capacity effects.

pointer knob on the shaft of the receiver tuning condenser, C_1. On the front panel the knob at the left controls the change-over switch.

The trimmer condenser seen in the antenna lead serves as a blocking condenser to isolate d.c. from the antenna and also provides some degree of adjustment of the electrical length of the antenna. The clip which connects the antenna lead to the tank circuit is set by trial. Generally it will be placed fairly close to the center of the tank coil.

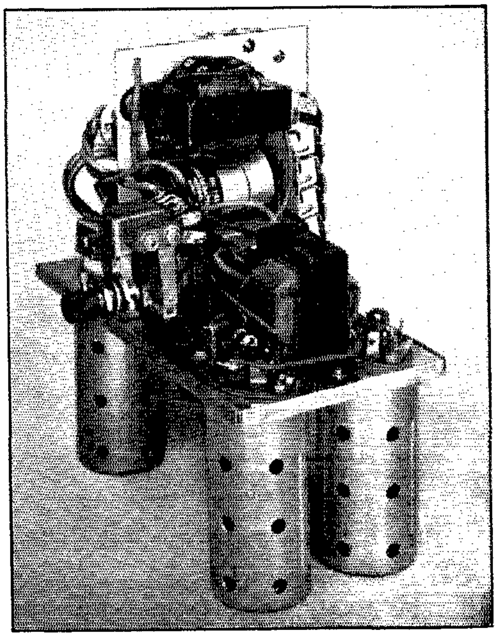
The batteries are contained in the metal pockets at the ends of the unit. The two 45-volt units in series and two 1.4-volt units in parallel are connected by a cable, conducted through grommets in the walls of the partitions, to the distributing points within the case. The arrangement is designed to distribute the weight of the batteries evenly and at the same time make them accessible for replacement. Covers are provided for the tops of the battery compartments.

Construction

The main case is a salvaged shield can measuring 4 × 7½ × 5 inches, with 4 × 3½ × 5-inch pockets added at each end for the batteries. While the batteries could be carried in pockets in the operator's clothing or supported from his belt, convenience in speedy donning of the equipment would thereby be sacrificed. Moreover, experience in the field has shown that it is worth while to eliminate interunit leads and cables which might become entangled in bushes or in other equipment carried by the operator.

All components except the change-over switch and the microphone are mounted on the top deck of the case and upon the vertical shield partition suspended from it. Thus, when servicing is required, it is necessary only to remove the knob and mounting nut from the change-over switch assembly and the mounting screws from the microphone breastplate, and then lift the entire assembly from the shield-case.

The upside-down left-hand view of the assembly shows the placement of the audio components. The midget transformer mounted on the baffle is a standard three-winding job, providing interstage coupling between the detector and the first audio stage and also a microphone winding. It was salvaged from a 5-meter transceiver, as were the midget Class-B input and modulation transformers. The input transformer is mounted between the sockets of the 1G4G and the audio 1G6G. The modulation transformer is near the center of the assembly, close to the baffle. The midget potentiometer next to the 1G4G socket is the volume control, R_3. On the front edge of the baffle as viewed in the photograph is the stack of 1.25-volt bias cells used to provide bias for the 1G4G. A cardboard strip, cemented to the back of the commercial mounting used, prevents short-circuits through contact with the shield-case, and a cardboard divider is installed on the opposite side of the mounting for the same reason.



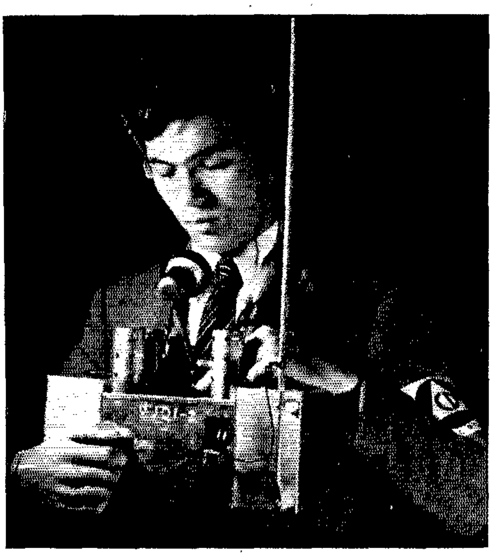
Audio end of the subpanel assembly. The driver transformer is in foreground, with the Class-B output transformer behind it. The stack of Mallory bias cells for the 1G4G is at the right rear. The microphone battery is strapped to the shield partition, with the combination mike-and-audio transformer above it. The "transmit-receive" change-over switch is in the left foreground.

Unity-Coupled Tank Coil

Another view of the assembly shows the r.f. end with its separate circuits for receiver and transmitter. Some rather careful work is required in the construction of the unity-coupled coil for the oscillator. Soft copper tubing, $\frac{3}{16}$-inch diameter, is cut to a 4-inch length and the exact center marked. At this point a $\frac{1}{8}$-inch hole is drilled through one wall of the tubing. This hole is enlarged longitudinally to a width of about $\frac{1}{4}$-inch and the edges smoothed with a fine file and emery cloth. On the same side, saw cuts are made $\frac{3}{8}$-inch from each end, halfway through the tubing, and a longitudinal half-section removed. The edges left here are also buffed smooth.

The tubing is then coiled about a 1-inch diameter dowel or piece of pipe, with the hole and the cuts on the inside of the coil. Considerable care must be exercised to make the coil symmetrical on each side of the center hole and to avoid a sharp bend or a break at the point where the wall has been weakened by the drilling. A 2-turn coil is formed — or rather, a $1\frac{3}{8}$-turn coil, as the halved ends are allowed to project at right angles to the coil, parallel to each other and separated by the distance between the No. 3 and No. 6 prongs (plate prongs) on the octal socket to be used for the 1G6G oscillator. This socket incidentally, should be of the best quality obtainable, both with respect to quality of insulation (preferably Isolantite) and strength of prongs, which must support the weight of the coil assembly soldered to them.

Two pieces of high-grade varnished insulating tubing are threaded from the open ends of the coil until they are seen to meet at the center hole. Then two pieces of No. 18 enameled copper wire are threaded through the insulating tubing in a similar manner. The inside ends of wire and tubing are carefully fished out through the center hole, just enough of the insulation being pulled through to insulate the wire from the edges of the hole in the copper tubing. The ends of the wire are cleaned and soldered to form the center tap of the grid coil. Enough wire is left at the outer ends to allow them to be crossed over and connected to the grid prong on the 1G6G socket which is opposite to the plate prong to which that end of the plate coil is soldered.



The operator snaps on the webbed shoulder harness of the "walking WERS" transreceiver, turns the change-over switch knob, and is on the air for either reception or transmission of 112-Mc. signals.

The soldering is the next step. The least possible heat should be applied consistent with a rigid job of mounting; too much heat will impair the usefulness of the insulation. The same caution must be observed when soldering the center tap to the plate coil, which is done at a point directly behind the center hole through which the grid tap is brought out, and in making the soldered connection between the grid tap and the grid resistor. Finally, the 3–30-$\mu\mu$fd. trimmer condenser, C_5, is soldered across the outer ends of the plate coil with equal care.

The mountings for the detector tuned circuit and the HY114-B tube were made up separately and wiring completed as far as possible before placing them on the chassis. The arrangement is such as to provide for the shortest possible leads between the tuned circuit and the plate and grid caps of the tube. The 80-mh. r.f. choke, RFC_2, would better be shielded.

Wherever leads pass through the baffle, rubber grommets are provided. As a final precaution, it would be well to cement an insulating layer over the inner surfaces of the shield case to avoid accidental shorts. A further refinement would be an insulating frame about the oblong opening in the shield case through which the antenna-lead clip is passed.

Performance

The original unit has been checked for stability against the oscillator of an S-29 receiver. Although some drift is apparent, probably arising from thermal conditions caused by the close proximity of the grid and plate coils in the unity-coupled circuit, the drift is not troublesome when used for periods not exceeding two minutes and when the receiver is a superregenerative detector. These are the conditions usually met in WERS operation. The tolerance is within the 0.3 per cent limit established by the FCC for portable units.

The performance of the transmitter is surprisingly good when the very low input power is considered. No difficulty was experienced in establishing contact with a control station somewhat over a mile distant. The receiver sensitivity compares favorably with other self-quenched superregenerative detectors, and WERS stations 9 or 10 miles distant have been received with satisfactory volume.

One or two units of this type should enable any WERS network to maintain contact between a control station or mobile units and personnel stationed at points which cannot be reached by vehicles carrying higher-powered mobile rigs.

New Electronic-Key Circuits

Two Adaptations of the Multivibrator Principle

The advantages of the electronic key, which makes automatically timed dashes as well as dots, are by now well known to most of us. Keys of this type not only lend themselves well to high-speed code work, but their operating characteristics are such as to make incorrect formation of characters almost impossible. The new circuits discussed in this article are designed toward simplification of the original electronic key developed a few years ago by W2ILE. Along with this simplification, some of the "bugs" of earlier keys have been eliminated.

An Improved Electronic Key

BY WILLIAM L. GARDNER*

AMATEURS who have used electronic keys are well aware of the demonstrable fact that semi-automatic keys of this type not only are the answer to increased hand sending speeds but also force the operator into habits of more uniform, if not perfect, formation of characters.

Several years ago I was an operator on Navy circuits in North China, where I also operated the Marine ham station XU2MC. During my sojourn there I had the opportunity to develop my receiving speed up to something over 60 w.p.m. Since most operators could not send above 40 w.p.m., I became interested in devices which would permit increased keying speeds. At about the same time articles appearing in *QST* [1] described the electronic key for making automatic dashes as well as dots, and I built up models following these descriptions as well as several versions of my own. While most of them operated reasonably well, several common faults were observed. Chief among these difficulties were the critical circuit components required for best performance and the disproportionate change in character spacing as the speed was increased or decreased. Investigation showed that most of the trouble could be traced to the use of gas triodes.

Theory of Operation

The circuit shown in Fig. 1 is a result of a search for an arrangement which would overcome these irregularities. An examination shows that the circuit is essentially that of a relaxation oscillator or multivibrator. In a balanced arrangement of this type, the conducting time of either tube section is equal to its non-conducting time. Therefore, when the proper frequency or range of frequencies is selected, the plate-current flow will correspond to dots which have a spacing equal to their own duration in time.

Now all that is required is a means of controlling the multivibrator and starting it at the same portion of the cycle. This is accomplished merely by placing bias on the grid of one section of the 6SN7 and then arranging the key so as to remove that bias. In a normal state (key in neutral position), the left-hand section of the tube in Fig. 1 is held well below plate-current cut-off with cathode bias while the right-hand section is allowed to conduct to some predetermined degree, depending upon the current necessary to activate the keying relay, *Ry*, thereby holding the external-circuit contacts open. At the instant the biasing resistance, R_7, is shorted out, the left-hand section begins to conduct, but because of the voltage drop across R_4 and R_5, its plate voltage decreases immediately. This results in an impulse which is transferred to the grid of the right-hand section through the coupling condenser, C_2, as a negative charge which immediately cuts off plate-current flow in this section, releasing the relay armature so that the keying contacts close. Since the plate current of the right-hand section flows through R_3, cessation of current flow results in an increase in voltage on the plate of this section. This pulse, in turn, drives the left grid more posi-

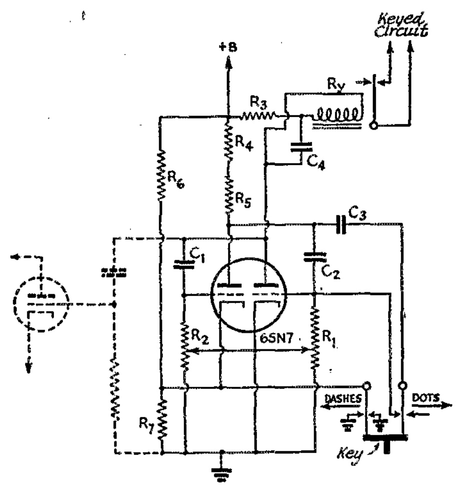


Fig. 1 — Circuit of the improved electronic key.

C_1, C_2 — 0.005 μfd.
C_3 — 0.01 μfd.
C_4 — 0.01 μfd., approximately.
R_1, R_2 — 2-megohm variable (see text).
R_3, R_4 — 50,000 ohms, ½ watt.
R_5 — 3000 ohms (or resistance equal to resistance of *Ry*).
R_6 — 0.25 megohm, ½ watt.
R_7 — 75,000 ohms, ½ watt.
Ry — Sensitive relay.

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[1] Beecher, "Electronic Keying," *QST*, April, 1940, p. 9; Grammer, "An Inexpensive Electronic Key," *QST*, May, 1940, p. 12; Savage, "Improved Switching Arrangement for Simplified Electronic Key," *QST*, March, 1942, p. 36.

tive and well into the conducting region. All of this occurs in a negligible length of time. As the charge on C_1 leaks off, the positive bias on the left-hand grid is reduced, this time resulting in a *drop* in plate current through this section.

The action described above is now reversed, a positive pulse being applied to the right-hand grid. This results in increased plate current which, in turn, opens the relay contacts. So long as the cut-off bias resistor, R_7, is shorted, the cycle will repeat itself and the relay contacts will open and close to make uniform dots and spaces, as mentioned previously. The output of the multivibrator is essentially square-wave in shape, with very steep sides. The relay may be placed in either plate circuit, the contacts, of course, being reversed.

Removing the short-circuit across R_7 again places bias on the left section, stopping all circuit action and returning the circuit to its normal state. If the short is removed during the process of making a character, the circuit action will tend to prevent clipping the character too short.

Making Dashes

Dashes are made merely by adding capacity to the RC network of the right section, holding that section at cut-off longer than the time it is conducting. If the value of capacity is exactly three times that in the left section, the right section will be cut off three times as long as the left section. In other words, the circuit produces dashes. Shorting out the same biasing resistor, R_7, throws the circuit into immediate operation, making dashes. The beautiful feature is that the space between dashes remains the same as the space between dots, for the RC network of the left-hand section has not been changed in value. The timing of this circuit has been checked by various means and found to be absolutely perfect.

Speed Control

Now all that remains to be done is to devise a means of controlling the speed. Let us go back for a moment to a simple balanced multivibrator in which each component in one section is equal in value to the corresponding part in the other section. If the RC network in both sections is halved the frequency will be doubled, but the space between dots will still be equal to the dot length since the spacing also will be halved. Therefore, if two potentiometers of equal resistance and equal taper are ganged, the grid resistance of both sections can be varied simultaneously and proportionately. Again, when the capacity of one side is three times that of the other, the first section is held at cut-off three times longer than the other. Thus we have a perfectly balanced, perfectly timed electronic speed key.

Adjustment

When the keyer is operated from a 300-volt supply the circuit values given under Fig. 1 will be approximately correct for a maximum speed of 60 w.p.m. However, certain adjustments for proper operation may have to be made. With the cathode of the right-hand section grounded, a milliammeter should be inserted between the plate of the left-hand section and R_5. If the plate current is not zero, the value of R_7 should be adjusted until no plate current flows. The plate voltage of the right-hand section should then be recorded. Now the procedure should be reversed, grounding the left-hand cathode, temporarily biasing the right-hand section beyond cut-off, and checking the plate voltage of the left-hand section. By adjusting the value of R_4 or R_5, the two plate voltages should be made exactly the same when they are conducting. A bit of juggling back and forth may be necessary before a balance is obtained. This will assure an equal plate swing for each section.

The circuit should now be returned to normal, with zero bias on the right-hand section, and the key closed to permit the production of dots. Plate-voltage readings of both sections should be taken with the circuit in operation. Unless the adjustment happens to be right, the two average voltage readings will not be the same. This means that the two sections are not conducting for equal lengths of time. If it is necessary to operate R_1 and R_2 with most of their resistance short-circuited for the maximum speed desired, limiting resistances of approximately 100,000 ohms should be placed in series with each of the potentiometers. The value of one or the other of these fixed resistances should be adjusted until the voltage readings are the same. The dot length will now be equal to the space length. The value of the limiting resistances should be low enough to permit attaining the maximum speed desired, with R_1 and R_2 entirely shorted out.

When the key is shifted to the dash side, the average voltage at the plate of the right-hand section should drop one-third. If the voltage recorded at both plates is 180 when making dots, it should drop to 120 volts when dashes are being made. At the same time the voltage at the other plate should increase by the same amount, or to 240 volts. If this is not the case, different 0.01-μfd. condensers should be tried at C_3, since most ordinary condensers of this capacity are held to a tolerance no better than 10 per cent of the marked value. When these voltage conditions are met, the dash will be exactly three times as long as the dot and the spacing will be equal to one dot.

When all adjustments are correct, the sum of the steady conducting voltage of either section and the supply voltage should equal the sum of the average intermittent voltages when the circuit is producing either dots or dashes. In this particular case the supply voltage is 300 and the steady-state voltage at either plate 60, making a total of 360 volts. When the circuit is making dots the voltage read at either plate is 180, so that the sum of the voltage for both sections is 360 volts. When the circuit is making dashes the voltage reading at one plate is 120 and at the other 240, again making a total of 360 volts.

The dual-triode arrangement shown in the diagram has worked out very well. However, there is no reason why separate tubes could not be used. If the tube characteristics are appreciably different, it may be necessary to experiment with different RC values to obtain the correct range of speeds. However, the same process of adjustment outlined above should be followed.

The relay I use is an Eby requiring about 12 milliwatts input. However, for better and more positive action, I ran the power up to approximately 24 milliwatts. The mechanical design is left to the individual. However, an arrangement should be used which keeps C_3 charged at all times. This can be done by allowing the dash contact to follow the arm to the "neutral" position. The dash contact is then broken only when the arm is swung to the dot side. With the exception of the two potentiometers, all components are mounted on the socket of the 6SN7GT, making a very neat and compact unit. Some may wish to vary the mechanical design to include a self-contained power supply and the relay on one chassis.

Depending upon the rig, it may be possible to feed the output of the keyer directly to some grid which is holding the transmitter down and thereby eliminate the need for a relay, as indicated by the dotted lines of Fig. 1.

Another Multivibrator-Type Electronic Key

BY CHESTER H. PAGE,* W3IKI

A SIMPLE multivibrator circuit with a keying relay in one plate lead, as shown in Fig. 2, will produce a continuous series of equal dots and spaces. The circuit can be elaborated upon to allow automatic keying of both dots and dashes. The problem seems straightforward, but a simple arrangement does not always behave properly. The first dot of a series will be too long, and the intervals between dashes will not be of the same duration as those between dots. These difficulties can be avoided by the proper choice of tubes.

Tube Considerations

To be most suitable the tubes used should require low bias for plate-current cut-off, operate at high current with low plate voltage, and have low grid resistance for a slightly positive grid. This last factor is desirable to permit the condenser to charge rapidly through the relatively low plate resistance and discharge slowly through the high grid resistance, and also so that C_1 and C_2 will charge to nearly the full supply voltage in operation. The requirement of high plate current at low plate voltage means in effect that pentodes or beam tubes must be used instead of triodes. The 25L6 makes an excellent tube for the purpose.

Timing

If the above conditions for uniform keying are met, making the sum of the capacities of C_1 and C_3 three times the capacity of C_2 will cause the first tube to remain idle three times as long as the second tube. The relay will then close for three units of time and then open for one unit and the circuit will produce dashes. In the circuit of Fig. 2, C_3 has twice the capacity of C_1 (or C_2), so that when the two are connected in parallel the initial circuit capacity is tripled. C_3 must be kept charged when not in use so that it will be in proper condition for a relay-closed period of full length. The key must close the circuit to the plate of the second tube for either dots or dashes and, in addition, must add the extra capacitance, already charged to full voltage, for making dashes. The key used with this unit consists of a homemade device, similar to the old "side-swiper," constructed from a hacksaw blade. The "stationary" contact from C_3 is actually movable to a limited extent. It is mounted on a spring arrangement which keeps it in contact with the arm in "neutral" position as well as when the arm is swung to the dash position. Its movement is restricted, however, so that it breaks contact with the arm as the latter is swung over to the dot side.

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Circuit Details

The speed control consists of R_1 and R_2, which are similar and are ganged to operate from a single control. The circuit will operate over a speed of from one dash per second (useful for timing purposes in a photographic darkroom) to well over sixty words per minute. The dash-dot interval ratio is correct within a few per cent over the entire range.

The 1000-ohm dropping resistor, R_5, in series with the screens was found necessary to prevent instability. With some relays it may be necessary to connect a capacitance of about 0.1 μfd. between one grid or plate to ground to kill a peculiar surge which shortens the open-contact interval to almost nothing at certain speed settings of R_1 and R_2.

The keying unit operates well from a simple transformerless supply with a 25Z5 half-wave rectifier and brute-force filter. The filtering must be fairly good, since any ripple will be applied directly to the grids and this can easily ruin the operation of the circuit.

The use of the key leaves only the spacing between letters to the judgment of the operator, making it well nigh impossible for him to develop one of those sloppy "individual" fists that have been all too common.

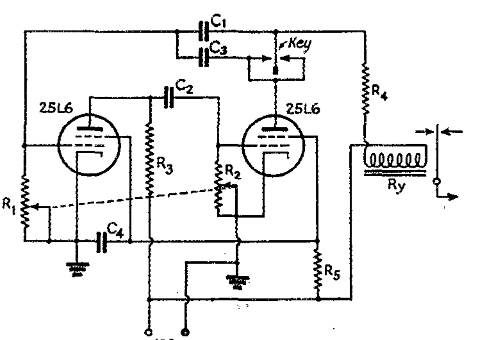


Fig. 2 — Circuit diagram of W3IKI's electronic key.

C_1, C_2 — 0.5 μfd. paper.
C_3 — 1-μfd. paper.
C_4 — 8-μfd. electrolytic.
Ry — Sensitive relay.
R_1, R_2 — 250,000-ohm dual volume control.
R_3, R_4 — 3000 ohms.
R_5 — 1000 ohms.

The Army Airways Communications System

Part Two—History and Development of the AACS

BY CLINTON B. DE SOTO,* W1CBD

SUPPOSE, if you will, that you are a staff officer at AAF Headquarters in Washington. It is early 1941. War is raging in Europe, and there is ominous likelihood that your country will be drawn into the conflict. Facing you is the problem of rapidly expanding a nuclear radio network with only four officers and a few hundred enlisted men into a world-wide communications system. What would you do?

If you were to do as Col. Lloyd H. Watnee did, you'd call in as many top-notch hams as you could find and put them to work. Then you'd keep a sharp eye on them, maintain a high spirit of morale and esprit de corps, drive them to do the impossible and show the way by your own example, build in them a high sense of responsibility toward the agencies using the system — and a couple of years later, when you were called to a still more important assignment, you'd leave a highly efficient organization as the tangible record of your success.

The colossus of communications of which Col. Watnee was the commanding officer until November, 1943 — the Army Airways Communications System — is the global network responsible for all aircraft in flight along the world-wide web of U. S. ferry and transport routes. Its hundreds of stations, located all over the globe wherever military expediency dictates, not only establish the link between air and ground for military aircraft wherever they may fly but enable the AAF to know where its planes are anywhere at any time.

The present high state of perfection of the AACS is all the more remarkable in the light of its swift growth — a growth so violent that it belittles the usual adjectives. Multiplying nearly 5000 per cent in the space of a scant five years, its fabulous expansion is equaled in impressiveness only by the intrepidity, ingenuity and persistence with which the obstacles in its path have been overcome.

*Editor, *QST*.

This is the record of that accomplishment — and of the part played therein by amateur radio.

Early History

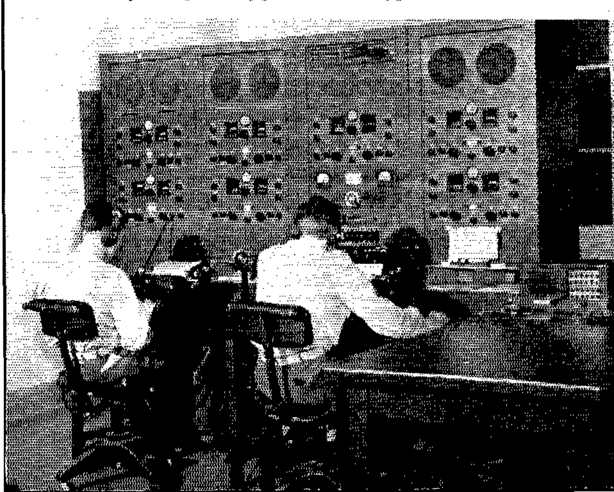
To fill in the background, it is necessary first to take a look at the early status of military aircraft radio. It won't be a very long look; up until the early '30s the Air Corps had little in the way of communications. This was partly because of limited funds and personnel, but also it was the result of a lack of appreciation of the worth of radio by the old-school "seat of their pants" Army fliers. They were having a hard enough time getting a few airplanes, let alone expensive accessories of dubious value. Anyway, such communications as were indispensable for domestic flying were supplied by civilian agencies, so why worry?

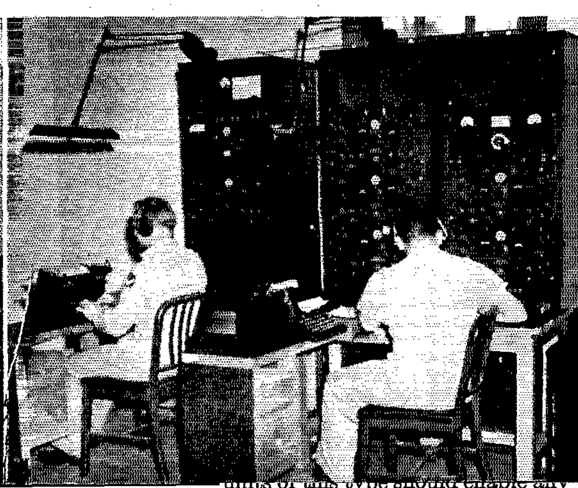
There were those who did worry, however. Among them were Brig. Gen. H. M. McClelland, now the Air Communications Officer of the AAF, Brig. Gen. A. W. Marriner, now with the Eighth Army Air Force in England, and Col. Watnee. Even during the middle '30s, when many Army airplanes carried no radio equipment and even pilots who did have radio were inclined to rely on their instincts instead, these men had the vision to foresee the day when radio would become an indispensable instrument in military aircraft operations — both combat and transport.

Between 1934 and 1936 the groundwork for the future AACS was laid by establishing 33 domestic air navigational stations. Within two years these stations had demonstrated their value to a point where, in mid-1938, Army Regulation 95-200 was published, officially establishing the Army Airways Communications System.

This was recognition — on paper, at least. On November 15th of that year the System was officially activated. It had three commissioned officers, a handful of enlisted men, and 33 stations scattered around the country. All of continental

Left—Operating positions at a typical small AACS station. *Right*—In an AACS station at a West Indies air base.





"Scattered from the steaming jungles of the South Pacific to the Arctic ice on one side and from the rice fields of China across Africa to the bulge of Brazil on the other side are some 16,000 men of the Army Air Forces Airways Communications System," stated Brig. Gen. H. M. McClelland, Air Communications Officer of the AAF, on a recent Army Radio Hour broadcast. "They are the little-known group of experts who furnish the three elements so vital to the flying of combat or transport planes over the extensive net of the AAF airways — communications, weather information and control."

The far-flung point-to-point, airways control and weather information services of the AACS were described in the February issue of *QST*. In this part is narrated the hitherto-hidden history of the organization and its development from a small nuclear domestic network to its present status as a colossus of world-wide communications.

U. S. A. was divided into three communications regions and a communications squadron was assigned to each region, along with one commissioned officer who served both as regional control officer and as squadron commander. Individual stations were manned by a non-commissioned officer in charge and a few enlisted operators.

During the next year or two the System grew — but only at a snail's pace. By early 1940 the enlisted strength had risen from 350 to 424, but this still left the original thirty-three stations undermanned by about 100 men. Nevertheless, much progress was made within the organization itself. The overworked staff of operators was drilled to high proficiency. Equipment — which, as originally supplied, had been largely obsolete and unsuited to the purpose — was being modernized; emergency power units were installed to keep the stations on the air despite power failures; bothersome man-made QRM at many airports was being eliminated. The AACS, despite its handicaps, was doing a competent, reliable job. More than that, it was, knowingly or not, preparing itself for the bigger job that was to come.

The outset of 1941 saw the beginning of AACS expansion. As the U. S. daily drifted closer toward active warfare, there was growing realization of the need for an expanded military airways communications system. New air bases were being established — for training purposes in domestic regions and for flyaway delivery of lend-lease aircraft — and the requirements for traffic control and communications were growing rapidly.

But this expansion of domestic operations was only a prelude to what was in the offing — the creation of international air transport and ferry routes for use by U. S. military aircraft. New stations were added until their number was approximately doubled. Successive authorizations for increases in AACS personnel allotments began to come through.

The problem was to find qualified men with which to fill these allotments — and not only qualified enlisted men but also the officers needed to command them.

This was when the present extensive amateur participation in AACS began.

The Call for Hams

It is no mere happenstance that the technical and operating leadership in AACS come from ham circles. That is the way it was planned.

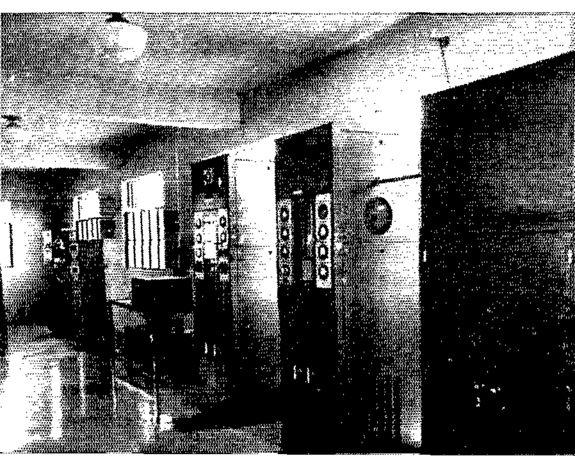
When the AACS on an international scale was first projected, two basic factors were apparent. The first was that already it was late — very late. The second was that there would be little time to train personnel in the usual military fashion, and that reliance would have to be placed on men already experienced in various phases of radio, either professionally or by virtue of amateur experience.

In the spring of 1941 there were, in all, only four communications officers on duty at AAF Headquarters in Washington. Among his other duties, Col. Watnee, singlehanded, was handling the administration of AACS. In the field there were four regional AACS officers, each of whom commanded a squadron with an authorized strength of from 223 to 277 enlisted men and supervised from 16 to 19 separate stations.

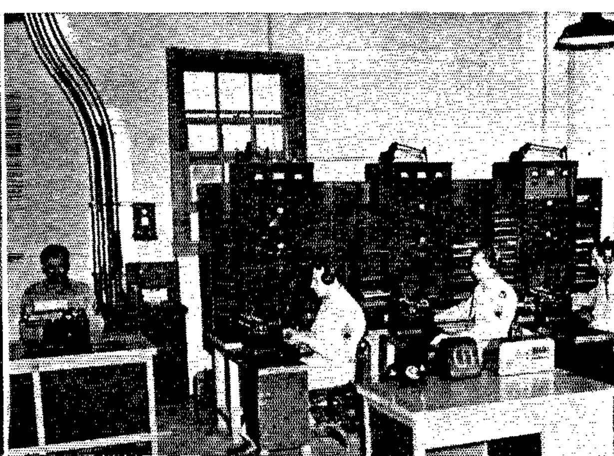
Then came the turning point. In April, 1941, a fifth communications officer reported for duty at AAF Headquarters in Washington — Lt. Col. Wilmer L. Allison, W5VV.

Allison was assigned as assistant to Col. Watnee. The colonel had acquired great faith in the

Left — Interior of a typical AACS transmitter building.



Right — Operating positions in a larger station.



A lone operator at an AACS station in Alaska.

All Official U. S. AAF Photographs

ability of amateurs as a result of his experience with the several ex-hams already in the enlisted personnel of AACS, and Allison himself was chosen on the basis of his amateur experience as well as on his reserve record. Col. Watnee gave him a free hand in enlisting the services of other amateurs. "You know me well enough to know that was all I needed!" W5VV has since told us.

The initial recruiting of amateurs for AACS was carried on both by word of mouth and by a direct-mail campaign. The word-of-mouth method was, of course, merely a process of signing up one ham for a given assignment and then, as related jobs opened up with the steady expansion, having him locate ham associates to fill these newer posts.

The direct-mail campaign was a more elaborate program. It involved mailing recruiting literature to a list of several thousand amateurs, selected to include a maximum of likely prospects.

Roughly, this is the way it worked out: A ham of typical qualifications would join up. He'd be given a rating as staff sergeant — and immediately ordered to active duty with a detachment, often at some foreign post. There, coupling his radio know-how with that of other hams in the same outfit, he'd go to work putting a radio station on the air.

It was a system that worked — so far as getting radio circuits into operation was concerned, at least. As a method for making soldiers out of hams, however, it had its drawbacks.

So urgently were operators needed that there wasn't time to give them even the usual six-weeks' basic military training. As a result, almost any ordinary private knew more about military customs and routine than they did, despite the fact that their ratings were several grades higher. AACS detachments being comparatively small and usually quartered in barracks along with regular enlisted men of lower grade, often the result was not entirely happy.

It wasn't long before the hams learned the soldiering end of the game as well as they knew radio, however. Between operating tricks or maintenance details they'd be out on the drill ground or the pistol range, picking up the rudiments of soldiering. Having high native intelligence and aptitude — their average IQ was up around 130 — they learned fast. Only a few failed to measure up, as is attested by the fact that many of these original recruits now are commissioned officers with ranks ranging up to lieutenant-colonel.

And so AACS grew. Additional officers were commissioned; several hundred enlisted personnel were advanced in grade; a number of new stations were activated. December of 1941 found AACS operating 65 domestic and 23 foreign stations with a field personnel of 6 officers and 2043 enlisted men.

With this strong embryo, AACS was ready for war when it came. Nimble brains, stout hearts and willing hands had made the organization strong and healthy. Even though overworked and under-equipped, Col. Watnee and his associates had instilled in their men the courage, loyalty, skill and enthusiasm required for the task that lay ahead — the creation of a world-wide system of military airways communications.

International Expansion

And an enormous task it was. Complex though any large scale international communication system must be, this complexity was enhanced in the case of the AACS by the exigencies of warfare, requiring the use of many precautionary measures which, although vital from the standpoint of military security, would not have been necessary had the problem been solely that of sending messages back and forth. A commercial organization establishing a comparable system during peacetime would naturally follow direct routes between the more populous centers, thus providing not only sources of revenue but established housing, power, and related communications.

AACS, however, had to go wherever military necessity dictated. This requirement imposed many perplexing complications.

Among the most persistent of these was the difficulty of transportation. In many cases no means of transport was available other than by plane, and air transport already was vastly overloaded. In certain areas around the waistline of the world, all equipment and supplies had to be moved in by camel. On the ends of the globe, ice-locked posts were accessible by boat only

Inside a small AACS station in the Far North.

Over Greenland's icy wastes, an AACS maintenance man goes out to check the radio range beacon installation.

once a year. Even where rail service was available there was often only a single-track road which changed gauge three times and required ferrying across rivers in the process — meaning that a single shipment would have to be loaded and unloaded at least five times.

As if that didn't make it difficult enough, the problem was further complicated by innumerable misadventures while the equipment was in transit. Newly enlisted hams, accustomed to buying parts right off the counter of a radio store down the street, soon learned that military requisitions had to be followed up in person from their origination until the time the equipment was delivered. If not, the shipment might be unloaded at the wrong port or even lost completely.

Even after a shipment arrived, it still could go astray. At practically every port of debarkation, for example, cargo was hastily piled on docks to speed the unloading and departure of the vessel. Unless an AACS officer and crew were on hand with papers to identify their equipment, it was often claimed by other organizations. In instances where boats came in unexpectedly equipment would disappear, only to be found later in as many as ten or twelve depots within a radius of fifty miles. Such miscarriages could be disastrous, especially when the scattered parts were the components of a transmitter broken down for shipment into as many as fifty component boxes. The loss of a single box would prevent the transmitter from being placed in operation.

Ham Gear Saved the Day

But the problems of transportation and delivery became important only after there was equipment on hand to be shipped. Before that came the problem of procurement. Here again the prewar existence of amateur radio proved the salvation of AACS.

During the early period, when the shiny commercial jobs now used existed only in the form of procurement orders on the desks of factory production superintendents, with delivery still months away, AACS made use of thousands of amateur communications receivers and hundreds of transmitters. These were procured by the Signal Corps in the *QST*-publicized program of 1942. Most of the equipment so procured, we are told, went to the AACS. Some was purchased outright, some loaned for the duration by patriotic hams. All standard manufactured units were immediately put into use at AACS stations. Composite rigs were disassembled for parts which, together with miscellaneous parts from amateur junk piles and other sources, were combined at a processing station into semi-standard units of uniform design.

Not a few receivers which once graced ham shacks are still in service in AACS stations, and some transmitters as well — although their use now is limited chiefly to stand-by purposes.

The equipment procured from amateurs was used throughout the world. It saved the day at many a United Nations hotspot. Not a little of it was sent to Africa for use by the British and by South Africa, via lend-lease.

"If this ham gear had not been available, we would have been in one hell of a mess." This is the way Major Robert G. Werner, who was associated with AACS's giant procurement headache during the mad days of that early expansion, summed it up.

Amateur ingenuity as well as amateur gear went into those early AACS stations. In those days many an erstwhile ham found himself set down abruptly thousands of miles from nowhere with only a transmitter, a flock of receivers, an emergency power unit, a pair of pliers, a screwdriver (if he was lucky), a roll of antenna wire — and orders to put a station on the air. There is a perennial yarn, variously attributed to Alaska and to Central Africa, about an AACS maintenance man who, on unpacking a disassembled transmitter, found in the instruction manual this note: "Screws for installation may be obtained at the nearest hardware store." The nearest hardware store was a thousand miles away!

The ingenuity and skill of the hams in AACS is proved by the fact that the stations *were* installed — and that they worked. How they were installed or what they looked like was unimportant. What is important is that they went on the air and stayed on the air.

It is no exaggeration to say that this accomplishment, also, could not have been achieved had it not been for the existence of amateur radio. For the amateurs who did the job were only doing for the Army what they had first learned to do for themselves as hams. It was nothing new to them. The fixed ground stations and the international point-to-point communications were, after all, only glorified ham DX traffic nets.

But amateur experience did not provide the answers to all the problems encountered by the AACS. They soon learned that, in addition to the difficulties involved in setting up stations far from the beaten trails, the rigors of climate introduced still more complications for both men and matériel.

Each new foreign theater into which they progressed produced new problems calculated to tax even ham-sharp ingenuity to the utmost. The functioning of equipment in the 130° temperature of the desert was entirely different than in the −70° cold of the Arctic. In the isolated wastes of the Far North there was the problem of making secure installations in shifting snows lying 40 feet deep on the uplands. The stability of installations even on solid rock was threatened by the constant high velocity of the winds, reaching 100–150 m.p.h. In South America there was the necessity for hacking clearings through the hardwood forests of huge mahogany trees, fighting through the jungle growth and the mud. In other sections of the world, swamps, forests and mountains affected the nature and types of installations which could be used.

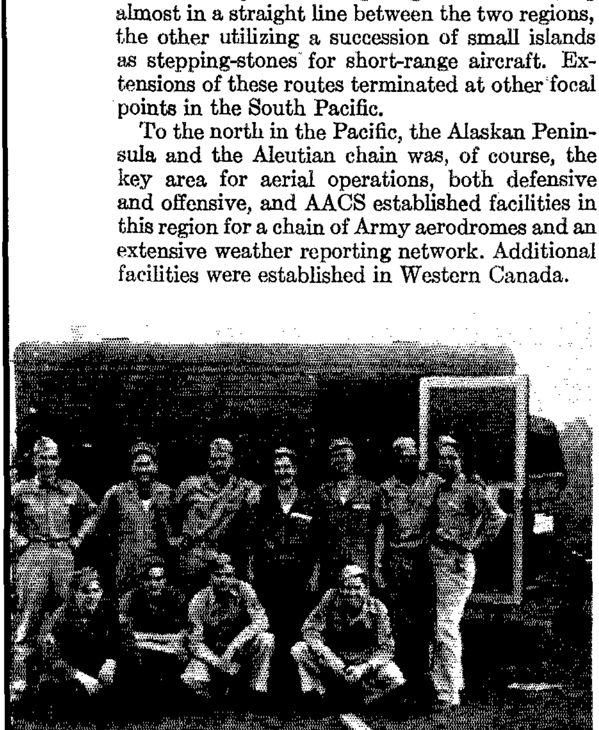
Spiderwebbing the Globe

The initial routes to be developed branched out almost simultaneously in directions representing the practical extremes of these conditions.

First, of course, there were the North Atlantic routes to the British Isles. The primary route followed the traditional avenue of eastward transatlantic aerial navigation — over Nova Scotia and Newfoundland, thence winging directly over the cold and stormy North Atlantic. Among the first major AACS stations established outside our shores were, therefore, those in the sleepy fishing villages and primeval wilderness of Newfoundland and Labrador. Later alternative routes were added, extending up well into the perpetual snows above the Arctic Circle.

In the South Pacific, leisurely prewar plans for establishing a series of inter-island navigational aids had been rudely interrupted by the Japanese when they took over several of the major points on the contemplated route, and planning was begun anew. Two separate routes were established from Hawaii to Allied bases in Australia — one a direct path for long-range aircraft running almost in a straight line between the two regions, the other utilizing a succession of small islands as stepping-stones for short-range aircraft. Extensions of these routes terminated at other focal points in the South Pacific.

To the north in the Pacific, the Alaskan Peninsula and the Aleutian chain was, of course, the key area for aerial operations, both defensive and offensive, and AACS established facilities in this region for a chain of Army aerodromes and an extensive weather reporting network. Additional facilities were established in Western Canada.



In September, 1940, the transfer of fifty American destroyers to the British had given the U. S. the right to lease and build air bases in British territory in the Caribbean and South America. During 1940, aerial routes were planned and sites for air bases selected, and with the outbreak of war there was feverish activity on the part of all U. S. military agencies, including AACS, to establish the chain. Despite obstacles, it was finally completed down to the South American bulge.

From there the next step was to Africa. For a time use was made of the commercial communications systems operated by Pan-American Airways within the continent of Africa, but with the approach of the North African invasion the need for absolute military secrecy forced the taking over of the PAA stations. Soon the Central African stations were supplemented by additional routes through North Africa. Later these were extended through the Middle East to India. Even there the AACS did not stop, however, continuing on until it had joined the western routes to Australia — completing the chain of guideposts for an aerial roadway circumscribing the globe.

As AACS stations abroad came on the air one by one, they vitalized the growing spiderweb of our foreign military airways and established the groundwork for victory. Today, aircraft of the U. S. Army Air Forces and of all the other United Nations can fly surely and securely along radio ranges anywhere in the world they may have need to go.

Equipment Problems

So great was the urgency that, although they were not required to do so, the major portion of the equipment in these foreign stations was installed entirely by AACS personnel.

Even now much AACS equipment is still experimental. This is because of the variety of situations and conditions under which the System is required to operate. An example is the signal blackouts that occur in the Arctic, particularly along the North Atlantic routes, the causes and cures for which still baffle the engineers. It is this type of problem, of course, that inspires the hams to exercise their inquisitive ingenuity to the full.

Fortunately, the policy in AACS has been to encourage the application of this ingenuity rather than to smother it in red tape. When a ham gets an idea he simply goes ahead and tries it out; there's no hampering rigmarole of project numbers or specifications or thick piles of preliminary blueprints to be approved. If it works, he tells the next operator down the line. Soon the new development is in use throughout the system. By this informal procedure many an idea has been put to use in stations all over the world within a few weeks or even days of its conception, where orthodox military procedure would have taken months to achieve the same result.

Of the many problems encountered, installation difficulties were among the most severe. While it

AACS detachment at a tropical air base — all hams.

Under the grass roof is an AACS station in Guatemala.

was usually possible to locate the transmitters at convenient points, the operating positions had to be in the center of activities, amid the noise from all the various other installations on the field. At first, it was axiomatic that receivers had to be right on the operating tables. This, of course, made the reception problem difficult because of the interference. The difficulty was solved by Major J. W. Hunt, W5TG-W5LCV, with a typical ham improvisation. He used a simple remote-control vernier tuning device requiring only a low-voltage d.c. line which permitted placing the Super Pros and HQ120s at optimum locations, well away from the electrical QRM. A similar problem was overcome when Lt. Col. Don C. McRae, ex-W6RM, devised a remote-control unit to synchronize the crystal-controlled h.f. oscillators of the dual-diversity receivers employed in radioteletype operation, keeping them always tuned to the identical frequency. Another ham-style modification was the addition of auxiliary master-oscillator control to the crystal-controlled fixed-station transmitters.

Antennas were also a problem, particularly in the Arctic. The ideal and preferred arrangement was to have a pair of large rhombics, one for each of the dual-diversity input channels, spaced a thousand yards or so apart. In many locations this could be no more than an ideal, however, and simpler arrangements had to suffice. In such cases, they would be content with inclined Vs or even a pair of simple doublets. No matter how simple the antenna, however, its installation always was complicated by the special regulations existing around the airfields. As an example, many installations necessarily were located close to runways and the permissible height was, of course, directly related to their proximity.

A standard item of non-standard equipment at many early AACS stations was the operating tables. In the beginning no tables were supplied, cargo space being more urgently needed for other items. Consequently, the operators made their own, using locally procured wood. Varied designs resulted. From their collective efforts a highly utilitarian standard design evolved which proved so superior that it continued in use even after GI tables became available.

Then there were the foot switches used to control the travel of perforated tape past the typewriter on high-speed auto circuits. When the regulation pedal switches failed to arrive with the rest of the equipment at one Arctic base, it was an obvious spot for a ham-style solution — and one was promptly produced by wangling automobile foot-starter switches from the automotive maintenance pool on the post and adapting them for the purpose.

Human Problems

Problems not only of matériel but of morale were met in building the AACS. The numbing cold of the Arctic and the sticky damp heat of the jungle were found to have profound effects on an operator's proficiency and mental stability. In isolated posts, scattered throughout the world and separated by wide expanses of territory, the effects of loneliness, of friction between individuals in constant association with each other, even the monotony of the daily operating routine, tend to undermine the most stable personalities. Minor feuds and jealousies arose, and a strong-willed commander was required to keep the peace.

Periodic blow-ups were common. Detachment commanders soon learned not to be surprised when an operator standing a monotonous watch suddenly rose with a wild stare and heaved his mill out the window. The experienced CO knew that the best thing to do was to send the man to the barracks and finish out the trick himself. Usually the operator would be back on the job the next trick, a bit sheepish perhaps, but otherwise behaving entirely normally. If discipline were suggested, old-timers would merely shrug. "Hell," they'd say, "it's these other guys we've got to watch for trouble now. He'll be all right for another two or three weeks after this."

AACS commanders now do everything possible to keep their men alert, entertained and free from nervous tension. In the outlying regions, practically anything goes. If the boys want to visit Kelly's Ritz or Happy Land to buy Blue Moons for the girls in Panama City or go searching for the Kee Bird above the Arctic Circle, that's quite all right with the CO — so long as they're back on the job next day.

Only one diversion is prohibited. That is rag-chewing over the air. It was early discovered that operators had to be weaned from their traditional hamming practices. This culminated with the blanket rule — "no ham chatter." Even the transmission of personal sines was prohibited. The reason, of course, was that vigilant enemy monitors could, by checking on the individual personal sines heard, determine the number of operators at a station and thereby deduce its strength and importance. That every transmission was being monitored by the enemy and that even the most innocent remark might disclose useful information was constantly stressed. It didn't take the operators in some theaters long to learn the lesson — not when the consequence of carelessness could be a few enemy eggs laid at their doorstep early some dawning.

(*Continued on page 94*)

IN THE SERVICES

With this issue, the comparatively inconspicuous yet equally vital hams in so-called 100 per cent war radio industry at long last take their place in this department. You will all appreciate the problems encountered in connection with segregating the immensely varied records which fall in this category. We finally came up with the idea of introducing this section by listing the boys in the Air Transport Command and affiliated projects. Next time we'll try one or two of the industries, and so on. Fair enough?

The section of our roster devoted to the YLs in uniform has also been duly brightened up this time. We have two newcomers — one each in the SPARS and the Marines. There must be more than one girl amateur in each of these services. If you know of someone, won't you let us know, too?

Once more, a word of caution. Please be sure to mention your station *call*, or, if you don't have one, the class of operator's license you hold. We can't publish your name otherwise. And remember, your rank makes your listing more complete. Just fill in all the spaces on the convenient form appearing on page 32 and we'll be happy.

ARMY—GENERAL

1JJE, Pfeiffer, Pvt., Oceanside, Calif.
1JUI, Camire, Lt., foreign duty.
1JWZ, Reynolds, W/O, Pine Camp, N. Y.
1MLO, Bamber, Cadet, West Point, N. Y.
2JNY, Westervelt, T/4, foreign duty.
2OHO, Hammer, Pvt., Camp Maxey, Texas.
3ECG, Merrell, T/Sgt., foreign duty.
3GDK, Cassell, Cpl., Ft. Eustis, Va.
3HND, Bright, Lt., Camp Davis, N. C.
ex-4GIY, Ormond, T/5, foreign duty.
5HEW, Selig, foreign duty.
5HXS, Hornbeck, Lt., Fort Sill, Okla.
5HZH, Holt, Lt., Fort Belvoir, Va.
5IIS, Doggett, Lt., address unknown.
5KSM, Carter, 2nd Lt., Ft. Custer, Mich.
6ILR, Waterman, T/Sgt., foreign duty.
6KGO, Boberg, Pvt., foreign duty.
6LVI, Zeis, T/Sgt., Camp Davis, N. C.
6UOA, Elsom, Pvt., Marysville, Calif.
6UQL, Wood, Capt., Seattle, Wash.
8DED, Sakkers, Pvt., Fort Bliss, Texas.
8IRJ, Rollins, Capt., Alvah, Okla.
8KYB, Buczkowski, S/Sgt., Fort Sill, Okla.
8OJM, Hartman, S/Sgt., foreign duty.
8QMK, Riker, Sgt., Fort Sill, Okla.
8RYR, Carpenter, Capt., Shaker Hts., Ohio.
8TCQ, Anderson, CWO, Springfield, Mo.
8TFB, Babiuk, Pvt., Camp Fannin, Texas.
8TLI, Amber, Pfc., Gainesville, Fla.
ex-9AAO, Wilson, Pvt., foreign duty.
9DDG, Schraut, Pvt., Columbia, Mo.
9DWQ, Goodbout, Pfc., Lafayette, Ind.
9FGQ, Linberg, Sgt., St. Louis, Mo.
9FIJ, Anderson, T/5, Camp Davis, N. C.
9GRI, Tuggle, T/4, foreign duty.
9GSB, Williams, Lt., foreign duty.
9HOE, Nordin, W/O (jg), foreign duty.
9HQO, Meyer, Pvt., Fort Benning, Ga.
9OQF, Kersten, Lt., Charleston, S. C.
9PHB, DeWitt, Pvt., Fort Benning, Ga.
9UGF, Cesnovar, S/Sgt., San Francisco, Calif.
ex-9UMD, Laster, T/4, Camp Campbell, Ky.
9UQN, Bechtol, Lt., San Francisco, Calif.
9WIT, Kersten, Lt., Detroit, Mich.
9ZZQ, VanDeventer, T/4, foreign duty.

Operator's license only:

Amber, Pfc., Gainesville, Fla.
Bauer, Sgt., Columbia, S. C.
Bowman, S/Sgt., foreign duty.
Cunningham, Pfc., Clemson, S. C.
Hoechstetter, 2nd Lt., Camp Gordon, Ga.
Ingebretsen, T/5, Vallejo, Calif.
Robbins, Pvt., New York, N. Y.
Stein, Cpl., foreign duty.

NAVY—GENERAL

1BOB, Scales, ACRM, Clinton, Okla.
1LIN, Norris, RM1c, Chatham, Mass.
2MNT, Pritchard, A/S, Cambridge, Mass.
2NVI, Devonchik, CRM, Beaufort, N. C.
2NZZ, Roethal, ARM3c, Memphis, Tenn.
3EDS, Wockenfuss, EM2c, Camp Peary, Va.
3MD, Hartley, CRM, Cape May, N. J.
3NT, Melton, Lt., Norfolk, Va.
4FCO, Barker, CRM, Miami, Fla.
4HZT, Stedham, RM3c, Oceanside, Calif.
5JNR, Brady, S1c, Stillwater, Okla.
5JYW, Marquez, S2c, Farragut, Idaho.
6EFF, Hartig, Lt., Newport, R. I.
6IBN, Cumpston, A/S, Chicago, Ill.
6LBN, Edwards, address unknown.
8HDV, Pitkin, Ens., Patuxent River, Md.
8QZB, Buklad, Sp3c(T), Miami, Fla.
8VNQ, Sinclair, Sea., Ithaca, N. Y.
9MLU, Jordanek, S2c, Chicago, Ill.
9TSC, Boyce, Lt. (jg), Great Lakes, Ill.

Operator's license only:

Dutra, A/S, Medford, Mass.
Moon, Lt., Chelsea, Mass.
Smith, Ens., Brooklyn, N. Y.
Spirer, A/S, Sampson, N. Y.
Wilson, ARM2c, Memphis, Tenn.
Wisehart, S2c, Stillwater, Okla.

ARMY—AIR FORCES

"An AF Lieutenant to Wed His Training Teacher." Thus ran the caption of a news item in a local newspaper. Miss Anna Tevlin, W9ONW, is soon to become the wife of Lt. Mark Guerra. She instructed him in radio communications at Yale, and we're betting he'll soon be a ham (if he isn't already).

1EFW, Chaffee, Pvt., Rome, N. Y.
1GHY, Chesley, Lt., foreign duty.
1HJU, Krolinsky, Lt., address unknown.
1IES, Bent, T/Sgt., Charlotte, N. C.
1MGI, Walen, Maxwell Field, Ala.
2JMP, Cain, Pvt., Westover Field, Mass.
2LVH, Clinton, Pvt., Lincoln, Nebr.
2MBN, Schuster, Pvt., Truax Field, Wis.
3GWV, Spitler, T/Sgt., foreign duty.
3GZY, Marsland, Capt., Dayton, Ohio.
3HYP, Robin, Capt., Wilmington, Dela.
ex-4DWZ, Galusha, S/Sgt., Will Rogers Field, Okla.
4EIJ, Wood, Bergstrom Field, Texas.
4FRU, Parrott, 2nd Lt., Shaw Field, S. C.
4IBE, Proctor, Pfc., Naples, Fla.
5CRI, LeBlanc, Lt., Strother Field, Kan.
5DPI, Fenner, foreign duty.
5JSL, Gustafson, 2nd Lt., Kelly Field, Texas.
5JUH, Smith, Sgt., Scott Field, Ill.
6HIW, Baird, Maj., McDill Field, Fla.
6RCC, Cryer, address unknown.
K6SJG, Reeder, Sgt., McChord Field, Wash.

This is one for the hams' "rogues' gallery," according to Lt. Robert C. Lydon, W1KOY, who drove his radio-equipped jeep at the head of the column while on bivouac last summer. *Left to right:* Lt. Robert T. Syler, ex-W9QQQ, radar officer on the First Troop Carrier Command special staff; M/Sgt. Cecil C. Kahn, W8BFF, chief operator in the 389th Signal Company, and W1KOY, assistant communications officer on the First TCC special staff. They are stationed at Stout Field, Indianapolis, Ind.

Leora E. Howe, W1KKQ, a YL ham now a private in the WAC—and proud of it! She received basic training at Ft. Des Moines and is now stationed at Miami Beach, Fla.

7GSW, Hedrick, Lt., Pratt, Kan.
8BDM, Whitaker, Maj., foreign duty.
8VJP, Newton, 2nd Lt., foreign duty.
9AMN, McKee, Capt., Dayton, Ohio.
9BRJ, Essex, Pvt., Scott Field, Ill.
9GMY, Gordon, Sgt., Sedalia Air Field, Mo.
9GOW, VanDuser, A/S, LaGrande, Ore.
9NLQ, Carpenter, 2nd Lt., Bergstrom Field, Texas.
9QZT, Edwards, S/Sgt., foreign duty.
9RLN, LaLuzerne, S/Sgt., Wilmington, Del.
9TDT, Erickson, Capt., Dayton, Ohio.
9TOB, Washburn, A/S, Northfield, Vt.
9UYL, Bryarly, Cpl., Drew Field, Fla.
9WXK, Diehl, S/Sgt., Selman Field, La.

Operator's license only:

Blainer, Sgt., Sioux Falls, S. D.
Csida, Pvt., Buckley Field, Colo.
Johnson, Pfc., Scott Field, Ill.
Kapsalis, address unknown.
Liebman, 2nd Lt., Boca Raton Field, Fla.
Myres, Sgt., Lawson Field, Ga.
Ostergren, A/C, Seymour Johnson Field, N. C.
Poehls, S/Sgt., Pyote, Texas.
Standish, A/C, San Antonio, Texas.

WAC

1KKQ, Howe, Pvt., Ft. Des Moines, Iowa.
7HZJ, Johnson, Greenville, S. C.

Operator's license only:

Zionson, Pvt., Washington, D. C.

WAVES

1NRY, Colburn, Ens., South Hadley, Mass.
5IIT, Jarratt, Ens., Washington, D. C.

SPARS

1KRO, Medary, Ens., New Orleans, La.

MARINE CORPS (WR)

Krueger, Pfc., Oxford, Ohio, operator's license only.

NAVY—SPECIAL DUTY

1EJT, Bunn, ART2c, East Boston, Mass.
1HQR, Erickson, RT2c, Quonset Point, R. I.
1JEK, Currier, Ens., North Wilmington, Mass.
2LLA, Horn, RT2c, Corpus Christi, Texas.
2MTI, Tomaro, RT3c, Bellevue, D. C.
2NWA, Tajkowski, RT3c, Washington, D. C.
4DEW, Montgomery, ART1c, Corpus Christi, Texas.
5FQM, Nicholson, ART2c, Corpus Christi, Texas.
5HCB, Culp, ART2c, Corpus Christi, Texas.
7GSG, Savage, Ens., Notre Dame, Ind.
7JDI, Crapsi, ART2c, Clinton, Okla.
8BCY, Springer, RT1c, Virginia Beach, Va.
8MRD, Drakeley, ART1c, Eagle Mountain Lake, Texas.
8QUN, Kafka, CRT, Cleveland, Ohio.
8RCM, Kowitz, ART3c, Corpus Christi, Texas.
8SUZ, Haworth, ART2c, Pensacola, Fla.
9ANC, Maxwell, ART3c, Corpus Christi, Texas.
9EWA, Finch, RT2c, St. Paul, Minn.
9NAB, Stehen, RT2c, address unknown.
9QIU, Enstrom, RT3c, Chicago, Ill.
9SXP, Denton, RT, Los Alamitos, Calif.
9UIX, Doughty, Ens., Brunswick, Me.

Operator's license only:

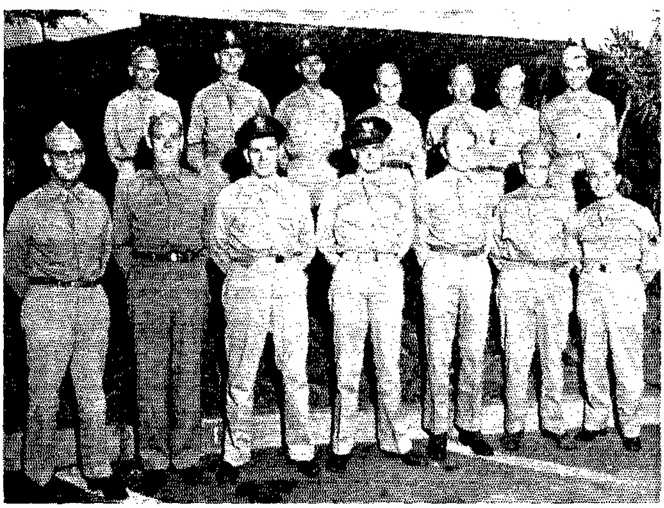
Alley, ART1c, Moffet Field, Calif.
Godwin, RT3c, Washington, D. C.
Ham, RT2c, Treasure Island, Calif.
Magnuson, RT3c, Chicago, Ill.
Sandford, RT2c, Treasure Island, Calif.
Williams, ART1c, Corpus Christi, Texas.

ARMY—SIGNAL CORPS

The following excerpt is from a letter written to the ITS Department by a well-known amateur now in Sicily:

"Every ham on the job out here is picking up some pretty fancy ideas about the kind of station he is going to have after this show is over. Mulling over their talk, I have come to the conclusion that the typical postwar U. S. ham station will be something quite modest—like this: Five or six 500-foot rhombics spread somewhere around the back lot, a couple of multi-channel one-kilowatt rigs on each of the ham bands (with full remote control and, by dialing, choice of at least ten channels), at least three Hammarlund Super Pros, a nice little General Radio sub-standard for frequency measurement work, a pretty fair machine shop with half a dozen or so precision lathes, a few milling machines and, say, some crystal-grinding equipment. That's all!"

1LYP, Levy, T/3, foreign duty.
2BHM, Painter, Lt., foreign duty.
2FRW, Stern, T/3, foreign duty.
2JXB, Churchill, Pvt., Camp Crowder.
2NBN, Frank, Pvt., Los Angeles, Calif.
ex-2NNW, Pitzer, Sgt., foreign duty.
2NYS, Misiura, Pvt., foreign duty.
2OAE, Karczewski, Pvt., Fort Ord, Calif.
2OLY, Presnell, 2nd Lt., foreign duty.
2ONZ, Reiss, Pfc., Camp Murphy, Fla.
3GLA, Wysoczanski, Lt., foreign duty.
3HDE, Trott, Capt., Red Bank, N. J.
3HRJ, Becket, Sgt., address unknown.
3IXP, Brown, Cpl., Smyrna, Tenn.
4BDT, Goforth, Pvt., Camp Crowder, Mo.
4DXU, Britt, Capt., Dayton, Ohio.
4GBO, Fitzgerald, T/Sgt., Nashville, Tenn.
4GHK, Roberts, Pvt., foreign duty.
4HCE, Johnson, 2nd Lt., Norwood, Mass.
5BEP, Tuma, Capt., Ft. Monmouth, N. J.
5CSJ, Korges, M/Sgt., Washington, D. C.
5CYM, Palmblad, Capt., foreign duty.
5FLV, Lee, 2nd Lt., foreign duty.
5GGG, Barron, M/Sgt., address unknown.
5HBX, Kirk, Lt., Dayton, Ohio.
ex-5HJG, Bray, W/O (jg), New Orleans, La.
5KAX, Goldbert, Pvt., Presidio of San Francisco, Calif.
ex-K6KFO, Topoleski, T/Sgt., Ft. Sam Houston.
6QGG, Seeberger, Pvt., Camp Crowder.
6SHE, Gilliam, T/5, Seattle, Wash.
7HMG, Alexander, Pvt., Camp Adair, Ore.
ex-7TM, Todd, 2nd Lt., Ft. Monmouth, N. J.
8CYT, Wood, Maj., foreign duty.
8IHY, Manthey, W/O (jg), Drew Field, Fla.
8LDQ, Moreland, Capt., foreign duty.
8MV, Beechler, Pfc., Ft. Monmouth.
8MZV, Fisher, Lt., foreign duty.
8PNT, Eifert, Sgt., foreign duty.
8RUH, Snefsky, Lt., Ft. Monmouth.
8SEM, Crow, Sgt., Davis, Calif.
8SXS, Stare, Sgt., Half Moon Bay, Calif.
8UGG, Gault, T/Sgt., Presque Isle, Me.
9EQY, Anderson, Cpl., Seattle, Wash.
9HHL, Price, S/Sgt., Camp Polk, La.
9KZO, Holmbeck, Cpl., Ft. Monmouth.
9LQJ, Meade, Capt., foreign duty.
9NGN, Howard, T/Sgt., foreign duty.



Amateurs all, these soldiers are seeing duty with a Signal Corps service company stationed "somewhere in the Central Pacific." *Front row, l. to r.:* Lt. W. A. McCartney, K6CRW; Lt. J. J. Kelley, W8BAZ; Capt. R. F. Bowker, K6RRM; WO E. A. Turner, K6SRZ (operator); Sgt. Ronald H. Turner, W9EZL; T/5 C. M. Hill, W9HTL, and S/Sgt. Edmund Serur, W5CNO. *Back row, l. to r.:* Lt. James R. Drinnon, W4AUU; Lt. D. F. Langham, W8CVJ; Lt. F. S. Randle, W5OW (operator); T/4 Jack Farrance, W8QHR; T/4 Leon V. Hastings, W1MJP; T/3 Francis Dewalle, W9JMA and S/Sgt. Al Shelleday, W6CFT-ex-W7JO.

9OOO, Delonais, Lt., foreign duty.
9VLE, Farmer, T/4, foreign duty.
9ZIS, Brown, Cpl., Eatontown, N. J.

Operator's license only:

Bartell, Pvt., Camp Shelby, Miss.
Bolinger, Pvt., Camp Bradford, Va.
Bonnell, T/Sgt., foreign duty.
Eisen, Sgt., Spring Lake, N. J.
Hancock, Lt., Ft. Sam Houston.
Martin, Cpl., Washington, D. C.
Wright, Pfc., Camp Crowder, Mo.
Yaxthimer, S/Sgt., Camp Livingston, La.

NAVY—FOREIGN OR SEA DUTY

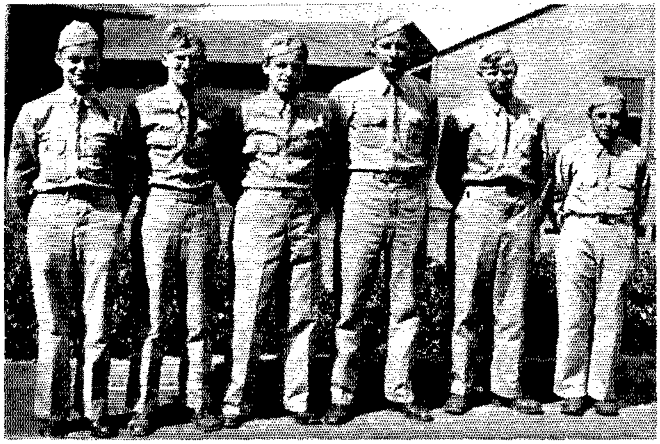
KA1AK, Fischer, Elect.; ex-1FHO, Simmons, CRM; 1KUG, Hadley, RE; 1LBW, Austin, RM1c; 1NAP, Culver, Lt. (jg); 1NOM, DiMenna; 2FNJ, Rael, RT2c; 3HJG, Skitzki, Eng.; 3IVT, Riddle, Lt. (jg); 4FBF, Miller, Lt. (jg); 5JHR, Romine, EM1c; 6DLN, Huddleston, Lt. (jg); ex-6LRM, Ulrich, RT2c; 6OVP, Klein, RT1c; 6RWU, Whitlock, RT1c; 6SKG, Lorentz, RT1c; 6TJU, Wiley, RM2c; ex-7HKP, Hobbs; 7HVD, Scheck, ART1c; 8PFH, Pistone, ART1c; 8VYQ, Bull, RE; ex-9MOL, McKeethan, RM2c; 9PUD, Ryan, Lt; 9TGQ, Blodgett, RT1c; 9ZKD, Robinson, ART1c; and the following have operator's license only: Almes, RT1c; Carter, EM2c; Corazza, RM3c; Lewis, RM1c; Struthers, RM2c.

100 PER CENT WAR WORK—AIR TRANSPORT

1ACW, Hughes, flight operator, Northeast Airlines.
1BYG, Evans, radio operator, American Airlines.
1COW, Tucker, FRO, Pan American Airways.
1DGN, Lockwood, FRO, American Airlines.
1DMS, Downer, radio operator, American Airlines.
1FAD, Graves, Pan American Airways.
1HSP, O'Donnell, radio operator, American Airlines.
1JIS, McGrew, radio operator, Ferry Command.
1JWA, Allard, radio operator, American Airlines.
1KIN, Steckevics, Pan American Airways.
1KXP, Hotaling, instructor, Northeast Airlines.
1MBU, Cipolla, FRO, American Airlines.
1MDX, Nichols, American Airlines.
1MFD, McGrath, FRO, Pan American Airways.
1NCD, Britton, radio operator, American Airlines.
1NMS, McMahon, radio operator, American Airlines.
2AQK, Melville, FRO, American Export Airlines.
2BJC, Steen, FRO, American Airlines.
2CKQ, Meditz, radio operator, American Airlines.
2CRV, Tilton, FRO, American Airlines.
2FIS, Lehman, radio operator, American Airlines.
2GCQ, Skogland, radio operator, American Airlines.
2GHF, Slominski, radio operator, American Airlines.
2HEL Fisher, FRO, American Airlines.
2HNR, Plung, FRO, Northeast Airlines.
2HXI, Caris, radio operator, Pan American Airways.
2IOP, LeKashman, FRO, Pan American Airways.
2JJH, Johnson, radio operator, American Airlines.
2KSB, DePouli, FRO, Pan American Airways.
2KVT, Samuelson, radio operator, American Airlines.
2LGS, Faeth, radio operator, American Airlines.
2MAG, Lemanski, FRO, American Airlines.
2MLW, Burke, radio operator, Pan American Airways.
2NAY, Forte, FRO, American Airlines.
2NDA, Wilson, Pan American Airways.
2NHD, Harris, radio engineer, Republic Avn. Corp.
2NIH, Sutherland, Douglas Aircraft.
2NUP, Obinger, radio operator, American Airlines.
2NYZ, Wheelden, radio technician, Pan American Airways.
2OLU, Johnson, FRO, Am. Air Export Lines.
2OLV, Lawrie, radio operator, American Airlines.
3AID, Burroughs, Eastern Aircraft Corp.
3BWF, Wood, radio mechanic, Eastern Aircraft Corp.
3DHJ, Sumner, supervisor, Aircraft Radio Corp.
3EUH, Hannah, radio mechanic, Eastern Aircraft.
3EWO, Charlton, navigator, Pan American Airways.
ex-3ICG, Newhoffer, FRO, American Airlines.
3IXH, Plimpton, radio operator, American Airlines.
3JCO, Miazza, radio operator, American Airlines.
3JOL, Bluml, radio mechanic, Eastern Aircraft Corp.
3JWN, Crissey, FRO, American Airlines.
4GQI, Shelton, FRO, American Airlines.
4HKJ, Ethier, FRO, Pan American Airways.
4IGE, Rollick, FRO, Eastern Airlines.
5AKN, Scroggins, FRO, Pan American Airways.
5CHJ, Kennedy, checker, North American Aviation.
5CPW, Weeks, Lockheed Aircraft Corp.
5HHF, Bandy, radio technician, Boeing Airplane Co.
5PG, Melancon, FRO, Amer. Export Airlines.
6BFK, Finley, FRO, address unknown.
6OYV, Clarke, FRO, Pan American Airways
6PGX, Bergholdt, Lockheed Aircraft Corp.
6QVP, Alcorn, Douglas Aircraft.
6RIR, Flanagan, radio operator, Transcontinental and Western Airlines.
6SUZ, Weismann, FRO, Pan American Airways.
6TLN, Eslinger, Pan American Airways.
7HGC, McClellan, radio operator, Northwest Airlines.
7IAJ, Frost, radio operator, Pan American Airlines.
8BLO, Guest, radio operator, Curtiss-Wright.
8CMH, Cousbaine, radio installer, address unknown.
8REC, Bove, FRO, Pan American Airways.
8RLO, Haines, radio technician, Lear Aviation Inc.
8RMH, Cantelon, radio installer, address unknown.
8SD, Griswold, radio operator, Curtiss-Wright.
8SQQ, Rowan, radio operator, Pan American Airways.
8SVC, Kenyon, radio operator, Eastern Airlines.
8TOG, Culver, radio operator, Curtiss-Wright
8UWZ, Harrison, FRO, American Airlines.
8VOV, Peters, FRO, American Airlines.
8VWQ, Shaw, radio operator, Transcontinental and Western Airlines.
9AMP, Brickey, W., radio mechanic, Pan American Airways.
9BBC, Chamberlain, radio installer, Republic Aviation.
9EFK, Pehoushek, radio operator, Northwest Airlines.
9EFQ, Stitzel, radio operator, address unknown.
9EXT, Klemetti, radio mechanic, Pan American Airways.
9GIT, Bushland, Northwest Airlines.
9GKJ, Miller, radio technician, Lockheed Aircraft.
9HDI, Brew, Northwest Airlines.
9HJD, Montgomery, FRO, Transcontinental and Western Airlines.
9HKF, Kuehn, radio operator, Northwest Airlines.
9HVC, Brammer, radio operator, Curtiss-Wright.
9IVR, Caudill, Boeing Aircraft.
9KAM, Stephens, radio operator, Northwest Airlines.
9KPS, Richardson, radio operator, Curtiss-Wright.
9KRV, Swafford, radio operator, Northwest Airlines.
9KUD, Duth, radio operator, Northwest Airlines.
9LBY, Grasse, Lockheed Aircraft.
9LCS, Juelson, pilot, address unknown.
9LSC, Soderlund, instructor, Northwest Airlines.
ex-9NCU, Campbell, radio operator, American Airlines.
9QFO, Grasse, radio technician, Lockheed Aircraft.
9QIN, Clark, radio operator, Northwest Airlines.
9QPG, Slattery, radio operator, Northwest Airlines.
ex-9SMS, Wells, radio technician, North American Aviation.
9TGI, Thumm, co-pilot, Northeast Airlines.
9TKX, Schoening, radio operator, Northwest Airlines.
9VXH, Davis, radio operator, Northwest Airlines.
ex-9WII, Miller, instructor, Lamesa Field.
9ZTQ, James, FRO, Pan American Airways.
9JNO, Brickey, M., Air Transport Command.
9VND, Jaeger, FRO, address unknown.
9ZKA, McCorkle, radio technician, Boeing Airplane.

Operator's license only:

Recupero, radio operator, American Airlines.
Smith, radio technician, Transcontinental and Western.
Watson, radio operator, American Airlines.



Another group of hams with the same Signal Corps outfit in the Central Pacific as those pictured on page 25. *Left to right:* T/4 Richard E. Perkins, W1KYO; T/4 James Houdsworth, W1KVN; T/Sgt. Leo Shapiro, W2JEW; T/3 John Caruthers, ex-W6MOY; T/5 Daryl Fraley, W9QPR, and T/5 Fred Klittich, W9HNQ.

Charles F. Herman, USNR, W2LQC, recently received the rating of warrant officer, radio electrician. He has been on active duty for three years. Before going on foreign duty he attended an RAF school in Canada and served at the Naval Research Laboratory at Bellevue, D. C.

CANADA

OUR hearty thanks go to Leonard W. Mitchell, VE3AZ, of Toronto, for his kind coöperation in making the Canadian listing this month the largest ever. We knew that a huge number of VE hams were in military service, but it was difficult to secure their names. Now that 3AZ has compiled the following gratifyingly long lists for us, won't you folks at home please fill in the blank ranks, ratings and addresses? "Address unknown" has a coldly impersonal touch which we dislike — so let us have more data for that little white card in our file.

Let us also remind you that VE3AZ has practically exhausted his source of supply — so won't some one else get up a nice long list of the OMs who are known to be in the service? Get busy now, so that the VE listing two months hence will be as prodigious as is this month's.

RCN

1AP, MacKay, Petty Ofcr., Newfoundland.
1EH, Fenwick, Albro Lake, N. S.
1EV, Brown, Opr., Albro Lake, N. S.
1PA, Bodley, L/Tel., Albro Lake, N. S.
3ABU, Diamond, address unknown.
3AEG, Attwood, foreign duty.
3AGN, Bate, address unknown.
3AMN, Gareau, address unknown.
3AOT, Marquis, address unknown.
3AUD, Whitton, address unknown.
3AYC, Bolduc, address unknown.
3AYF, Misner, address unknown.
3AZW, Christie, address unknown.
3BAW, Suggett, address unknown.
3HG, Crooker, address unknown.
3HV, Holmes, address unknown.
3KC, McKnight, address unknown.
3UH, Stark, address unknown.
3WL, Wigle, address unknown.
3WZ, Wale, address unknown.
3YZ, Hewitt, address unknown.
3ZQ, Best, address unknown.
4AEU, McCrindle, address unknown.
4AFD, Swennell, address unknown.
4AFH, Miller, address unknown.
4AGN, Dixon, address unknown.
4AGQ, Doughty, address unknown.
4ASD, Young, address unknown.
4RP, Whyte, address unknown.
4XG, Keatinge, Ottawa, Ont.
4ZC, Jinks, address unknown.
5AAZ, Clark, address unknown.
5AFG, Tomlinson, Ottawa, Ont.
5AGJ, Greaves, address unknown.
5AGN, Poulton, address unknown.
5AIY, Alexander, address unknown.
5AIZ, Penny, address unknown.
5DN, Wicks, Opr., Albro Lake, N. S.
5DS, Watson, address unknown.
5DY, Scholes, address unknown.
5EB, Betts, address unknown.
5HO, Drysdale, address unknown.

RCA

1DG, Craft, address unknown.
1DP, Haughin, address unknown.
2AM, Wade, address unknown.
2BT, Roach, address unknown.
2BU, Heustis, address unknown.
2EM, McArthur, address unknown.
2GF, Brough, address unknown.
2KY, Walton, address unknown.
2ML, Miller, address unknown.
2OZ, Anderson, address unknown.
3AAT, Dudley, address unknown.
3ACQ, Knowlton, address unknown.
3AGK, McPherson, address unknown.
3AII, Henderson, address unknown.
ex-3ALH, Richardson, address unknown.
3ANL, Willing, address unknown.
3AON, Brodribb, address unknown.
3APW, Johns, address unknown.
3AQI, Harris, address unknown.
3ATK, Dunn, address unknown.
3CM, Johnson, address unknown.
3DF, Stauffer, address unknown.
3KE, Williams, address unknown.
3PV, Green, address unknown.
3RF, Tattersall, address unknown.
3ST, Venning, Sgt., address unknown.
3UD, Gauvrea, address unknown.
4CM, Driver, Maj., address unknown.
4UZ, Harris, Pte., address unknown.
5ABO, Newnham, address unknown.
5AFH, Haymond, address unknown.
5AFN, MacKay, address unknown.
5AT, McCallum, address unknown.
5EK, Kelcey, address unknown.
5NR, Hawkins, address unknown.
5RM, Nayell, address unknown.
5SP, Action, address unknown.

RCAF

1CP, Moir, address unknown.
1EC, Trenholm, address unknown.
1EM, Robertson, address unknown.
1DS, Breau, address unknown.
1JR, Roy, address unknown.
1ND, Duffy, address unknown.
1OX, Fulton, address unknown.
2EX, Millar, Sgt., Greenfield Park, Que.
2JH, O'Brien, address unknown.
2PG, Bertrand, address unknown.
2RG, Guerette, address unknown.
3AAD, Leutchford, address unknown.
3ADU, Keen, address unknown.
3AEO, Scarrow, address unknown.
3AFK, Ferguson, address unknown.
3AGB, Bilesko, AC2, Toronto, Ont.
3AHW, Sanderson, address unknown.
ex-3AIP, MacLauchlan
3AIU, Bissett, address unknown.
3ALR, Sleeth, address unknown.
3ANI, Bavington, address unknown.
3ANT, Tapp, address unknown.
3ANV, Gribble, address unknown.
3AQQ, O'Byrne, address unknown.
3AR, Seon, foreign duty.
3ARS, Sass, address unknown.
3ARV, Thomas, address unknown.
3ARX, Oates, address unknown.
3AVA, Ironside, address unknown.
3AVM, McAleese, address unknown.
3AVN, Gordon, address unknown.
3AYP, Alexander, address unknown.
3AYX, Honer, address unknown.
3BBH, Page, address unknown.
3BD, Carpenter, address unknown.
3BZ, Stiles, address unknown.
3CJ, Eaton, address unknown.
3DH, McCalla, F/Lt., St. Catharines, Ont.
3FO, Langstaff, address unknown.
3IF, Spafford, address unknown.
3JH, Cooper, address unknown.
3KD, Cromwell, address unknown.
3LG, Walker, address unknown.
3LW, Irwin, F/Lt., address unknown.
3MS, Herring, F/O, foreign duty.
3OZ, Taylor, address unknown.
3PI, Nash, address unknown.
3PK, McNeill, P/O, Scoudouc, N. B.
3RI, Stevens, address unknown.
3SH, Burke, address unknown.
3SM, Walker, address unknown.
3SY, Yearron, address unknown.
3VT, McGregor, address unknown.
3YX, Knight, address unknown.
4ABD, Jones, address unknown.
4ABN, Ogren, address unknown.
4ADS, Cardwell, address unknown.
4AF, Hannay, address unknown.
4AGM, Antoine, address unknown.
4AHE, Simpson, address unknown.
4AHN, Jenkins, address unknown.
4AJ, Hawkins, address unknown.
4AKL, Arnold, address unknown.
4AKV, Riley, address unknown.
4ALW, Wilde, address unknown.
4AMQ, McCallum, address unknown.
4APD, Naff, address unknown.
4APT, Skelhorne, address unknown.
4AX, McLaughlin, address unknown.
4CS, Smith, F/L, Preston, N. S.
4FM, Baker, address unknown.
4FO, Brownfield, address unknown.
4JC, Duncan, address unknown.
4JD, Mauchel, address unknown.
4MD, MacArthur, address unknown.
4OQ, Veale, address unknown.
4SD, Bennett, address unknown.
4UO, Davis, address unknown.
4VA, Eymundson, address unknown.
4VG, Keys, address unknown.
4YO, Holmes, address unknown.
4ZN, Routledge, address unknown.
5ADD, Jones, address unknown.
5ADK, Pattison, address unknown.
5ADO, Begg, address unknown.
5AES, Spence, address unknown.
5AGA, Lee, address unknown.
5AHJ, Hallm, address unknown.
5AHS, Allard, address unknown.
5AHV, Canfield, address unknown.
5DR, Maylam, address unknown.
5DU, Riddell, address unknown.
5HI, Newton, address unknown.
5MP, King, address unknown.
5SD, Johns, address unknown.

Capt. Colin Dumbrille, VE2BK — once Canada's youngest ham — now is a staff officer with the Canadian Second Army Corps stationed overseas. He received his amateur ticket ten years ago at the age of 13, the youngest VE ham ever to have been licensed.

A Simple Signal Tracer

An Inexpensive Instrument for Receiver Testing

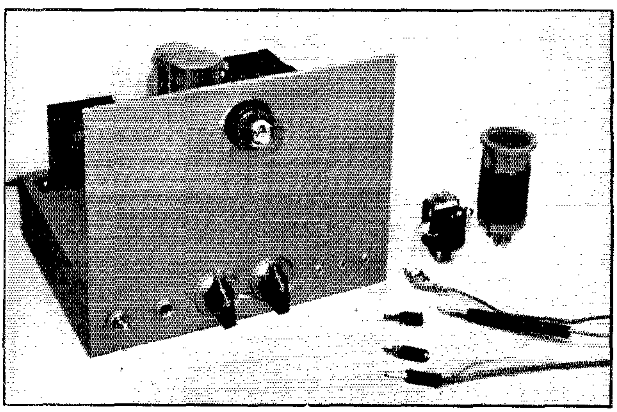
BY WALTER E. BRADLEY,* W1FWH

This article describes the construction and use of a simple version of that most useful tool of the b.c. serviceman — the signal tracer. By comparing the input and output signals of any stage in a receiver, a defective stage can be quickly identified. It's a handy gadget to have around for shooting trouble, not only in the family b.c. receiver but also in a communications job or a speech amplifier.

FOR the past several years the trend in receiver servicing equipment has been in the direction of increased complexity. The more recent developments in commercial test units have consisted chiefly of expansions to include additional equipment, rather than improvements of existing units. While it is not to be denied that this trend has resulted in distinct benefits to the serviceman, it is true, nevertheless, that the overwhelming array of dials, meters, switches and plugs appearing on the panels of modern test units tends to obscure the fact that it is still possible to do a pretty good job of trouble shooting with simple equipment. The fact that by far the larger percentage of repair work can be done in a satisfactory manner without the use of the oscilloscope, signal generator or vacuum-tube voltmeter is worth remembering in these days when new test equipment is obtainable only on high priority.

Much of the difficulty in spotting trouble in modern receivers arises from the fact that the superheterodyne circuit in universal use today is a combination of many individual circuits. Once the faulty section has been isolated, the rest of the job usually is comparatively easy. A simple signal tracer of the type shown in the photographs is most useful for this purpose.

* ARRL Technical Information Service.



Front view of the signal tracer. The two controls are for audio gain and voltage-indicator adjustment. At the right are the i.f. and r.f. input coils and the probe leads, including the removable low-capacity tip.

Circuit Details

As the diagram of Fig. 1 shows, the signal tracer consists of a simple detector and audio amplifier. By connecting the unit across the various circuits in a receiver by means of a probe, it is possible to determine by listening just where along the line the signal goes sour or gives up the ghost entirely. When testing audio stages after detection, only the audio section of the tracer is needed; the 6J5GT detector will be required whenever circuits operating at r.f. are to be checked. Also included in the test unit is a simple neon-tube "voltmeter." While it may be given a rough calibration, if desired, most electrode-voltage troubles can be readily located by simply determining whether there is voltage or no voltage at the tube terminals.

The 6J5GT detector is of the grid-leak type. (It might be mentioned that an infinite-impedance detector was tried first, with the idea that it would impose a minimum of loading upon the circuit under investigation. However, this arrangement failed to provide sufficient sensitivity for testing the front-end stages of most receivers.) To permit testing both r.f. and i.f. sections, plug-in coils are used at L_1 in the tuned input circuit. Since this tracer was designed primarily for checking broadcast receivers, the coils are pretuned to selected frequencies with compression-type condensers. The coil used for testing signal-frequency stages is tuned to the frequency of a local station, while the other one is tuned to the frequency of the i.f. amplifier. If the tracer is to be used to check *all-wave* or communications-type receivers, it may be preferable to mount a 140-$\mu\mu$fd. variable condenser on the panel as the tuning element rather than to use the plug-in compression-type trimmers. Coils can be made up to tune to any desired bands.

Resistance coupling is used between the detector and the 6G6G audio stage, although transformer coupling may be used if desired. Parallel feed in the output circuit makes it possible to isolate the headphones from the d.c. plate supply. Here again a suitable output transformer may be substituted.

Voltage Indicator

The voltage indicator, consisting of the neon bulb, N, and the potentiometer, R_5, includes the essentials of a similar arrangement described in an earlier issue of *QST*.[1] It is capable of indicating both a.c. and d.c. voltages, provided their minimum potentials are not much less than 50 volts. Since, by inserting a condenser in series with the test probe, it is possible also to measure an a.c. voltage of this magnitude or greater when it is superimposed on d.c., the neon bulb may also assume the role of an output indicator for set alignment.

The power supply is conventional with the possible exception of R_6 and C_8, which constitute an additional filtering section to reduce hum from the power supply to the necessary minimum. The considerable reduction in hum level between the input and output ends of R_6 can be heard with the signal tracer. It is essential that this instrument itself be practically humless to do a good job of tracing hum in a receiver, which is one of its primary uses.

Choice of Parts

The performance of the tracer will not be affected seriously if some liberty is taken in following the values suggested below the diagram. Almost any medium- or high-μ triode will work satisfactorily as a detector and, of course, other pentodes or beam tetrodes may be substituted in the audio amplifier.

The resistance of the grid leak, R_1, may be anywhere between 1 and 5 megohms, although the higher resistance is preferred for greater sensitivity. The detector plate resistor, R_2, should preferably be 100,000 ohms, but a resistance as low as 50,000 ohms will serve very well. The volume control, R_3, and voltage divider, R_5, may be 250,000-ohm variables. R_4 should remain close to 500 ohms, but R_6 may be anything between 10,000 and 15,000 ohms without impairing results.

[1] Bradley, "The Neon-Tube Parts Checker," *QST*, October, 1942, p. 18.

It is best that C_2 be no larger than 100 $\mu\mu$fd., but C_3 may be 100 or 250 $\mu\mu$fd., and any value between 0.01 and 0.1 μfd. will be satisfactory for C_4, C_5 and C_7. Minimum requirement for C_8 is 1 μfd., but anything larger may be used if it is already on hand. The capacity of C_9 and C_{10} should be not less than 8 μfd.

Any size or type of neon or argon glow tube may replace the ½-watt screw-base G-10 bulb specified. This type has a resistor in its base, but it is immaterial whether the glow tube used has such a resistor or not.

The power transformer, T, may be of any type which will deliver the proper heater voltage for the tubes used and a plate-supply output voltage between 180 and 300 at about 60 ma.

Some may find it desirable to add a small p.m. speaker. This may be done by connecting the speaker-transformer primary in place of L_2. The headphone connection need not be disturbed when the speaker is added. In fact, the use of 'phones is recommended whenever weak signals are involved.

Construction

Construction is simple and straightforward. A steel chassis measuring 9 × 7 × 2 inches was reclaimed from the junk box. After stripping it of the parts which still remained, the necessary additional holes were punched and drilled. A piece of ⅛-inch Presdwood was cut to make a panel 7⅛ × 9 inches.

Aside from the point that the tuned circuit, L_1C_1, should be mounted fairly close to the detector tube socket, there is nothing critical about the placement of parts on the chassis. If an old chassis is used, advantage may be taken of existing socket and mounting holes. Three pin-jacks are provided along the bottom edge of the panel for connecting the "hot" test leads. They must be insulated from the chassis, of course. The headphone jack requires no insulating mounting.

Dimensions for L_1 are given under Fig. 1. The compression-type condenser, C_1, for the b.c.

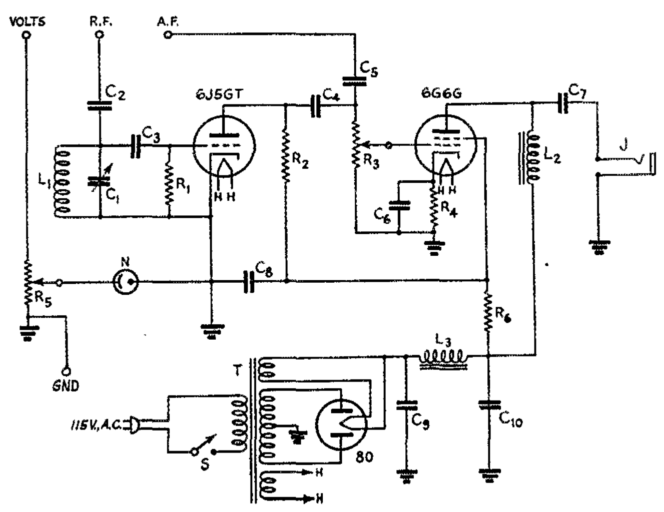


Fig. 1 — Circuit diagram of the signal tracer and its power supply.

C_1 — 160-$\mu\mu$fd. mica trimmer on r.f. coil; 100-$\mu\mu$fd. mica trimmer on i.f. coil.
C_2, C_3 — 100-$\mu\mu$fd. fixed mica.
C_4, C_5, C_7 — 0.01-μfd. paper.
C_6 — 25-μfd. 25-volt electrolytic.
C_8 — 1-μfd. 25-volt electrolytic.
C_9, C_{10} — 8-μfd. 450-volt electrolytic.
R_1 — 5 megohms, ¼ watt.
R_2 — 0.1 megohm, 1 watt.
R_3 — 0.5-megohm volume control.
R_4 — 500 ohms, 2 watts.
R_5 — 0.5-megohm variable.
R_6 — 1200 ohms, 2 watts.
L_1 — 90 turns No. 24 enamel, close-wound on 1½-inch form for b.c. band; 2.5-mh. r.f. choke for i.f. range.
L_2 — Audio choke or 30-hy. filter choke.
L_3 — Standard filter choke.
J — 'Phone jack, open circuit.
N — Neon bulb. S — S.p.s.t. toggle.
T — Power transformer.

band is mounted inside the coil form. The tuning range with the coil specified is approximately 900 to 1500 kc. If the frequency of a local station does not fall within this range, the lower frequencies may be covered with a coil of 135 turns of No. 30 enameled wire on a form of the same size.

An old tube base is employed for mounting the 2.5-mh. r.f. choke used for the intermediate frequencies. The trimmer condenser is soldered in parallel with the choke, which fits into slots cut in the walls of the tube base. The 100-$\mu\mu$fd. condenser permits tuning the circuit to either of the standard i.f.s of 465 or 365 kc.

Test Probe

Special attention must be given the probe which is used in making connection between the tracer and the receiver. Inasmuch as the signal tracer is actually a receiver in itself, signals from local stations may be picked up by the probe lead if it is not shielded. This shield should cover the entire length of the lead from the 'phone tip at one end to the usual type of test probe attached to the other end. It is also necessary that the ground point of the receiver under test (not always the metal chassis in every receiver) and of the signal tracer be connected together when tests are made. For this reason, a short wire with a 'phone tip for plugging into the ground tip-jack of the tracer is soldered to one end of the shielding and a longer wire with a small clip at its end is soldered to the shielding 6 or 8 inches from the test probe. This clip must be attached to either the receiver chassis or the ground point, as the case may be, during all tests.

To reduce detuning effects, which sometimes occur when the tracer is connected across a tuned circuit, a small capacity connected in series with the probe is used except when testing audio stages. This capacity consists of a winding of 6 or 8 turns of *insulated* hook-up wire wound around the exposed tip of the probe. There is no direct connection between the winding and the test-probe tip. The tip end of the winding is straightened out and the insulation removed for about ¼ inch. The bare end of this wire, is then used instead of the test-probe tip for making contact to the "hot" side of the tuned circuit. The winding may be slipped on or off as conditions dictate.

Rear view of the simple signal tracer. All power-supply components are mounted along the rear edge of the chassis. Close to the panel, from left to right, are the input coil and the detector and audio-amplifier tubes.

The only precaution necessary in wiring the tracer is to shield the grid lead running from the detector to the grid connection on the coil-form socket. This will prevent feed-back, which might otherwise occur as a result of the necessary close proximity of the a.f. wiring to the r.f. wiring.

Alignment

Since the capacity effect of the test-lead shielding will add to the total stray capacity of the tuned circuit in the tracer, the plug-in units should be given their fixed settings with the test lead plugged into the r.f. jack and the shield-to-ground tip in its jack. The r.f. unit should then be tuned to the frequency of any convenient local broadcast station while holding the probe tip in the fingers of one hand, touching it directly to an antenna or connecting it to the output of a signal generator. The i.f. unit may be tuned without a signal generator if the removable low-capacity tip is placed on the end of the probe and touched to the plate of the last i.f. tube in a good receiver tuned to some station. With each of the two plug-in units properly tuned, the signal tracer is ready to go to work.

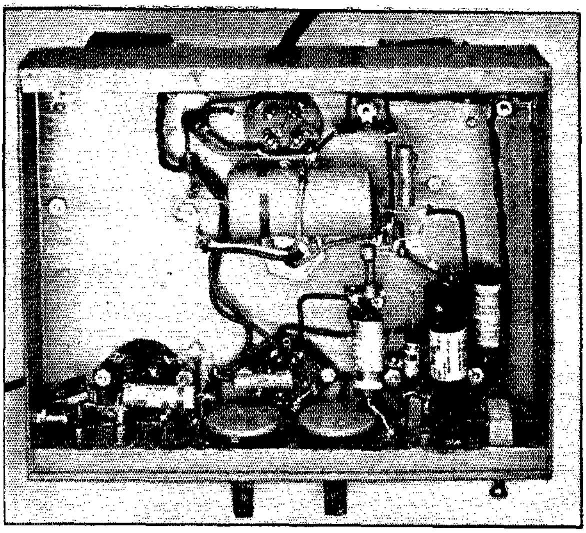
Using the Tracer

As anyone with experience knows, it is usually easier to spot trouble in a receiver which is delivering no signal whatsoever to the speaker than in one in which the signal volume or quality has dropped off or which has developed some form of intermittent trouble. Nevertheless, the tracer is effective in isolating troubles of any of these classifications.

However, for the time being it will be assumed that the trouble is continuous and not of the intermittent type. The primary principle of checking with a signal tracer is that of making a comparison of the signal strength and quality between one point in a receiver and other points. With the signal-frequency coil plugged in at L_1 and R_3 turned up for maximum audio gain, start out by placing the probe on the grid terminal of the input stage of the receiver. The local test signal to which L_1 has previously been tuned should then be heard, and the receiver should be tuned for maximum signal strength. Next, touch the probe to the grid of the following tube, usually the mixer, and again tune the receiver for maximum signal strength. There may not be any noticeable indication of gain at this point, but at least the signal strength should not be weaker, unless there is something wrong with the input stage. The procedure should be repeated with successive stages, making a careful comparison of signal strengths and quality and watching for any evidence of loss in either. When the i.f. section is reached, it will of course be necessary to shift coils at L_1 so that the signal-tracer input circuit will tune to the i.f. of the receiver. A satisfactory signal at the grid of the mixer, when none is present at the grid of the first i.f. amplifier, obviously points toward h.f. oscillator failure.

The i.f. tracer coil can be used up to the input of the second detector. If the trouble has not been isolated by the time the second-detector input has been reached, the low-capacity tip should be removed and probe lead should be shifted to the audio pin-jack on the tracer panel.

Experience and a little common sense will soon enable the trouble shooter to judge whether or not any particular stage is operating at normal gain. R.f. and mixer stages will, of course, show low gain as compared with i.f. and audio stages. As progress is made toward the output end of the receiver, the signal-tracer gain control may have to be turned down to permit a more accurate estimate of gain. The gain setting should not be changed during checks between stages, however.



Bottom view of the signal tracer. The pin-jack for the external ground connection is mounted on the left-hand side of the chassis.

Using the Voltage Indicator

As soon as the trouble has been pinned down to a certain stage, voltage checks at the tube terminals can be made with the neon voltage indicator. Before the probe is applied to any terminal, R_5 should be turned to minimum resistance (ground end). After making contact with the probe, the resistance should be slowly increased until the neon bulb just starts to glow. The discovery of a lack of screen or plate voltage at the tube terminals naturally should be followed by further voltage checks along the high-voltage leads toward the power supply to determine where the voltage first appears, thus isolating the point where the circuit is open. In checking terminal voltages, remember always to connect the indicator return circuit to the cathode terminal rather than to the chassis.

Biasing voltages usually are not sufficiently high to operate the neon indicator. However, most troubles of this nature in a dead receiver or one with a very distorted output can be located by touching a 50,000- or 100,000-ohm resistor across each of the various grid resistors in the receiver. R_5 can be used for this purpose by connecting the probe to the voltage pin jack, and turning it so that the neon bulb is connected directly to ground. An open grid will immediately come to life, and the defective resistor can be replaced by one of proper value. Similar tests of cathode resistors can be made with a 500- or 1000-ohm resistor. The next logical step would be to try a new tube in the stage giving the trouble. A search for hum may be aided by using the probe in the a.f. pin jack. For this purpose, the audio gain control should be wide open.

Intermittent Troubles

Intermittent troubles require more patience. Perhaps the best point at which to start checking troubles of this type is at the audio output of the second detector. With the tracer connected at this point, the receiver gain should be turned down so that the speaker output does not drown out the signal from the tracer. If the receiver signal fluctuates when the trouble occurs while the signal from the tracer remains unaffected, the trouble is, of course, in some circuit following the detector output. If both signals fluctuate simultaneously, the trouble lies ahead of the detector. In either case the tracer should be moved, stage by stage, in the direction of the defective stage until it is located. After that, it is chiefly a job of replacing parts one at a time until the culprit is located.

Output Metering

As previously mentioned, the neon-tube circuit provided with this tracer can be used as an output meter for set alignment. A 0.1-μfd. condenser should be connected in series with the test lead to remove the d.c. voltage, so that only the audio signal will affect the neon bulb. A steady modulated signal from a signal generator is essential for alignment work. The neon tube fluctuates with modulation, which makes alignment of the receiver from a local b.c. signal impracticable. The brilliance of the bulb will grow in intensity as the receiver is brought into proper alignment. No attempt should be made to align the receiver when the tracer is connected to any of the i.f. or r.f. stages, since the detuning effects of the tracer are too great.

The audio section of the tracer also will be found useful in checking speech amplifiers, p.a. systems and record-player circuits. Other uses to which the tracer may be put undoubtedly will suggest themselves to the builder.

HAPPENINGS OF THE MONTH

MIDWEST ELECTION RESULTS

Floyd E. Norwine, jr., W9EFC, and Capt. William H. Graham, W9BNC, have been reëlected director and alternate director, respectively, of the Midwest Division for the 1944–45 term. It will be recalled that the Midwest failed to make nominations on the first call and that readvertising was necessary. Resulting nominations named only the incumbents, whereupon the Executive Committee declared them reëlected without the need for balloting by the membership.

"Schultz" Norwine is a good guy to know: he's in the coffee business. So is Bill Graham: he's in the Jap-killing business right now.

JETT AS COMMISSIONER

If you have *QST* for July, 1938, handy, pull it down and read our account of the battle for amateur frequencies at Cairo, wherein we reported the retention of all amateur frequencies after a terrific fight. We quote: "For three successive days amateur radio, its frequencies, and its value relative to broadcasting, were the chief topic of the allocation meetings. European administrators, greedy at the smell of frequencies, faces livid with rage at being balked in their objective, attack us in the plainest talk we've ever heard at international conferences. The United States, with very little support from other sources, courageously maintained a determined stand. But for that defense, we would have been torn to shreds. . . . The United States did a magnificent job of defending amateur radio. It left nothing to be desired. Credit for this belongs chiefly to Lt. Ewell K. Jett, chief engineer of the FCC. . . ."

On January 12th President Roosevelt nominated Mr. Jett to be a member of the Federal Communications Commission for a term of seven years. At this writing the nomination is still in the hands of a Senate committee and some political byplay is expected, but his confirmation is regarded as certain. The nomination is commonly spoken of as the elevation of a career official, "a merit appointment of the highest quality," and a decided addition to the Commission.

Mr. Jett served 18 years in radio in the Navy, during the last war being radio officer on the Flagship *Seattle* of the Cruiser & Transport Force and on the USS *Georgia*. In 1929 the Navy Department lent his services to the engineering department of the old FRC. Upon his retirement that year from the Navy, he was made FRC's senior radio engineer in charge of all engineering except broadcasting. He was named assistant chief engineer in 1931, chief engineer on January 1, 1938, on the eve of his departure for the Cairo conference. He has long been one of the most important figures in American radio administration, a U. S. delegate at seven major international conferences, chairman of IRAC from 1939 to 1941, and during this war serving as the main cog of the Board of War Communications in the post

AMATEUR WAR SERVICE RECORD

Name

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

Present mailing address

SERVICE

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

Rank or rating

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

ARE YOU LICENSED?

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

of chairman of its Coördinating Committee. His appointment as a Commissioner will lend indisputable stature to FCC.

YOUR WAR SERVICE RECORD?

A GREAT many thousands of amateurs have registered at ARRL Headquarters the essential facts of their wartime employment of their amateur radio skill, using the simple form at the bottom of the facing page. But by the rate at which they still pour into Hq., we know that we are only scratching the surface.

We aspire to compiling a card record of the wartime service of every licensed radio amateur of the United States and Canada who is engaged in communications or any other application of radio technique. Its statistics, and the ability to plunk the whole thing down in the middle of the hearing table, will be powerful medicine in getting our frequencies back. It is similarly the raw material for compiling, for posterity generally, the history of the amateur's contribution to the winning of this war. Those are the reasons why you, as an amateur, should be willing to go out of your way to help ARRL make the record complete. Two ways in which you can help:

1) Have you sent in the dope on yourself? If not, use the convenient form, or reproduce its essentials on a post card — and please do it now, before you forget it! We want your record whether you're in uniform, in the Civil Service or other essential government service, or in radio industries wholly devoted to the war effort.

2) Can you help us with records of your amateur associates in your own outfit, or the pals from whom you hear regularly? It's inordinately difficult for the man in an active theater to mess about with a registration of this sort, yet his service is the kind we are most eager to get into our record. We'll appreciate it immensely if you pass along such data on your friends, where you know the calls and other dope are reliable. If you wish them, we can send you some card forms for that purpose.

NOTICE TO MEMBERS DISCHARGED FROM THE MILITARY SERVICES

THE requirement of continuous membership in the League for eligibility to ARRL offices has been waived for members serving in the uniform of the United States. See particulars on page 24 of *QST* for July last. Those desirous of taking advantage of this arrangement are asked to claim the right when renewing membership, stating the beginning and ending dates for their military service.

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Gold Stars

RECENTLY the attention of this nation has been forcibly drawn to the inhuman treatment accorded American prisoners of war by the Japanese. There is no need to repeat here the reports of barbarous atrocities. It is sufficient to say that fellow amateurs have been among those who suffered this fiendish mistreatment — and died as a result of it. The initial appearance of this department (*QST*, September, 1943, p. 63) included mention of Tech. Sgt. Albert C. McArthur, W9VBI, who died in a Japanese prison camp on June 11, 1943. Here are reports on two more amateurs to meet the same fate.

STAFF SGT. LEONARD V. ANDERSON, W9ASB, died in the Japanese prison camp at Mukden, Manchukuo, on May 14, 1943. He had enlisted in the Coast Artillery Corps in February, 1941, and shortly thereafter was sent to the Philippines. He was among those of our forces who were taken prisoners of war by the Japanese when Corregidor fell.

Shortly after he entered the services, W9ASB was assigned to radio school. Exceptional ability resulting from his ham training caused him to be promoted rapidly, and he became a staff sergeant within six months after enlisting. In the Philippines he served both as a radio operator and as a searchlight operator.

PFC. GLENN SCHLINGERMAN, W9WNQ, died in a Japanese prison camp in the Philippines on June 29, 1943. Enlisting early in 1941, he arrived in the Philippines in November, 1941, a month before the Japanese attack on Pearl Harbor. After the fall of Bataan and Corregidor he was reported missing in action, and it was nearly a year before it was learned that he was being held as a prisoner of war by the Japanese.

Before entering the Army, W9WNQ was one of the active hams in Green Bay, Wis. Not only had he built several rigs for DX work, but he was well known on 160 'phone and was interested in the very-highs.

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F.M. Distortion in Mountainous Terrain

Some Observations of Multi-Path Reception of F.M. Signals

BY A. D. MAYO, JR.,* W4CBD, AND CHARLES W. SUMNER, W4EJ**

> **There are times when curiosity is not a bad thing — particularly when it inspires a zealous effort to track the causes of phenomena for which no ready explanation is at hand. When we observe something we don't understand, too many of us are inclined to speculate a bit and let it go at that. W4CBD and W4EJ didn't — and this account of the explorations resulting from their zeal will interest v.h.f. experimenters.**

Anyone who has listened to a good f.m. receiver under favorable conditions knows that the quality of reception has many advantages over a.m. Close listening reveals the presence of higher audio frequencies, while there is also a greater range of volume since weak sounds are not drowned out by noise and loud sounds are not compressed. Still other advantages might be mentioned. Nevertheless, there is one serious disadvantage which appears in mountainous terrain.

We have listened to many f.m. transmissions in the vicinity of Asheville, N. C., and find that there are many places in the mountains where the audio signal is badly distorted to the point of becoming unintelligible. We assume that the distortion is caused by simultaneous reception of signals which have traveled different paths from the transmitter. The effect varies with the frequency of the audio modulation, with the time lag between the several paths, and with the intensities of the received signals.

The same effect occurs in a lesser degree in the case of a.m. transmissions wherever there are conditions resulting in multi-path reception. However, the distortion we have observed with f.m. is far more severe than the differential side-band fading experienced with a.m. and does not vary as does the latter, but is a constant phenomenon over periods of weeks in those spots where it occurs. There is, however, a seasonal change.

This is in keeping with findings made by Murray G. Crosby and published in the *Proceedings* of the I.R.E. for June, 1936, and July, 1941. The effect is summarized by F. E. Terman in his "Radio Engineer's Handbook," page 752, where he says, in part: "Frequency-modulated signals transmitted over great distances under conditions where there is more than one transmission path suffer much greater distortion than do amplitude-modulated signals. The distortion is greatest at low modulation frequencies and high depths of modulation. This distortion results from the fact that the instantaneous frequency of a frequency-modulated wave is continually varying, so that when two waves arrive at a receiving point after having traveled different distances, they have different instantaneous frequencies. The resultant wave then contains a new modulation involving both amplitude and frequency that is not harmonically related to the modulation produced at the transmitter, but that rather depends upon the difference in transit time for the different paths."

An Instance of Severe Distortion

This story really started when a summer resident of Asheville arrived with a new f.m. receiver, expecting to enjoy the programs from WMIT, whose f.m. outlet is located on Mount Mitchell, elevation 6600 feet, northeast of Asheville. At points free from the multi-path reflections reception from this station is excellent in Asheville and in neighboring places. At a receiver in Charlotte, distant by more than 100 miles from the transmitter, the noise level was so low that the studio clock could be clearly heard ticking between announcements. Our summer resident did not have such good luck, however. On her receiver programs were badly distorted, and this condition was continuous.

A local serviceman, observing that Asheville was shielded from Mt. Mitchell by intervening peaks as shown by the profile in Fig. 1, suggested that W4EJ be called in to install a higher antenna, in the hope of clearing up the distortion by raising the signal strength. It is, of course, well known that if the quality is to be good in an f.m. receiver enough signal must be obtained to saturate the limiter. Otherwise, variations in amplitude will appear in the audio output. Since the troubled location was on the opposite side of a mountain from the transmitter, it seemed reasonable to expect some improvement with a dipole 30 feet or more in height.

W4EJ installed the dipole, and the received signal was strong enough to bring the limiter grid current up to 0.5 or 0.6 ma. — yet the quality remained very poor. Nothing was wrong with the receiver, as he proved by taking it home with him. There he demonstrated good quality reception with only a short piece of wire for antenna and with much less limiter grid current. Undoubtedly something not accounted for by previous knowledge was occurring at the bad location.

Field Observations with Vertical Antenna

In order to check on other locations we mounted an f.m. converter in an automobile,

*610 E. North St., Greenville, S. C.
**149 S. French Broad Ave., Asheville, N. C.

feeding its output into the car's b.c. receiver and using the existing vertical cowl antenna, about 54 inches in length. A pi-section antenna coupler was installed to match the antenna to the converter input. Meters were installed to indicate limiter grid current, plate voltage and filament voltage. We had no way of calibrating the limiter grid current meter in terms of microvolts and so decided to record the measurements in terms of grid current.

In the flat country encountered about 25 miles east of Asheville, and which generally speaking extends to the Atlantic coast, a signal producing a reading of 0.1 to 0.15 ma. or more would give good signals of high quality, noise being effectively squelched. The same conditions held true for a part of the territory in and around Asheville. In many places in that mountainous territory, however, spots were encountered in which a meter reading of as much as 0.6 to 0.7 ma. was recorded, yet the reception was very badly distorted. These areas of distortion appeared at random locations, and by no line of reasoning could we predict their occurrence. In one case we followed a road about 5000 feet up the side of a mountain facing the peak on which the transmitter is located, and found both good and bad spots all the way up. At some points the signal would drop out completely; at others it was very strong, but frequently so distorted as to be unintelligible.

While the car was in motion the signal meter would vary almost continuously, following the fading as we passed from area to area of differing signal level. The fading was not at all apparent in the audio output unless a spot was passed in which the limiter grid current dropped below about 0.1 ma. Signal inputs at this level allowed noise to get through, resulting in a "f-f-t" sound similar to that heard when a receiver having good a.v.c. action is tuned rapidly across a carrier. Most of these dead spots appeared to be related to the presence of steel poles, girders, and similar structures. The effect was very sharp, so that a movement of the order of 2 inches in the position of the car would span the dead area. As a result, the noise in the receiver passed in and out quickly as the car was traveling.

In driving under a bridge which had vertical steel girders we noted that the signal disappeared completely every time the antenna was placed in the same critical position with respect to a girder and the line of direction of the transmitter, indicating that the signals were arriving from a single direction at this location. With the antenna properly orientated at such spots, the quality of reception invariably was good.

Where distortion has been observed, among the mountains, we find that there is a seasonal effect. Some spots where reception of good quality may be recorded in January and February are found to be areas of distorted signals six months later. Quality of reception appears to improve in poor spots in cloudy weather, with a very definite improvement during rainfall. Not only does signal strength increase on rainy days, but less fading is noted in the course of mobile reception.

We observed that in cases of distortion the audio quality could sometimes be improved by readjustment of the r.f. tuning. Sometimes it appeared that one sideband was missing, sometimes the other, and at times a dead spot appeared where the carrier should have been.

As before stated, a signal which would produce a reading of from 0.1 to 0.15 ma. was needed even in level terrain in order to saturate the limiter and ensure good quality. The same conditions held, of course, for the "good" spots among the mountains. In other places slight distortion was noted at limiter grid-current levels of 0.15 ma., but the quality could be greatly improved by slight changes in the position of the car, raising the meter reading to 0.3 or 0.4 ma. The best meter reading we were ever able to obtain on the strongest signal was about 0.8 ma., and this was when the receiver was located at a spot within sight of the transmitting point. The minimum signal required to produce output of good quality varied according to the receiving location, as we have seen. It was also dependent in some degree upon the level of motor noise present. Ignition noise could be heard whenever the meter reading dropped below 0.1 ma. Of the two cars used in the tests, the Ford was an earlier model than the Chrysler and was not so well shielded for the suppression of ignition noise.

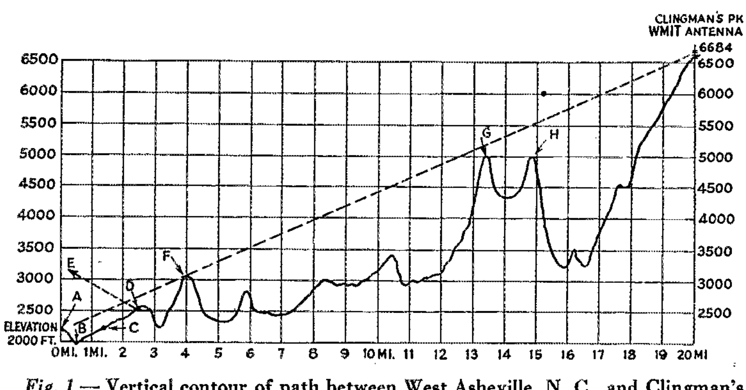


Fig. 1 — Vertical contour of path between West Asheville, N. C., and Clingman's Peak, Mt. Mitchell, N. C. The vertical exaggeration is approximately 2:1. (A) Point in West Asheville from which the photograph accompanying this article was made. (B) Bed of French Broad River. (C) Home location of W4EJ, where signals were received without distortion. (D) Location of summer residence where extreme distortion prevailed, on west slope of Sunset Mt. (E) Direction of best reception of W41MM signals at this location, determined by experiment with a directional antenna. (F) Piney Mountain ridge. (G) Brushy Ridge. (H) Craggy Dome. Dotted line from the transmitter indicates line-of-sight path for direct ray.

Field Reception with Horizontal Dipole

Up to this point we had used only the vertical antenna on the car. At the original poor spot, and at W4EJ's location, the dipoles had been shifted in polarization without producing much effect upon the signal. It was difficult to find a maximum indication by lining up the antenna in the direction of the transmitter, since the signal apparently was being reflected toward the antenna from many directions by surfaces on all sides.

Anyone who has attempted to mount a 7-meter horizontal dipole on a car can appreciate our difficulties. We tried mounting it crosswise on the car but that arrangement would not allow us even to leave Charlie's driveway, overhung with trees as it is. We ended up with the contraption shown in the photograph, which looks like a cross between a hook-and-ladder truck and the gear of fishermen vacationists. All the cops looked askance at it. We would not have been surprised to find that the FBI was following us around. The neighborhood kids pointed at it and yelled: "Mama, what is that thing?" Even the little dogs barked at it — which furnished the crowning insult.

Generally speaking, signal strengths were lower when using the horizontal antenna on the car. This was true especially when we were in mountainous territory shaded from the transmitter. However, the quality of reception was generally improved. Nearly everywhere distortion appeared to be diminished and good reception was obtainable in the "good" spots with lower signal strengths, even when the meter reading dropped to 0.02 ma. on rare occasions. Less noise pick-up resulted from use of the horizontal antenna, but this, of course, was not a factor whenever limiter grid-current readings exceeded 0.1 to 0.15 ma.

Experiments with Directional Antennas

In attempting to restrict our reception to one direction, with the hope of eliminating interfering signals reaching the antenna along other paths, we tried various reflector and director elements in connection with the horizontal dipole. These had but little effect in lessening the degree of distortion, however. We did learn that the signals did not necessarily arrive solely from the direction of the transmitter. At the location of the summer resident whose experience first brought attention to the distortion, the mountain side was shielding the receiver from the transmitter. Our tests proved that this spot was the worst one in Asheville with respect to distortion. Here we found by experiment that the signals were best received when the antenna and reflector were aimed at a point about 30 degrees above the horizontal in a direction *away* from the transmitter. When the reflector was placed on the opposite side of the antenna, so that the system was directive toward the transmitter, the signal strength dropped to practically nothing. The use of a directional antenna did not serve to clear up the distortion.

With the horizontal dipole in normal position on the car the signal strength was fairly low, about 0.2 ma. limiter grid current being the best reading obtainable. The meter deflection climbed rapidly as the antenna height was increased and at a height of 25 feet reached maximum of 0.6 to 0.7 ma. However, in places where serious distortion appeared, the increase in signal strength failed to improve quality.

Conclusions

Since this distortion would not appear as such in the field-strength meter readings commonly made by engineers engaged in a survey preliminary to selecting a transmitter location, the results of such a survey can be very misleading. No doubt it will be necessary to employ a type of field survey which will investigate quality of reception as well as field strength before dependable service areas can be established for f.m. stations.

We have made our observations purely from the standpoint of amateur knowledge and interests. We have no wish to throw a bad light on such an excellent method of transmission as f.m. can be under proper conditions. We do believe, however, that we have pointed out a "bug" which is characteristic of f.m. propagation in mountainous country, concerning which little has been published thus far, and that little appears to have escaped wide attention. If there is a practicable means of clearing the distortion from f.m. reception *in such* terrain as our own, we would like to hear about it.

The horizontal dipole mounted on the spare tire rack of the car used for field observations. Location is on the eastern slope of heights in West Asheville. The view looks northeastward, approximately along the line of sight to Clingman's Peak. Mt. Mitchell appears in the remote background at upper right.

U.S.A. CALLING!

NAVY RADIO TECHNICIANS

The Navy is offering a rather exceptional opportunity to young men between 17 and 18 years of age who are in their last semester at high school and who have a special aptitude for mathematics. Upon passing a special examination for radio technician (a new Eddy Test), and being otherwise acceptable, they will be enlisted as Seamen First Class, permitted to remain home to finish the school year and graduate, and then be called to active duty. Following approximately seven weeks of the usual "indoctrination," there comes a very special training course at any one of three admirable technical schools where training of great value is imparted dealing with new techniques at very high frequencies. Upon graduation the student is promoted to Radioman Third Class, Second Class or First Class, depending upon the showing he has made.

Thus it is possible that a lad may, by his eighteenth birthday, become a first-class petty officer, at excellent pay and with knowledge of a new technique that will be valuable in the years to come. Some idea of how good a proposition this is comes from the realization that in peacetime it used to take the Navy man an average of 12 years' service to achieve a first-class rating and the minimum age was 30.

This offer is also open to men above the upper draft age limit of 38. We don't know what the Navy's maximum age limit is in this category but we believe it is 45.

If you are of draft age, but not yet called, there is also an opportunity for you in this work if you can qualify. You can take this test while awaiting induction. If you pass, you get a letter from the Navy saying that you have passed and are accepted, and you then go to your draft board and ask to be inducted at once, ahead of your regular order. This examination for Radio Technician is available at any Navy recruiting office. If you're interested, demand it. The armed services are not permitted to recruit men between the ages of 18 and 38 — they come in through Selective Service — and some Navy offices may be reluctant to give the examination to a man in these age brackets for fear that it would be deemed improper recruiting. But it is not recruiting at all — particularly when you ask it of your own volition — and you should be able to talk the Chief into letting you take this test of proficiency if you seem to be qualified.

All hands are advised that full particulars may be had from the nearest Navy recruiting office. A particular word to licensed radio amateurs: if you take this Eddy Test but are informed that you have not made a satisfactory mark, write full particulars at once to G. W. Bailey (president of ARRL), at 1530 P St., N. W., Washington 25, D. C. *But only if you are a licensed radio amateur.*

PHYSICISTS AND ENGINEERS

The president of ARRL, George W. Bailey, is serving during the war as special assistant to the director of the Office of Scientific Research & Development, with offices at 1530 P St., N. W., Washington 25, D. C. He is in position to engage in confidential correspondence with qualified men and women of a high degree of professional competency in radio, who seek an opportunity to employ their talents more effectively in the war effort. There is much that remains to be done in the application of modern electronics technique to war problems. Top-notch physicists and research engineers, particularly those capable of organizing and directing the work of other such people, are badly needed for some pressing problems. This work holds opportunity for the fullest exercise of one's abilities. Mr. Bailey invites correspondence from qualified persons, with a view to a mutual exploration of the possibilities.

ARRL Calling!

TECHNICAL EDITOR-WRITER

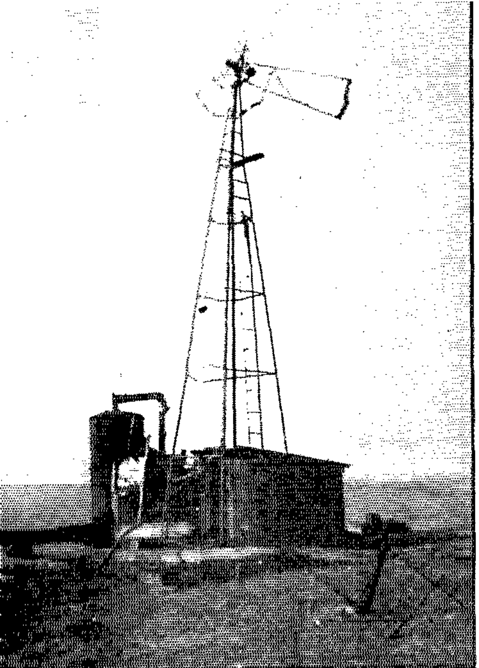
QST's editorial staff has immediate need for a highly qualified amateur with experience in both technical and editorial fields, one who can write literately and lucidly, who can edit capably and sympathetically, and who can design and construct model radio apparatus. Ability to work either on original projects or under direction is desirable, as are intelligent curiosity, amenability to working as a member of an organization, and keen interest in amateur radio. He must be draft-exempt and not now employed at his highest skill.

Applicants should write, stating age, education, experience, present and previous employment, family and draft status, physical condition, and minimum salary. Examples of previous technical or other writings will be helpful.

Address: Editor, *QST*, 38 LaSalle Rd., West Hartford 7, Conn.

Strays

Praising the "cool efficiency and splendid morale" of the Signal Corps WACs in North Africa, Signal Corps officials report that the entire fixed telegraph and telephone communications systems throughout the rear areas in the Mediterranean theater could be manned by these feminine soldiers — if there were enough of them!



Left — The ancient windmill tower on its native heath.

Towers that Never Tire

Reclaiming Old Windmill Towers as Antenna Supports

BY ROBERT J. DONALDSON,* W8WJF

Supports for the antenna are often the last item considered when plans are being made for the new ham station. As a consequence, the flimsy "two-by-two" mast put up as an afterthought promptly blows down when the first respectable breeze comes along. W8WJF has different ideas about the matter, however. Here he tells you how to get a pair of substantial steel towers for the expenditure of little more than a few hours time and some elbow grease.

ANTENNA supports have been the subject of much discussion in the past. Those who are able to order from the nearest mail-order house a pair of stout 75-foot trees spaced a half-wave apart are among the favored few. Most of us have to erect a support for at least one end of the sky-wire. When the war has been won and we get the green light from Uncle Sam this problem is going to be of prime importance to many of us, and yet, as in the past, the erection of a suitable mast or tower probably will be thought of last.

A lot of prewar wooden poles are going to need replacement, too, unless the owners have been at home and have been keeping up their maintenance. It is surprising how the guy-wires will loosen up and how the wood will rot out unless a mast gets the proper attention. So long as parts cannot be obtained for that rebuilding job you were going to do on the rig, this is a good time to turn some thought toward the skyhook.

A few years ago I needed something which would fill the bill without being too expensive. After a little pondering I remembered that I had seen two old windmills which were used at one time on a neighboring farm for the purpose of pumping water. The propeller wheels were no longer turning in the wind and the vanes had sagged at an odd angle, showing no sign of use for years past. The supporting towers were in good condition, however. While they were exactly the thing I was looking for they were of little or no value to the owner in their present condition, and I found that both could be had for the mere price of removing the hazards from the premises.

These towers, the tops of which were about 45 feet above the ground, were found to be of good construction. A steel ladder runs up one side, which comes in handy on various occasions. The four legs are composed of ten-foot sections of angle-iron, braced diagonally by long rods and horizontally by lighter angle-iron stock at the center and end of each section.

*R.D. No. 1, Eighty Four, Pa.

Dismantling the Tower

Before starting the job of dismantling such a tower it should be given a careful inspection, not only for the purpose of studying its construction but also to determine if any defective members require replacement. If you want to be on the safe side you'll mark each piece, although it will probably be found that all vertical members, excepting those in the top section, are alike and therefore interchangeable. The diagonal bracing rods and horizontal members also are alike for any one section and after dismantling are easily identified by their length, which decreases as the height above ground increases. It is important, however, to make accurate measurements of the diagonal as well as the horizontal distances between the legs of the tower where they enter the ground. If this is not done it will be almost impossible to locate the new base holes correctly.

The dismantling job is not a hard one, but there may be a little difficulty in removing the propeller wheel, gears and wind vane from the top of the tower. Since the total weight is usually too heavy to handle, as many loose parts as possible should be removed before trying to lift the assembly from the top of the tower. If the various bolts are rusted too badly, it may be necessary to go to work with a hacksaw. Make certain that any part which will prevent the lower section of the gear from coming up through the hole in the top casting has been removed. As soon as enough weight has been removed to make the assembly easy to handle, stand as near to the top of the tower as possible and raise the remaining portion up until it is free from the top casting. Then toss it overboard. Make certain, however, that it clears the lower portion of the tower, if you don't want to have to straighten out one of the legs!

No serious trouble should be encountered in disassembling the tower itself. The job should be started at the top of the tower, of course, and you should be careful to stand at a spot which will not be weakened too much when the bolt you are working on is removed. It will probably be found that the assembly bolts are galvanized or plated, so that they yield quite readily when a flat wrench is used to hold the nut while the bolt is loosened with a ratchet socket wrench. If the bolts have no damaged threads and are not too rusty, they can be saved and used again.

When the four base members are reached, the job of dismantling is practically done. These pieces should be removed from the ground, but the portions below ground level probably will be in poor condition because of rust.

The work done thus far should have taken about eight hours.

Repairs and Finishing

After hauling the material to your workshop or garage, the most monotonous part of the whole job begins. Piece by piece the rust and loose galvanizing should be removed. By using a wire brush with a handle a bad case of skinned fingers can be avoided, but the job still takes a lot of elbow grease unless you happen to have a motor-driven brush.

This also is the time to make up replacements for any damaged members. Dimensions can be taken from the original parts. Upon inspecting one of my towers I found that several of the diagonal bracing rods were in poor condition. Since I was unable to obtain duplicate stock I used ⅛-inch flat bar stock, 1-inch wide, which made a good substitute. It was reasonably priced and came in 20-foot lengths. The center-to-center distances between bolt holes in the original braces were measured and duplicated in the new pieces.

The four new pieces for the base should be about five feet long. When drilling the holes in these pieces, use one of the vertical members from the next section above as a template and mark the new holes or clamp the two pieces together. Be sure that each of the four holes is placed at the same distance from the end, to make it easier to level up the tower when the time comes to erect it.

The various pieces now are ready for painting to protect them against the weather. The first coat should be put on with some sort of primer. As soon as it is dry, a finishing coat may be applied. Your hardware dealer can probably recommend the best kind of metal preservative.

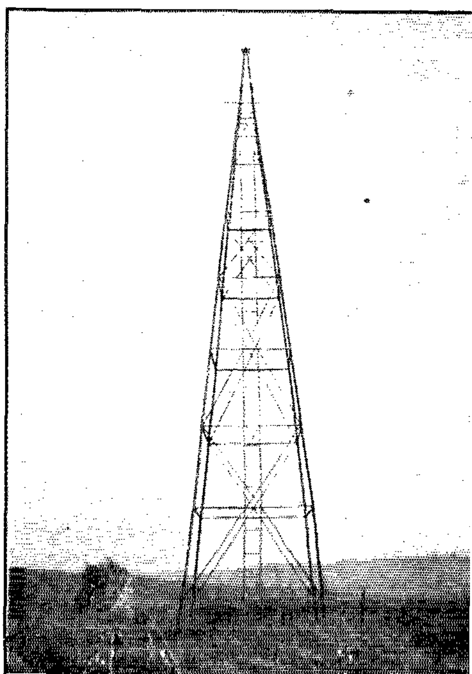
The New Foundation

When the new site for the tower has been selected you can begin work on the foundation. The four legs should be set in concrete, and so suitable forms must be prepared. Discarded hot-water tanks cut in half, using either an acetylene torch or a hacksaw, make excellent forms. If they are not available, rectangular box forms can be constructed from scrap wood. In either case, all forms should have the same depth. The locations for the new holes can be spotted from the dimensions taken at the old site. Make them somewhat larger than the cross section of the forms and only deep enough to bring the tops of the forms about flush with the surface of the ground. The bottoms of all holes should be at a common level. This may be checked by driving a stake at the center of the square defined by the four holes, and attaching a plumb line to one end of a "one-by-two" or "two by-four" beam laid across the top of the stake and leveled up with a carpenter's bubble-level. If the ground is uneven it will probably save some trouble if the tower area is graded off first. If this part of the job is done carefully, much trouble will be saved later in leveling to make sure that the tower is in a vertical position.

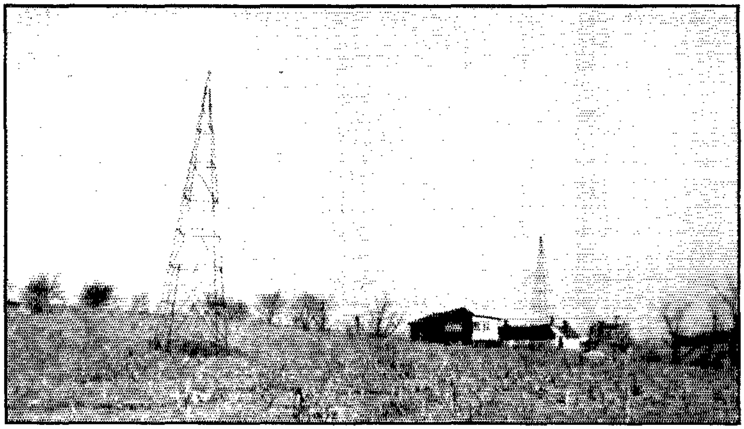
Reassembly

After placing the forms in the holes, the new five-foot legs and the vertical members of the next section above should be bolted together. One pair of these should be laid on the ground while three of each of the first two sets of horizontal braces are attached. The fourth horizontal braces should be fastened between the other pair of vertical sections.

Now turn the first assembly over so that it rests on the ends of the horizontal braces, and drag it across the tower site so that the two legs drop into one pair of holes. Push it up into approximately the correct position and prop it up with a piece of "two-by-four." Now drop the legs of the second assembly into the two remaining holes and lean it against the horizontal members extending from the first assembly. Using a step ladder, bolt the two sections together and put in the diagonal braces, but do not tighten the bolts. Now measure the distances between each pair of diagonally opposite legs. If these distances are not equal, run a loop of heavy wire around the tops of the pair with the greater spacing and twist



The rejuvenated windmill tower, now ready for duty as an antenna support at its new location.



Two reclaimed windmill towers on duty at W8WJF.

complete. If the fastening bolts are rusted too badly, new ones can be made by sawing off the heads of carriage bolts and bending them into proper shape.

In this article I have discussed only the handling of square towers with four legs, since both of mine were of that type. However, many windmill towers have triangular cross sections with three legs. There seems to be little to choose between the two types of construction, although those with four legs may be a little easier to erect. If, after completing one tower, you are satisfied with the construction, look around the countryside and find another to match. You will have antenna supports that will last for years to come with little if any attention. And don't forget that, if the rope breaks, you can always climb *this* support and put in a new one.

it with a stick at the center. By this means the legs can be drawn into correct position where the diagonal spacings are equal. All bolts should then be tightened up. The wire will hold the legs in position while the concrete is setting.

If you want an accurate job, this section should be plumbed to make sure that it is vertical. This can be done by placing a beam across the top ends of diagonally opposite legs and dropping a plumb line from the exact center of the beam. The plumb should drop on the intersection of diagonal lines drawn between the legs at the ground level. Any adjustments necessary can be made by pulling the tower into position with one or more temporary guy wires. To complete the base section, the forms are filled with mixture of concrete and plenty of gravel. Each form should be filled full, rounding the top so that it will shed water readily.

After the concrete has set, the space around the forms should be filled with well tamped earth or rocks. If wooden forms have been used, they should be removed before filling in the holes. Otherwise the wood will rot out, leaving the concrete loose in the hole.

The remainder of the tower can now be assembled, section by section. Planks laid across the top of each section as it is finished will form a working platform for the next section. Since one bolt usually holds both vertical and horizontal members as well as the diagonal braces, the bolts should not be brought up too tight until all members held by any one bolt are in place. Each section should be checked to make sure that it is square before proceeding to the next section.

If the holes for the top casting do not match up, they can be brought into line with a drift pin. If you are thinking about mounting a rotatable antenna on the tower, it would be advisable to drill some mounting holes in the top casting before putting it in place. If you do not know the dimensions at the time the tower is erected, drill holes an inch in from the edge every sixty degrees around the circumference. The ladder can be assembled as tower sections are added, or you can postpone mounting it until after the tower is

Radio Historical Quiz

BY ROBERT COBAUGH,* W2DTE

How good is your knowledge of the historical background of the radio art? How did the terms we now bandy about so freely — ohms, henries, and all the others — originate? Who discovered the fundamental principles of radio and electricity, and when?

Test your knowledge by the following questions. You should answer at least five correctly for an average score; seven or more right would be an excellent showing. Correct answers are given on page 92.

1. Who coined the words "positive" and "negative" and applied them to electricity?
2. Who invented the carbon microphone telephone transmitter?
3. Who discovered the piezoelectric effect of quartz, and when?
4. Where did Ohm's Law come from?
5. Who first discovered electrical conduction?
6. Where did the term "microphone" come from?
7. When was static electricity first observed?
8. Who discovered the principle of the electrostatic condenser?
9. Who invented the scanning disc, as used in television a few years back?
10. Who first proved that electromagnetic waves could be sent through space at the speed of light?

* 3534 Bell Blvd., Bayside, L. I., N. Y.

ON THE VERY HIGHS

CONDUCTED BY E. P. TILTON,* W1HDQ

In the carefree days prior to the outbreak of war, our prime purpose in working one another on the various v.h.f. bands was, of course, the pleasure we derived from the making of friendly contacts and the thrills we often felt in expanding our limited v.h.f. horizons. DX and rag-chewing will always be the heart and soul of amateur radio, but there are other factors in v.h.f. work which should not be overlooked.

The fact that we were working in an almost unknown field was often stressed in these pages and in similar material appearing in the various magazines catering to the amateur. One of the chief interests for some of us lay in the fact that, even with the limited facilities at the disposal of the average ham, we were still in the position of being able to contribute, here and there, bits of information which added — more than we may have realized at the time — to man's store of knowledge of wave propagation on the frequencies above 28 Mc.

That one need not be a learned scientist to come up with discoveries of major importance was never more clearly demonstrated than by the experience of our own Ross Hull, who changed our whole conception of what happens to our 56- and 112-Mc. signals, and produced a means of weather forecasting which, even now, is just beginning to receive the attention it deserves — all because he wanted to see what could be done on these frequencies with high-gain directive arrays. He worked what were then unheard-of distances; but he became really interested when he found out that it was not possible every time he tried it. The results of his intelligent curiosity are history of which every amateur may well be proud.

How much more would we know today about skip DX, for instance, if just a few of us had been willing to devote an equal amount of time and energy to the study of this phenomenon? Just what is the highest frequency at which signals are reflected back to earth? What is the greatest distance possible? Can it happen on 112 Mc.? How about reflection from the aurora — at what frequencies does this strange business begin and end? A page could be filled with the questions remaining to be answered regarding wave propagation in the v.h.f. region. Helping to find some of the answers can be fully as much fun as the daily round of repetitious QSOs on the lower-frequency bands.

It is entirely possible that we may find ourselves forced to devote our energies to v.h.f. work in the early stages of our return to active status in the postwar world. In view of this, and because of the general lack of information in many quarters as to what amateur experience tells us of v.h.f. propagation, it has been suggested that there is no better time than now to summarize the picture as it exists in the logs and memories of the country's v.h.f. enthusiasts.

* c/o La Concha Hotel, Key West, Fla.

First of all, we know that communication beyond the visual horizon is accomplished by four principal media: *atmospheric refraction*, at distances from across town to a maximum in the vicinity of 400 miles; *sporadic-E reflection*, bringing down signals from a minimum of 400 miles and extending (by multiple hops) up to several thousand miles; *aurora reflection*, affecting local-range stations and bringing in others beyond the normal range up to perhaps 600 miles; and *F_2-Layer reflection*, presenting the possibility of transcontinental and transoceanic work.

Atmospheric Bending

The whole radio-frequency spectrum shows some evidence of bending of waves which pass through air-mass discontinuities, but the fact that this phenomenon was discovered by Hull when he was working with 56-Mc. gear gave rise to the belief that it was a condition peculiar to this frequency range. Actually, although amateur experience on the frequencies above 116 Mc. is very meager, it appears that the degree of bending is progressively greater as the frequency is raised, with pronounced increases in operating range beginning at 28 Mc. The experience of many operators in working distances of from 75 to 300 miles on 28, 56 and 112 Mc. indicates a considerably greater degree of wave bending on the two higher-frequency bands, although quantitative comparisons are out of the question because of the great difference in the gear employed and the relative efficiencies obtained.

Both 28 and 56 Mc., being in the borderline area where skip signals may or may not be heard, present more varieties of fading and distortion due to multi-path transmission than will be found on 112 Mc. and higher. It is quite probable that, when equipment for 112 Mc. attains a degree of performance comparable to that obtained with 56- and 28-Mc. gear, the 2½-meter band will be much better for local-range work. Distances covered in daily work will, in all probability, be equal to or greater than the normal operating range on Five, and the latter band will be complicated by the possibility of the various forms of multi-path propagation.

Sporadic-E "Short Skip"

In recent years much of the work on 28 Mc. was accomplished by this medium, the result of sporadic ionization of the *E* layer to a degree sufficient to reflect signals at this frequency and higher. Contacts over distances from 400 to 1500 miles are made, and, fortunately for the 28-Mc. worker, the period of greatest activity comes when the normal F_2-layer skip is lacking — principally in the summer months. When short skip appears on 28 Mc., it will usually be found on the police and f.m. bands as well. If the signals on these two bands are strong, there is a good possibility that skip DX will break out on 56 Mc. also. The working of skip DX has, in the past, provided many of our geographically isolated 56-Mc. stations with their only contacts on this band.

When the right conditions appear in the right places at the right time, a series of reflections (multi-hop transmission) may occur. Thus 28-Mc. stations in the Hawaiian Islands may, on occasion, be worked from the East Coast during the late hours of a summer evening, and transcontinental work on Five is possible on a few exciting nights each summer. Since the advent of war and the cessation of amateur activity, many owners of high-frequency receivers have taken to monitoring the f.m. and police bands, and the results of their observations have been reported in this column from time to time. Numerous instances of transcontinental reception of f.m. stations have been reported, with some instances of signals of extraordinary strength. Many a radio serviceman has been asked to "repair" a home f.m. receiver which strangely developed the ability to receive interfering signals from other sections of the country — usually sometime around the first of May!

Just how high in frequency this phenomenon extends has never been established, due in part to the lack of any signals much higher than the end of the 56–60-Mc. band. Some years ago we had a number of stations running broadcast programs on 60.5 to 63 Mc., and these stations were heard whenever skip appeared on 56 Mc. So far as is known, about 63 Mc. represents the high-frequency limit of recorded skip, but the strength of signals on this frequency indicates that higher frequencies would come through if there were services operating above this point. There has never been any evidence of skip DX in amateur experience on 112 Mc., though many workers believe that sky-wave transmission will eventually take place on this band also.

Signals brought in by sporadic-E reflection often show terrific strength and usually exhibit good quality, although occasionally multi-path effects may produce some distortion. On 28 and 56 Mc., signals from 500 to 1200 miles away may reach peaks above that of any but the strongest of locals. Skip signals on the f.m. band frequently are strong enough to take over control of the receiver from stations within the normal range.

The possibility that we may some day be able to predict, with reasonable accuracy, the coming of sporadic-E ionization has for many v.h.f. enthusiasts long been one of the more intriguing angles in the amateur field of endeavor. Every dyed-in-the-wool five-meter fan has his own pet theories, and not a few come out with better than an even break in their guesses. Five-meter skip has been worked during every month of the year and at about every hour of the day and night; but the most pronounced sessions seem to follow a fairly consistent pattern. The major period of skip is about equally distributed either side of the longest day of the year, from mid-April to mid-August, with May, June, and July exhibiting the greatest activity and strongest signals. A minor period exists either side of the shortest day also, but outbreaks are less frequent and much less widespread during this portion of the year. On 56-Mc., skip has been very rare in the months of September, October, February, and March. As to time of day, the principal hours appear to be from 9 A.M. to 1 P.M. and from 5 P.M. to 11 P.M. There are many exceptions, but the vast majority of all skip DX worked on 56 Mc. will be found to be in accordance with this schedule.

Aurora DX

Newest of the vagaries of v.h.f. wave propagation to be uncovered, the reflection of signals from the vicinity of the aurora is practically unknown outside of amateur circles. It was not until the advent of stabilized transmitters and superheterodyne receivers that this effect was observed, for it took selective receivers and pure d.c. carriers to make its peculiarities noticeable. Of all the means of v.h.f. wave propagation, it is probably the least understood.

Aurora-reflected signals are easily recognized, for they sound like nothing else on this earth; in fact many operators, when hearing them for the first time, have started to work on their receivers in an attempt to discover what was wrong that signals suddenly sounded thus. Four unique characteristics distinguish the signals received by this medium: (1) the peculiar buzz-saw note; (2) the width of band occupied, running up to 500 kc. for strong signals; (3) the mushy quality of any sort of modulation, occasionally reaching the point where it is difficult to tell if the carrier is being modulated at all; (4) the fact that, in this hemisphere, the aurora-reflected signal will always come from the north. When directive arrays are used by two stations beyond the normal operating range, they will be able to work *only* if both arrays are aimed at the aurora.

Like lower atmospheric bending, aurora effect was discovered by amateurs working in the 56-Mc. band, and practically all that is known about it is the result of amateur observation and experience. It appears whenever there is a clearly visible aurora in the northern sky, and may also occur when no aurora is seen, though this is probably due to low visibility or daytime conditions which make the aurora invisible. The first warning, to the listener, is the mushy quality of all modulation on signals which are coming from beyond purely visual distances, and even locals will be affected when the condition is strong. Turning on the receiver b.f.o. has no apparent effect, and one is tempted to assume that the b.f.o. has suddenly quit. If the effect is very strong, modulation of 'phone stations disappears completely and the carriers of all stations, 'phone and c.w., broaden out beyond their accustomed channels. A strong background rush is heard all across the band. The only method of communication which provides intelligibility then becomes c.w., and even this must be pounded out very slowly if it is to be readable. Stations separated by an east-west distance of 600 miles have been worked by this medium, and stations in the northern part of the country have worked others 350 to 400 miles to the south; all this with directive antennas aimed at the aurora. When the directive arrays are aimed at each other the signals disappear.

Aurora DX is possible for the v.h.f. operator when all low-frequency communication is washed out by magnetic disturbances. The 28-Mc. band exhibits peculiar tendencies which are different from those observed on Five. A rapid flutter appears on ten-meter signals but, unlike 56 Mc., 'phone signals are generally readable, though the quality may be somewhat mushy. The direction of transmission seems to be principally north-south, similar to 56 Mc. What happens to frequency-modulated signals remains to be seen. Meager reports of f.m. broadcast reception indicate that modulation suffers somewhat but does not disappear entirely on the 43–50-Mc. band.

As in the case of sporadic-E DX, the upper limit of frequency for reflection by the aurora is not known. There have been several instances of 150-mile work on 112 Mc. during periods when aurora DX was being worked on 56 Mc., but there has been no case as yet when it was possible to prove that the aurora was responsible. As few stations were set up to transmit and receive 112-Mc. c.w., it was never possible to make any very conclusive tests. Several stations were becoming so equipped at the outbreak of war, and solemn agreements had been made whereby a number of operators were going to "drop down from Five" and bang away on 112-Mc. c.w. on the next occasion of aurora flutter on 56 Mc. This project never materialized, but we still have some opportunities for observation. If aurora borealis shows up on a WERS night, for instance, the results should be worth watching (and reporting!), and we still have the police and f.m. bands to observe. Reports on the behavior of any signals in the v.h.f. range during periods of aurora are earnestly solicited.

It is interesting to note that instances of aurora effect have been confined to the northern part of the country, principally in the East and Middle West. The farthest into the South that contacts have been made has been Virginia, West Virginia and North Carolina. None has ever been reported on the West Coast, nor in the Deep South, though lack of activity may have been a contributing factor.

F_2-*Layer Skip*

All normal operation on the 28-Mc. band is accomplished by this medium, but the frequently observed condition where strong signals are heard in the low-frequency portion of the band and weak ones, or none at all, come through in the region between 29.5 and 30 Mc. indicates by what a slim thread hangs the fate of communication on this band. The maximum frequency at which communication is possible by reflection from the F_2 layer is considerably affected by sunspot activity. It is generally above 30 Mc. during the daylight hours of winter months at the peak of the 11-year cycle, and well below 28 Mc. most of the time in the two or three years at the bottom of the sunspot curve.

Transcontinental reception of police cruiser cars operating around 33 Mc. was a common occurrence some years ago, and reception of American police stations, fixed and mobile, was reported on occasion from Europe and Africa. Our f.m. broadcast band may expect considerable intersectional QRM when the peak of the coming cycle is reached, and there is a good possibility that some juicy 56-Mc. DX may be worked by this medium — if we hurry and get the war out of the way in time. In the period between 1935 and 1937 there were a few instances of transcontinental reception on 56 Mc. which may have been single-hop F_2 layer, and the very rare reports of transatlantic reception (five-meter signals have been heard across the Atlantic, in both directions) almost certainly were. It appears that 56 Mc. is just about the ragged edge for F_2 DX. Our experiences in postwar work should tell.

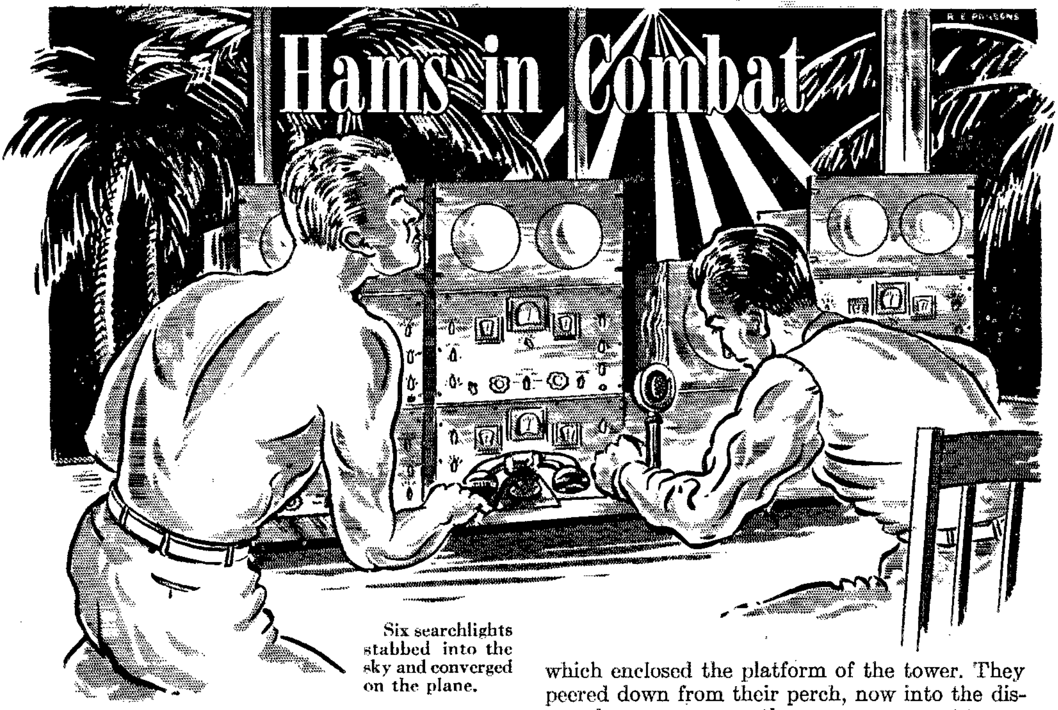
Multi-Path Propagation

Thus, above, we have neatly pigeonholed the various means by which contacts are made on the various v.h.f. bands, but let no one think that the picture is quite that simple. On the frequencies up to 60 Mc., at least, we may have combinations of two or more of these conditions, resulting an almost infinite variety of flutters, fades, bursts, and distortions. Multi-path effects are in evidence nearly all of the time that the 28-Mc. band is open for long-distance work, and large variations in signal level are an accepted part of any work beyond the visible horizon on 56 Mc. Not all signal variations are evidences of multi-path propagation, of course, but certain types are characteristic of the presence of sporadic-E ionization and aurora effect, and as such have come to be recognized by alert operators as the "tip-off" that DX is in the offing.

In order to determine the interference ranges of stations operating in the television and f.m. bands, the FCC now has in progress a comprehensive program of daily recordings of stations in these ranges. Recorders are running on clear-channel stations at distances of from 100 to 1400 miles, and others are set up on channels which are shared by stations operating in different sections of the country. Evidence of multi-path propagation was noted, and provision is now being made to measure the delay of the longer-path signals in comparison to those received over the direct path. In this way the distance traveled by the long path can be determined, and some light may thus be shed on the nature of the reflecting medium.

Little enough is known of v.h.f. wave propagation, in any case, and anyone who is still in a position to do any v.h.f. listening is urged to do so

(Continued on page 86)



Six searchlights stabbed into the sky and converged on the plane.

Henderson Tower

BY CAPT. J. E. ROBERTS* AND S/SGT. JOHN R. DUNN*

Henderson Field on Guadalcanal isn't what it used to be. The wail of the air-raid siren is more of an event now, and Jap bodies no longer lie around to smell up the place. Most important of all, supplies have come in — supplies that make Henderson look like one of the many well-kept air bases in the South Pacific. Gone are such landmarks as the old Henderson control tower which weathered one Jap raid after another, its flimsy uprights battle-scarred from slugs of flying steel. A stronger, more carefully built structure has taken its place, but the old tower might well have been called the cornerstone of Henderson Field. Its story is the story of the former hams who served as tower operators during those early days. They were boys who had become men overnight — men of the Army Airways Communications System — and their story might be termed the jive translation of that official phrase: "The former enemy air-field is now in operation." This is their story.

THE quick black of the tropic night settled down among the palm groves of Guadalcanal. A great yellow bomber's moon rose out of the quiet sea, pouring its amber light along the runway of Henderson Field and down through the tops of the swaying palms, stealing up the crude, angular lines of the control tower.

Two young men, their figures vague and shadowy in the odd half-light, leaned over the railing which enclosed the platform of the tower. They peered down from their perch, now into the dispersal areas, now over the runway, now out to sea.

A field telephone jangled harshly. One reached out automatically, not turning his head, and took the telephone.

"Henderson Tower."

A thin, metallic warning crackled through the instrument.

"Bogies coming. Direction southeast. Stand by for Condition Red."

"Roger."

The tower operator put down the 'phone. He was tall and stripped to the waist, and a blond fuzz struggled to form a beard on his face. He turned to his companion as though picking up an interrupted conversation, and said:

"All right, Dog Face — you can quit pining for Lamour. Tojo's little boys are coming over to play. On with the receiver, and let's keep posted on the slant-eyed spooks."

The other operator, small and dark, reached for the headphones. A loudspeaker sputtered. Through it came a distinct monotone:

"One Victor Two Three calling Henderson Field."

"Sold American!" the blond boy sang out as he grabbed a mike and flipped a switch. He intoned into the microphone: "Henderson to One Victor Two Three. Go ahead."

"Search flight coming to you two minutes out. Request landing instructions, please."

"Come in and circle the field. You may have to go out again; Charlie is headed down the slot. Stand by and we'll give you the dope."

"Roger."

He put the mike aside. The other boy turned and said: "These binocs don't help worth a damn in this light. Can't see a sign of the bogies yet."

*c/o AACS Wing Headquarters, Asheville, N. C.

"Can't see 'em?" shouted the blond one, snatching the binoculars from his companion's hand. "F'crissakes, who ya think you are — Superman? You couldn't see 'em in this light if they were right overhead. What's the matter with you, buckin' for Section Eight?"

"It's the sweatin' them out gives me the jitters, I guess," the dark lad replied quietly. "Just plain scares the hell out of me."

"You and me both. Those bombs whistlin' and crashin' around don't make like lullabies, son. A guy who says he doesn't get the shakes is a Grade-A snow artist."

The other laughed. "If every one of these raids takes a year off your life, brother, have a look at the walkin' dead."

"Yeah, those foxhole prayers of ours must be payin' off. Otherwise we'd be SOL."

The loudspeaker broke in, blaring: "Bogies closing in fast from southeast. Two flights of three medium bombers each. Condition is Red."

The blond, fuzzy-faced kid became all business. "Give 'em those lights," he said, jerking his head toward the field. "Hit the foxhole and leave the door open. I'll bring in this rubberneck flight and do a power dive right after you."

His companion looked at him, not moving. "Relax, junior," he said. "Let's both bring 'em in."

"Okay, but you don't have to stay here on Condition Red, you know."

"Save it. Here go the lights."

The signal flare lifted and faded in the pale night, and with it came a raucous cacophony of old auto horns, gongs, clanging brake drums and harsh voices. Over in the tent area lights winked out as though turned off by a single switch.

Now the moon had the field to herself. The incoming search flight was overhead, its planes circling the landing strip. On the ground, planes began warming up for the scheduled interception, their slipstreams churning great clouds of dust.

By now the bogies were overdue.

In the tower, five loudspeakers blared at top volume. The blond boy, his fingers clicking at switches, carried on a half dozen conversations at once, while his companion, pointing a directional-beam light gun into the sky, signaled with green flashes to the planes coming in from the search flight.

From one speaker: "Bogies now orbiting. Direction south southeast."

Suddenly the noise quieted down in the tower, and then, from below, new noises were added to the roaring of the engines — noises from the tent area, where the men were shouting, gibing, catcalling and whistling like kids in a neighborhood movie on Saturday afternoon. Somewhat like the kids, the men in the tent area were catcalling, partly at the Japs, partly because their own evening movie had been called off because of the raid.

The two tower operators were tense. The blond lad fingered the controls of the receivers. The other played with the signal light. From time to time they grinned uneasily.

"You know," said the dark one, "this place really does have the old South Seas romantic atmosphere. In the moonlight it does, anyway. What a night to pitch a bit of woo. . . . Anything new on the bogies?"

"Nope. That flight of bombers we sent out early this evening is due back pretty soon, or we could watch the little sons-of-heaven put on their fireworks from the dugout."

"Yeah — from our nice, comfy little foxhole. Cozy like a sewer."

"Sewer? I've seen you whip in there like it was Shangri-La, son. Oh, oh — there goes the searchlight over behind the mountain battery. Hear any motors?"

Soon they could hear a peculiar desynchronized motor sound — "Washing-machine Charlie." When the noise seemed to be coming from directly overhead, six searchlights stabbed into the sky and converged on one plane high above.

"Let's see what the anti-aircraft boys can do tonight," said the blond, looking up at the plane. "Last time they had Charlie hitch-hiking to hell in nothing flat. Hey — sticks away! Hit the deck!"

Even as they dropped they could hear the shrieking whistle of the bombs. Then came a thudding roar as one struck, and successive *booms* as others hit. The bombs whistled and blasted, and each brief pause between sticks was filled in with echoes reverberating far out over the jungle.

The blond boy raised his head. "You know what they remind me of? A big Douglas fir being felled. You hear that wind-splitting *whish* speed up as the branches whip through the air, and then — *boom!* she hits the ground. Timber-r-r!"

With a *ba-loom* that the men could feel press against them, a big one struck near by. The tower seemed to lift; then it dropped and swayed and trembled. "Boy! That was close," said the blond. "But you see what I mean."

"'Fir trees,' he says. Those damned things sound to me like a fast freight high-balling over a crossing back home in Kansas. Listen and you'll get it — that sort of trembling roar."

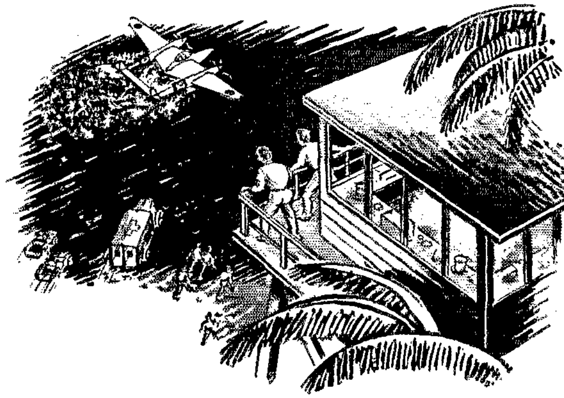
Another bomb hit close by.

"Bing, bam — thank you, ma'am! That last baby jarred my bridgework. You okay?"

"Roger. Let's take a look and see if Charlie's using his good eye tonight."

They got up and looked out from the platform over the moonlit field. "Set 'em up in the other

Both men leaned over the railing and watched as the plane with the wounded hit the mat.



U. S. War Bonds for Stories of War Service

QST wants reports on the experiences of radio hams in active service on the battlefronts — for immediate publication in this section, where feasible, or to be held confidential where security considerations so require.

Do *you* have a story of war service to tell — either your own or that of someone you know? Then write us a letter giving full details, including photographs, clippings and other substantiating data where available. If your story is published in *QST*, you will receive a $25 U. S. War Bond. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted, or if all information must be held confidential.

alley," said one of them. "He didn't even hit the hospital area this time."

"Every time we get a bombing, I hope he lays an egg near our tent. We'd sure get a swell start on a new foxhole. Save us a lot of digging."

"Boy-oy! The ack-ack boys are hotter than a two-buck pistol tonight. Look at 'em bounce Charlie around! Oh, oh — see him slip that one? Bet he got a fanny-full on that burst."

"You ain't beating ya gums, son. One more Charlie will miss some Geisha necking. If that hit's confirmed, it costs me just five bucks even. I bet that noisy AA corporal a fin they wouldn't get a hit the next time they had a target. I won't even get to help drink up the fin — we won't get any beer around this place unless we make it."

A faint, imperative voice from a loudspeaker broke into their talk. "One Victor Four Three calling Henderson Tower. One Victor Four Three calling Henderson Tower. Go ahead, Henderson."

"Henderson calling One Victor Four Three. Henderson calling One Victor Four Three. You are S5, R5. Go ahead."

The light-haired kid listened awhile, then turned. "Hey, quick, junior — alert the crash crew! Tell them to stand by for a crash landing on the strip. Get an ambulance there. . . . Two unidentified planes, too, huh? A couple of Charlies pulling a sneak!"

The other operator dove to a telephone while he went on talking with the men in the air.

"How much gas has your lowest plane got left?"

"Plenty. Couple of hours. How about landing instructions?"

"Hold everything. Circle the field until we identify the strangers. A P-38's going upstairs right now to look 'em over. Calling Four Victor Six Six. Calling Four Victor Six Six. Take off when ready, from the mountains to the sea."

From the P-38: "Roger. Thank you."

The Lightning roared down the strip, lifted and then zoomed upward, climbing almost vertically. The men could see the two strange planes high in the moonlit sky, and the P-38, hanging on its props, rising toward them. They listened to the pilot over the loudspeaker: "Four Victor Six Six calling Henderson. Two medium Jap bombers. And I'm right behind them, closing in now. Here we go! Tally ho."

Other planes in the air came in over the loudspeaker. "Take 'em apart, boy! Teach the little bastards to sneak in without a ticket!"

Other messages were received. The blond boy, answering one, said: "Plane with wounded, land on the strip. Mountains to the sea."

"Roger; wilco."

"Which is it this time — Gracie Allen again?"

"Nope. Butterfingers, this time. She's got no more landing gear than a bathtub."

Another plane cut in over the speaker. "Tell him to stick his feet out of the bomb bay and run like hell."

"Crash on the strip from the mountains to the sea. Good luck to you!"

"Hate to do this. Butterfingers is gonna rip her Sunday panties. Embarrass the lady. Well, here we come."

Another speaker blared: "Six Peter One Two calling Henderson Tower."

"Henderson calling Six Peter One Two. Go ahead."

"Military transport coming in with general officers aboard. Request immediate landing instructions."

"Can y'beat that," the operator, flipping off the microphone switch, muttered disgustedly. "Those office boys bothering us at a time like this!"

He switched back in. "Sheer off and backtrack on your course a few minutes. Then come in again for instructions. Combat traffic over field."

"Roger," came the meek reply.

Both men leaned over the railing of the control tower and watched as the plane with the wounded hit the mat. When it touched the ground with dirt spraying up alongside it like water around a speedboat, the ambulance, crash trucks and jeeps roared across the runways. The propellers splintered into the air. The battered plane finally scraped to a halt, and before the emergency vehicles could reach it the crew members piled out.

"Guess this baby won't be a blazer, thank God! Call the strip and see what the score is."

The dark-haired operator plugged in on the command-post party line, waited, then broke in: "What's the tale on those last two landings? Yeah? Swell! Nobody seriously wounded? We saw all the crew walk away from the crash. To hell with the plane — the men are safe."

Another interruption: "Six Peter One Two calling Henderson Tower. On my way back to you. Have you landing instructions for us?"

"Come in and circle the field, but don't land until you get the green light." The boy at the transmitter turned to the other. "Guess we'd better get the rest of the technical unit in first. Let the brass hats wait."

"Okay, I'll green light 'em. The strip is clear now. Tell 'em to land there." He took up the signal gun, pointed it at the leading plane of the flight coming in, and flashed the green landing beam. The planes came in almost nose to rudder, swung into the taxi strip and parked in their area.

The blond young man was still complaining about the generals. "Now we can green light the big shots. With this important stuff out of the way we can roll out the red carpet for 'em, too. Too bad we don't have an eighty-piece band." He told the transport to follow the bombers in.

"Wonder how the Lightning is doing with those gate-crashing Charlies?"

"Don't worry about that baby. Those P-38s are bad news to anyone who has the bad luck to tangle with 'em. He'll make a good Jap out of a live Jap — wait and see. I'll call the message center and find out what they've heard."

On the 'phone: "Hello, Harry. Any message from that P-38?"

"On his way in. Just talked to the AA command post and they say one of the bogies is down in the drink. The 38 got him in two bursts. No enemy craft now, so we're waiting for 'em to declare Condition Green. Wait up! Here it comes. Okay, Condition Green!"

"Thanks, boy." The young man on the tower hung up, turned to his friend and said: "Time for lights, bub. All clear."

He recharged the signal pistols. Brandishing them like a cowboy star riding into town, he shot them into the air. This time the flares were green, and they were faint in the white moonlight. Lights began to wink all over the area.

In the tower the tension was over.

"How about a coke, junior? A nice, ice-cold coke?"

"D'ya feel all right, daddy? I'd even settle for a *warm* coke!"

"You'll settle for a chlorine cocktail and like it."

"Hey," yelled a man from the foot of the tower, "those frag bombs damn near chopped this thing down."

"Not frag bombs. The beavers did it." The dark young man tossed a canteen to his companion. "Here, have some horse medicine."

In a Jap Internment Camp

BY JEFFERSON D. H. LAMB, JR.,* XU8JL

I WAS one of those lucky ones to return to civilization and freedom shortly before Christmas aboard the repatriation ship M.S. *Gripsholm*, from Shanghai, China, where I had been interned in a Japanese prison camp.

Before describing our life in the internment camp, first let me tell you something about my prewar activities as XU8JL.

I was first bitten by the radio bug in 1937, when I took an interest in v.h.f. transmission. I had built a 5-meter battery transceiver. The trouble was that there was no one else on five meters to talk to. So I got a few other radio enthusiasts together, and we all started building 2½ and 5-meter rigs. Some of us had our cars outfitted with them. We also did a lot of experimenting with f.m. and light-beam transmitters.

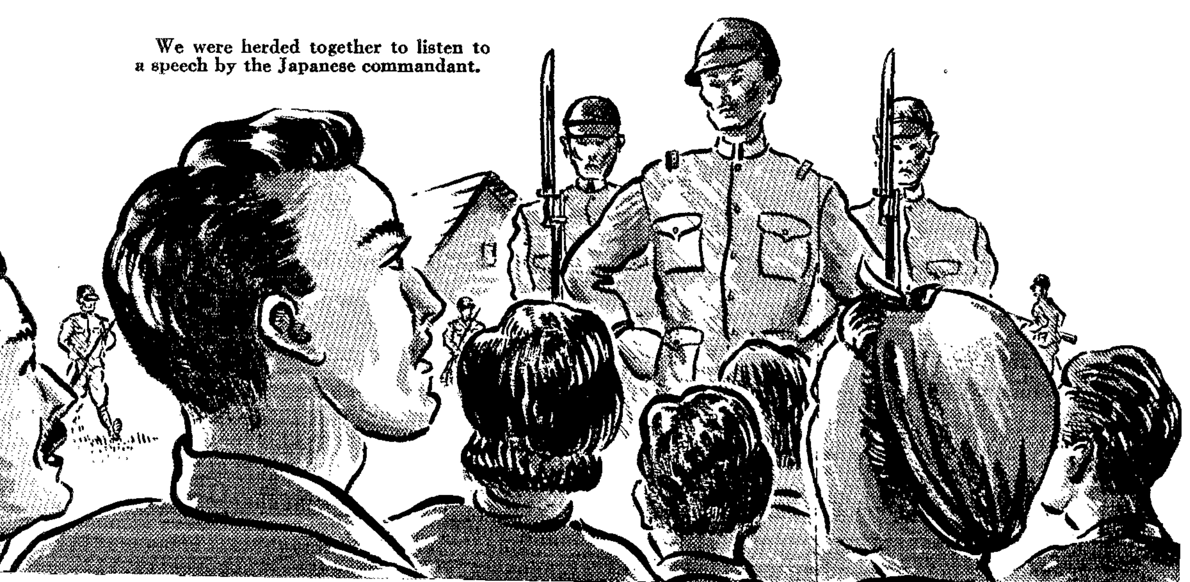
Like many hams, I got fed up with staying in my own back yard. Early in 1938 I joined the International Amateur Radio Association of China, and shortly after went on 20-meter 'phone with a single 6L6 in the final stage. This rig was breadboard mounted. For a receiver I used the family BCL super.

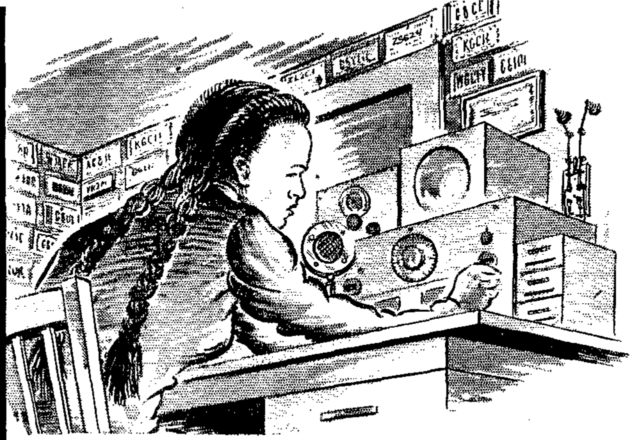
In early 1940 I decided to modernize the station. My new transmitter was built on a 5-foot steel rack. The line-up was as follows: 7C5 crystal oscillator, 6L6 buffer, pair of 6L6GXs Class-C final. This was plate-modulated with a pair of Class-AB, 6L6Gs. A Shure 70D crystal mike fed a 7A7 preamplifier. A 7N7 twin triode was used as a combination phase inverter and driver, followed by another 7N7 push-pull driver for the modulator tubes. Automatic modulation control was incorporated, using a 7A6 rectifier.

My receiver was a 14-tube homemade job with plug-in coils. I employed a two-stage preselector

*Apt. 54A, 625 West 164 St., New York City.

We were herded together to listen to a speech by the Japanese commandant.





I had a schedule with XU6YL. . . . Two hours later the Japs walked in and confiscated my rig.

(using 1852s) with it. Two different antennas were used at XU8JL — a center-fed Zepp and an 8JK rotary beam.

South America, the Philippines and the interior of China were worked nearly every evening. Some of the W6 boys on the West Coast may remember me, too.

My last contact was on that tragic morning of December 8th (the 7th, to you) in 1941. That was the morning Pearl Harbor was bombed — and it was also the morning the Japs walked into Shanghai. I had a schedule with Jean Tan, XU6YL, and I was determined to keep it, war or no war. Upon contacting Jean, I told her that Shanghai had fallen. She came back: "I get it, Jeff. You had better close down. 73 and good luck."

Two hours later the Japs walked in and confiscated my equipment. I was interned in Chapei Camp, just outside of Shanghai. Chapei Camp originally had been the Great China University buildings. One of the buildings was to house all the families; the other, all the single men and women. As fate would have it, three other hams were interned in the same camp. They were Sandy Calder, XU8ZA, Alec Alexander, XU8LA, and Bob Lang, XU8RL. I knew when I saw these boys that here was a spark of hope for a few good round-table QSOs. As time went on, our rag-chews proved a heaven-sent morale builder.

Upon arriving at the camp we were first assigned to our rooms. There were an average of 14 people in each room, with approximately 40 square feet per person.

Then we were herded together to listen to a speech by the Japanese commandant, who told us to accept this as our home — that, under the prevailing circumstances, it was the only abode we could now live in. We were also told that, should we attempt to communicate with the "outside" or try to escape, we would be shot to death by the Jap guards. He added politely that he hoped we would live in peace and harmony and be free from worry.

All requests or suggestions were handled through our own committee, which acted as a go-between on behalf of all the internees with the Japanese authorities. The only time we actually came in contact with the Jap guards was at roll call, which was once a day.

Every person in camp was assigned some work. The younger men worked either in the kitchen or the infirmary or in the construction and repair department. These men worked an average of seven hours a day. The older men worked in the camp vegetable garden and on the grounds or did the camp policing, averaging two hours a day. The women in camp worked in the sewing room and did the cleaning jobs, as well as the washing and scullery duty.

For the men who worked in the kitchen, the day began at 5:30 A.M. They would have to get up and make the fires, cook the farina for the children, and the cracked wheat for the rest of the camp, and have it ready for breakfast at 7:30 A.M. At eight o'clock they would return to their rooms for roll call. Then they would go back to the kitchen, to begin preparing lunch, until 12:30. At that time the afternoon shift came on. In the afternoon they could either sleep or go outdoors and play baseball.

A school was formed, and education was made compulsory for all children up to eighteen years of age. Adult classes were held in the evening for those who wished to attend. Church services were permitted. Catholic Mass was held at 5 A.M. every morning. Mass and Protestant services were held on Sundays.

Life in camp, after we'd had to go through the same routine, month in and month out, got to be very montonous. The only form of entertainment that we had, other than the baseball games was our own orchestra, which played for us every Saturday night.

For the first three months of our internment we were not allowed to write to our neutral friends and relatives on the outside. When at last we were permitted to write, the messages were limited to a maximum of 25 words of a personal nature only. The answer took two months to come back.

We got newspapers to read — but only when the news was in favor of the Japs. Medical supplies and food were inadequate. We got (when the food was at its best) a maximum of 1600 calories, which is insufficient for a hard-working man. Epidemics of malaria and dysentery at one time laid up 75 per cent of the camp. Quinine and other necessary medicines were not to be had.

A happy man was I when I was notified that I was to be repatriated. Life is not getting any easier for those left behind. I only hope that repatriation will be made possible for them in the near future. For conditions there are bad enough now, and they must get worse when our *little yellow* enemies really start losing this war.

I have often thought how lucky the people in America are to be free. You don't know the meaning of freedom until it has been taken away from you. We who have been interned, deprived of our freedom, forced to give up our usual way of living, managing only to keep up our morale with such few pleasant moments as we could create for ourselves — we value our freedom above anything else in this world.

Adjustable I.F. Selectivity

A Simple Method of Obtaining Changeable Band-Width

BY SEYMOUR LOBEL*

ALTHOUGH the use of variable i.f. selectivity is not in any sense new, it seems to this author that its greatest assets have never been fully appreciated, particularly by the amateur.

As the term implies, adjustable i.f. selectivity is a means of controlling the i.f. stages to various degrees of selectivity, each different band-width serving some special purpose. It is not to be imagined that this will require any great amount of design work; on the contrary, variable i.f. transformers are quite simple to construct and the results will be well worth a trial.

Let us examine the selectivity curve of a typical i.f. transformer, as shown in Fig. 1. This transformer is designed for an intermediate frequency of 455 kc., and the curve shows that, when the transformer is perfectly tuned to this frequency, the band-width as measured at 2 times down is 10 kc. This is the type of transformer used in communications receivers. As an explanation of this curve, the frequency is plotted along the linear horizontal base line, while the vertical scale is divided logarithmically. The curve shows the signal-input multiplication necessary at various frequencies off resonance to give standard output.

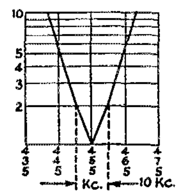
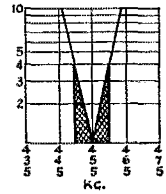


Fig. 1 — **Typical selectivity curve for a single i.f. stage. The vertical scale is in terms of the ratio of voltage input off resonance to the voltage input at resonance required to obtain a standard output voltage.**

For example, assuming that an i.f. stage tuned to resonance has a gain of 40 and that the input voltage to the grid of the i.f. tube is 0.01 volt, the voltage measured at the grid of the following tube will be 0.4 volts. Now, maintaining 0.4 volts as a reference level for constant output, the input voltage is doubled, which in turn increases the output voltage to twice the original value, or 0.8 volts. If the source of voltage is a signal generator, the frequency of the generator can be varied either side of resonance until two frequencies are obtained where the output will be reduced to 0.4 volts. In the instance of Fig. 1, those fre[illegible] are 450 kc. and 460 kc.

It is obvious that, as the input voltage is increased, the generator can be taken further off resonance and still maintain the 0.4-volt reference output level. At approximately 13 kc. either side of resonance the curve shows that the input voltage must be increased 10 times to bring the output up to the 0.4-volt level. Single-stage measurements are seldom carried beyond this point. When over-all curves are taken for several stages, they are usually extended to a point where the input must be increased 10,000 times.

Fig. 2 — **Characteristic selectivity curve of a highly selective i.f. stage. The dark area indicates the sidebands which have been cut as a result of the attenuation by the i.f. transformer.**



Selection of Band-Width

Let us ta[illegible] average i.f. transformer. It is so designed that the [illegible]d-width will vary anywhere between 6 kc. and 12 kc. at 2 times down. It should be understood that these figures represent single-stage measurements, since the band-width decreases with each added stage. If each of two transformers shows a band-width of 12 kc. an over-all measurement of two stages may show a band-width of about 8 kc. A receiver designer will select the i.f. transformer which gives him the required band-width for the particular job at hand. For example, he may decide upon a 6-kc. band-width, his purpose being high selectivity, which makes for greater discrimination against unwanted signals and less noise. These are ideal conditions for receiving c.w. signals. The receiver can be made even more selective by employing a band-width of only 3 kc. By making the i.f. amplifier regenerative, band-widths as narrow as 1 kc. are obtainable.

On the other hand too much selectivity can prove harmful, for then one must suffer less intelligible reception on speech and extremely poor musical quality. This is because the sharp cut-off of the transformer will greatly attenuate all frequencies above a certain value. Naturally, much quality is lost. This is depicted in Fig. 2, which shows in the shaded area the side-bands which are cut off. Very selective transformers of this type are appropriate for use in communication receivers for they serve most usefully in crowded

In this article the author points out some of the advantages which accrue if the i.f. selectivity of a receiver can be adjusted to various band-widths. A simple method of transformer design for accomplishing this result is described.

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channels where noise and interference might combine to make satisfactory reception impossible, were it not for the sharp cut-off. Quality under such conditions naturally is secondary.

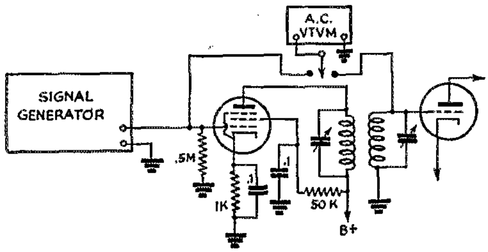

Fig. 3 — A simple single-stage test circuit for measuring selectivity. The values shown are not critical. Normal receiver voltages should be employed.

If a receiver employs no preselector stage, or perhaps an untuned stage ahead of the detector, the advantages of a sharp or regenerative i.f. will prove very gratifying. Thus, a narrow band-width serves a useful purpose, and so the first position for a variable i.f. transformer design should be for 5 kc.

High Fidelity

If the receiver must also cover the broadcast band, the i.f. stages can hardly rest at 5 kc. The public today has become accustomed to certain definite standards for local radio reception, and this narrow band-width will hardly meet their approval since fidelity is paramount. Regulations for broadcasting studios call for a 10-kc. band-width. Therefore, if one is to enjoy the full benefits of the transmitted signal the receiver should be equipped to pass sideband frequencies up to 5000 cycles above and below the carrier with equal amplitude, and the i.f. stages must be designed to pass a band 10-kc. wide.

Here the designer has more latitude. There is no demand for optimum selectivity, since the stations are well separated, and sensitivity is of no great importance. The signal strengths of the various local carriers are strong enough so that the gain available is more than ample. Therefore, the second position of a variable-selectivity design should call for a 12-kc. band-width.

Up to now two different band-widths have been decided upon. For the average receiver this may be all that is required. However, the author has found it advantageous to go one step further. There is much to be gained by increasing the band-width to 25 kc. On local broadcasting the quality is excellent. While it is true that there are times when it is impossible to employ so wide a band-width because of interference, in many cases it is possible to detune to one side of the carrier and thereby lose the interfering station without any noticeable loss of quality. How well this can be accomplished depends upon the individual receiver. However, the r.f. stage is usually broad enough to make this possible. If the interference still persists, switching to the 12-kc. position will clear up the matter instantly.

As for short-wave reception, there are many times when the broad band cannot be used because of interference. If the channels are heavily crowded, the sharp 5-kc. band must be used.

However, the 25-kc. band-width may be utilized in other ways. In many cases fading can be easily overcome, and signals which drift can be held relatively constant whenever interference permits. The receiver stands up well under vibration, where ordinarily the shifting of the oscillator frequency with vibration might easily lose the signal. Not so with this degree of spread, even though the oscillator may shift as much as 10 kc. This is a distinct advantage in receiving equipment which is subject to rough treatment, such as mobile units in ambulances, trucks or tanks.

Temperature and humidity play havoc with a receiver. Variations in humidity will cause the oscillator to drift badly and, unless a negative temperature coefficient capacitance is employed, the receiver is rendered useless. Even a negative temperature coefficient condenser has its limitations. Here again the broad i.f. will keep the signal coming through even though the oscillator may drift. Therefore, there is a definite purpose for this broad i.f. stage, and the third position of the variable i.f. design should be for 25 kc.

Now that the three positions have been decided upon, the next step is to see how the desired result may be accomplished. The equipment necessary will include a signal generator, a vacuum-tube voltmeter and a simple single-stage test chassis. Fig. 3 shows the schematic of a simple test arrangement. The values indicated are for general i.f. testing but the designer may use his own values, simulating the receiver under construction. The unit should be so made that the i.f. transformers are easily accessible for tuning or removal. The v.t.v.m. can be switched to measure either the output of the single stage or the output of the signal generator.

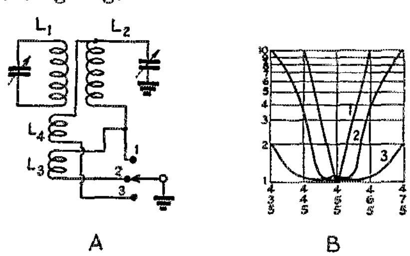

Fig. 4 — A — L_1 and L_2 are the usual i.f. transformer primary and secondary windings. L_3 and L_4 are added windings adjusted to give the desired characteristics. B — Typical curves for the three switch positions.

Transformer Design

Many methods have been employed by designers to achieve required results. However, the author feels that the most suitable and least troublesome arrangement is that shown in Fig. 4. L_1 and L_2 in Fig. 4-A are the usual primary and secondary windings of an ordinary i.f. transformer. L_3 and L_4 have been added and are tightly coupled to L_1. The inductance of L_4

(Continued on page 98)

★ BOOK REVIEWS ★

Reference Data for Radio Engineers, edited by H. T. Kohlhaas. Published by the Federal Telephone and Radio Corporation, 67 Broad Street, New York. 200 pages, 5½ × 8½. 1943. Price, $1.00.

The engineer who owns a copy of this little volume will definitely want to keep it within arm's length. But he will have to be vigilant indeed to do so — unless his associates acquire their own copies — because it is the kind of book that is destined to be borrowed. It summarizes concisely most of the information and formulas needed in ordinary radio engineering and then goes a bit farther to include material which, while not directly radio, nonetheless is frequently needed. For example, there is data on machine screws, on weather, precipitation and world temperatures, on types of power supply in foreign countries — to name a few.

The scope of the contents is evident from the section headings: General Engineering Tables; Engineering and Material Data; Audio and Radio Design; Rectifiers; Vacuum Tubes and Amplifiers; Telephone Transmission; Radio-Frequency Transmission Lines; Radio Propagation and Antennas; Noise and Noise Measurement; Non-Sinusoidal Waveforms; Mathematical Formulas; Mathematical Tables. The material ranges from color codes through nomograms for reactance and time constant calculation to wave guides and Bessel functions. Since the book has only 200 pages it would be, perhaps, an exaggeration to say that it contains all the data one is likely to need, but it is no exaggeration to say that it is an excellent compilation, one likely to provide an answer to a large proportion of the questions that normally arise.

The engineers of the Federal Telephone and Radio Corporation and their associates in the IT&T family are to be congratulated on having produced a most useful addition to handbook literature.

— *G. G.*

Basic Radio Principles, by Capt. Maurice Grayle Suffern. Published 1943 by McGraw-Hill Book Co., New York. 271 pages, 5½ × 8. 1943. Price, $3.00.

Ordinarily, high-school and vocational-training courses do not include sufficient mathematics to be of much use in radio. However, a lot of radio can be absorbed without a mathematical treatment, and it is in this field that "Basic Radio Principles" will be appreciated.

The opening explains the meaning of some important radio concepts, together with the usual definitions, terms and symbols. By the end of the second chapter the student is familiar with such terms as inductance, solenoid, millihenry, capacitor, dielectric, etc. Then he is carried swiftly into resonance and coupling. Formulas for such items as capacitive and inductive reactance and resonant frequency are treated in the footnotes. Plenty of analogies and diagrams ease the shock of going into sensitivity, selectivity and *Q*.

Electron emission leads into general vacuum-tube theory. Types of tubes and their construction receive a complete discussion. Having disposed of these the next logical step takes in tube applications, the first of which are rectifiers and power supplies. This is followed by explanations of oscillators and various types of amplifiers.

A discussion of detection sets the stage for the general subject of receivers. Regenerative, superregenerative, t.r.f. and superheterodyne types are taken up in detail. Transmitters are treated from self-excited oscillators through the m.o.p.a. Neutralization, adjustments, methods of biasing, keying, and antenna-coupling devices take up a generous portion of the discussion.

The chapter on amplitude modulation covers Heising, grid, high- and low-level and tone modulation. To make the volume complete, there are treatments of transmission lines and antennas. The final subject is test equipment, where ammeters and voltmeters of various types, together with signal generators, oscilloscopes and vacuum-tube voltmeters and their applications, are detailed.

At the end of each chapter there is a quiz, making the book useful as a text for self study. Summing up, it is a good volume for high and vocational schools, the practical radio man, and anyone who wants his radio without mathematics.

A Primer of Electronics, by Don P. Caverly. Published by the McGraw-Hill Book Co., New York. 235 pages, 5 × 8. November, 1943. Price, $2.00.

With the increase in the number and application of electronic devices, we have discovered that there is a shortage of personnel who can speak the language. In this category probably would fall the manufacturer's salesman, the store clerk, the order- and billing-department people, and others whose duties require them to write and talk about such matters intelligently. They need not know in detail what makes them tick, but it is desirable that they know how they may be used and the limitations on their uses. It is to such people that the author directs his remarks.

He lays low that time-waster of the classroom — the direction of current flow — in the first page. That out of the way, he proceeds to a layman's discussion of basic electric theory — the meaning of electrons, composition of matter with respect to its electrical properties, and historical data about the early days. Electric current, its measurement, and its behavior in different substances are explained. The volt, ohm and ampere are put in terms understandable to the salesman. This brings up the subjects of power and energy — what they are and how they are measured.

To prepare the reader for the contents of the main chapters, the author shows how the principles of magnetism are employed in the generation of electric power, spending some time on a.c. generators, phase relations, d.c. generators, motors and counter-e.m.f. No discussion of this kind would be complete without taking up transformers, inductance, capacitance and power factor. Along with these items, reactance, impedance, resonance and harmonics are treated.

The main business of electronics is prefaced by a revealing treatise on electromagnetic radiations and, for completeness, some material on medium-propagated waves. We have long thought that such material should be made the subject of a full and complete discussion, because vibrations of various frequencies have a profound effect upon mankind. While some authors have discussed special types of vibration, giving only a small glimpse of a very big picture, what is needed is a comprehensive treatment of the subject from all known angles.

A glance at the subtitles reveals how far this author has gone. The list includes simple waves, sound waves, electromagnetic waves including light, heat and radio waves, X-rays, gamma rays and cosmic rays. He takes the reader beyond the range of visible light and audible sound and shows how these vibrations are generated and detected. All of this is done in language a non-technical reader can understand. A chart of the electromagnetic spectrum, giving a good picture of the scope of the subject, appears on the fly-leaf.

After this preparation, the au hor continues with a discussion of basic electronics. Beginning with electronic emission, he follows through the usual subjects of diodes and detection, triodes as amplifiers and oscillators, tetrodes, pentodes and beam-power tubes. Under the general heading of incandescence we learn about ionization of gases and its application to lighting. Fluorescent lamps are treated rather fully, as well as bactericidal vibrations and black-light sources. Strobotrons and timing devices, phototubes, cathode-ray tubes and other types are brought in to give the salesman an opportunity to learn something about his product. A simple description of the electron microscope concludes the book.

A diligent reading of this little volume should greatly help in the work of those for whom it is intended.

Fundamentals of Telephony by Arthur L. Albert. Published by McGraw-Hill Book Co., New York. 374 pages, 5½ × 8½. 1943. Price, $3.25.

Although many books on radio and a lesser number on communications have appeared since the beginning of hos-

(*Continued on page 88*)

The New Contrapolar Frequency Spectrum

Announcing the Discovery of a Revolutionary New Principle Which May Overcome the Frequency Shortage

BY SGT. WM. A. WILDENHEIN*

One wartime phenomenon is the interest shown by amateurs in the services (as well as of thousands of GI-trained radio men becoming infected with the amateur virus) in pseudoscientific radio writings. Despite a variety of offerings *QST* has refrained from publishing such material, believing that space could better be devoted to more serious matters. This rule has been relaxed in the case of the accompanying paper because it describes a possible solution to what is undoubtedly the most important single problem facing the postwar radio world.

As THE representative of a number of hams now in military service at this base, I wish to present a remarkable theory which, we feel, is destined to solve the serious frequency shortage anticipated in the postwar period. Despite its possible military significance, the disclosure is made at this early date so that the amateur fraternity may receive full credit for a revolutionary discovery.[1]

To state the basic principle of the new discovery, it is the hypothesis of a brand-new frequency spectrum which begins where the old one leaves off. According to the canonical textbooks, the frequency spectrum as it is now known extends from 0 c.p.s. to infinity. However, after many a night of technical discussion in the barracks, we wish to dispute that theory. We have decided that the zero point is merely an arbitrary one, as it is on the scale of a thermometer.

In the case of the thermometer, our GI authority on thermometers explains that an early Los Angeles scientist one chilly evening swore up and down that the temperature had reached absolute zero. His calibration, based on that night's temperature, has lived to be known as 0°. However, as scientific knowledge progressed, absolute zero was found to be − 273°. Similarly, radio technicians have come to regard 0 c.p.s. as the absolute limit in that direction. Our experiments have proved the fallacy of this contention.

The reason no one heretofore has suspected any range below 0 c.p.s. is because of the fact that we have always believed that current flows from negative to positive. We have found, however, that, under certain circumstances and when viewed in the right light, the reverse can be true — current will flow from positive to negative.[2] This discovery not only opens up a broad new field for development but also introduces us to the region of frequencies *below* 0 c.p.s. Our research to date indicates that, in general, the technique in this region is basically similar to that employed in the conventional spectrum, the major difference being that already noted — the fact that current flows from positive to negative.[3]

At this point in our investigation a minor problem arose. We all agreed on the basic theory but, unfortunately, there was some dispute as to what we should term this new region. Tentatively, however, it has been decided to apply the term "contrapolar electricity"[4] to the phenomena as a whole. Equally difficult is the problem of assigning names to the units of the new frequency spectrum thus opened up. Should we call them "negacycles" (negative cycles) or "seldomcies"? Each is equally appropriate. "Negacycles" — or, in larger units, kilonegacycles or meganegacycles — is self-explanatory. However, we could term them "seldomcies" because they occur more seldom (or less frequently) than 0 c.p.s. For the moment we have abandoned this phase of our speculations, feeling that the matter could be decided at our leisure.[5]

This new spectrum is the inverse of the common spectrum and, as might be suspected, presents startling and intriguing new phenomena.

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*23rd Academic Squadron, Sioux Falls Air Base, Sioux Falls, S. D.

[1] As if we didn't have troubles enough. — EDITOR.

[2] At the risk of minimizing the importance of the present discovery, in the interests of scientific exactness it must be recorded that Benjamin Franklin's historic experiment involving a key, a kite and a bolt of lightning demonstrated this fact in 1751. Actually, the purpose of his experiment was to verify not only the direction of current flow from positive to negative but that there was such a thing as electric current and that there *were* "positives" and "negatives" — a theory which Franklin himself devised. Prior to that the orthodox theory (originated by Charles François Dufay in the early 18th century) was that there were two different brands of electricity — the *vitreous* (positive) charges built up on a piece of hard rubber rod when rubbed with silk, and the *resinous* (negative) charges acquired by the silk when the rubber rod was rubbed with it. (No wonder the ancients had a hard time understanding electricity!) — EDITOR.

[3] Further research is now being conducted on the accompanying question of what happens to the direction of electron flow — if any. For the present, however, the discussion is limited to consideration of electrical charges or fields. In the case of a.c., of course, these fields may be considered as traveling backward, instead of forward as in the conventional spectrum.

[4] Presumably based on the corollary effect, hitherto not fully understood, which is observed in chemistry, whereby contrapolarization of certain substances by the influence of strongly polarized (ionized) atoms causes dilation and even disintegration. Thus it may be inferred that contrapolar electricity is responsible for the peculiar odor sometimes observed as a result of a spark-gap discharge, lightning flash, etc. In fact, you can almost smell it in this article. — EDITOR.

[5] When they cease rationing that commodity.

The band from 0 c.p.s. to 15,000 c.p.s. corresponds to our new frequency spectrum of from 0 to 15,000 "negacycles." In this band we discover a most interesting phenomenon.

Because of the fact that such a tremendous amount of energy has been built up in this region

from thousands of years of caterwauling babies, hysterical women and sundry other sources of audio-frequency energy, we find it necessary to utilize oscillators and frequency generators of colossal power to transmit anything directly into this spectrum. However, we *can* reclaim this energy. Prior to our investigations it was generally conceded that a.f. waves were generated, propagated into space, expended, and lost. We now know differently. They are *not* lost or expended. The basic laws of conservation of energy disprove that. Instead, they are merely transferred to the region of contrapolar or negative frequencies. It is possible that, if all of the audio energy of the universe were expended, we could reclaim this energy from the negative frequency region. Furthermore, in the process of reclamation we uncover a second phenomenon. The voices and sounds are those of countless generations preceding us.[6]

A maze of fallacies has thereby been discovered. By means of special filters and equipment we have been able to isolate individual conversations from centuries back. History tells us that, upon discovering the principle of displacement of fluids, Archimedes dashed bare naked down the streets of Syracuse, shouting: "Eureka! I have found it!" What he actually said was: "When I capture the knave who putteth lobsters in my bath, I will have the rascal thrown to the lions."[7]

George Washington is reputed as having said to his father (after chopping down the cherry tree): "I cannot tell a lie. I dood it with my little hatchet." History fails to record his next comment, made a few moments later to a playmate: "As soon as Pa goes to the house we'll cut down the peach tree and finish our log cabin."

In order to present an accurate account of historical events as they actually transpired, we are now recording, in order, the comments made on all famous occasions throughout history. This is being done by means of a special transcription turntable which revolves in reverse and cuts from the inside out. Thus the finished recordings can be played back on standard equipment.

It was during the process of recording history in this manner that we became aware of another important phenomenon. Necromancers, crystal gazers and others have at one time or another stumbled onto these "negative frequencies" and have been able (using strictly natural means) to reproduce the voices of the dead. In so doing the voices were merely transferred from the contrapolar frequency region to the ordinary a.f. spectrum. After they were heard they naturally returned to the negative frequency spectrum. This is rather awkward, as it destroys the chronological sequence of the waves. As a result of this "freak," the boys in the recording room were amazed to hear this comical sequence of conversations when playing back one recording. It was the voice of the pirate Henry Morgan they heard first, saying to one of his men: "Mate! Where hast thou buried our gold?" A misplaced voice answered: ".eniV dna doowylloH fo renroc eht nO"[8]

The spectrum from 10 kilonegacycles to about 500 meganegacycles is equally intriguing. As one might suspect, this is the inverse of the conventional radio-frequency spectrum. In our early experiments we attempted to construct a transmitter for these negative waves. We finally completed it, but to our dismay it was a dismal flop. Somewhat irked at the failure, I yanked the line switch open. Immediately the transmitter came to life. Conventional methods of tuning proved ineffective, however. We had to tune the p.a. first and then the buffer, and then tune the oscillator to agree with the final. To our amazement, the current flow was from the antenna into the rig. When we placed an a.c. voltmeter across the open primary winding of the power transformer, we found 115 volts a.c. at the terminals!

By this time you no doubt are wondering just what our circuits are like. Unfortunately, I cannot release a detailed diagram because, of course, this discovery has considerable military signifi-

cance. However, I can mention a few of the things we are up against. Ordinary vacuum tubes are useless, since the electron flow is from plate to cathode. By cooling the plate to approximately 250° F. a copious stream of electrons is released

(*Continued on page 90*)

[6] This is only reasonable, considering that during all that ancient time until the recent past (when current and electron flow were given the same direction) current was considered as flowing from positive to negative. — EDITOR.

[7] It was only later, in the seclusion of his laboratory, that he expressed his amazement at his discovery, and then only in these words: "Well, I'll be damned!"

[8] For the guidance of the reader, it should be stated that the latter statement is of comparatively recent origin (i.e., since the time current flow was changed to the negative-to-positive direction) and therefore must be read in reverse.

STRAYS

As we go to press, all the commentators are speculating concerning Russia's motive in establishing the sixteen independent republics. There shouldn't be any mystery about it to any DX-minded ham, however. The purpose in creating these new countries is so the Us will have an easier time making the Century Club after the war, of course.

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Thin silver coatings applied directly to crystal faces, in somewhat the same manner as mirrors are silvered, have been found to overcome the tendency of crystals to change frequency as a result of movement in mobile installations. Connections are made by soldering springs or fine wires to the silver film.

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Vitally needed raw quartz crystals with suitable piezoelectric properties have been discovered in Montana in a bed of gravel and clay about eight feet underground. These deposits are expected to yield five tons of rocks a day.

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A new device for preventing the formation of ice on propeller blades is being tried out. A strip of rubber which has been made electrically conductive is fastened to the edge of the blade. Passage of the current through the rubber warms it enough to prevent ice formation. — *Ohmite News.*

—•••—

The idea for the cartoon below was relayed to Hq. by Mrs. Leonore M. Gooding, W1MIM/8, who received it from her husband, Robert P. Gooding, RM2c, W1LDV, in the form of a sketch by a Navy pal of his named Brett, based on a suggestion originating at the headquarters of the Commander of the South Pacific Forces — which, you will agree, is a long way for an idea to travel, even in these days.

And that reminds us — have *you* an idea for a Gil cartoon? If so, send it along, either as a rough sketch or as a written suggestion, and we'll ask W1CJD to draw it up for *QST*.

Servicemen in the Mediterranean theater on last December 15th listened to programs celebrating the first anniversary of the first radio station in history operated by servicemen for their own entertainment.

The original station, which came on the air just 37 days after the first shell was fired at Casablanca, was built by Capt. H. A. Brown, formerly of W9YH, from materials found on the beaches and from old parts of a requisitioned French transmitter, connected together with miscellaneous scraps of wire. Now six stations operate in the area, and crews with modern station equipment move ahead as fast as the troops. W9YH is the technical director of the new commercial-type stations, but his first overseas handmade job, cut down now so that it fits into a suitcase, is still operating.

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Lectrofilm, a new synthetic dielectric material which replaces mica in capacitors, has been announced by the General Electric Co. The new product has a greater combination of desirable properties than was previously available in any one dielectric material, and can be applied to the manufacture of most r.f. blocking and by-pass fixed capacitors.

—•••—

Induction heating is ideally suited for soldering applications. This method, when used to solder the required thirty wires to a terminal connector for a fighter plane, completes the required connections in only fifteen seconds, leaving the joints clean and uniform. If done by hand, the job requires about fifteen minutes.

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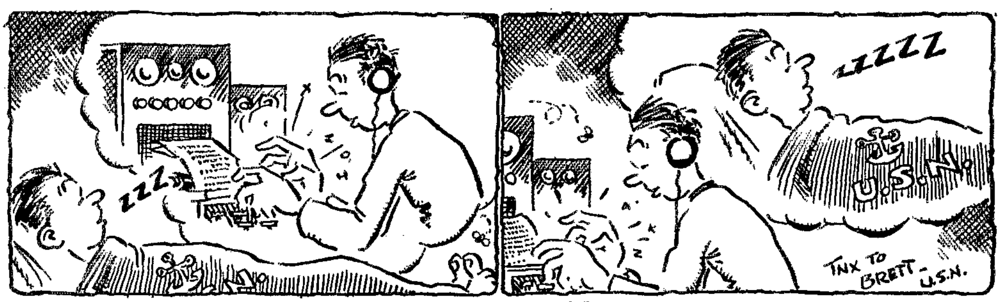
The standard specifications on radio transformers and capacitors evolved by the War Production Board, the American Standards Association and the radio industry have proved generally satisfactory, the Radio Replacement Parts Industry Advisory Committee reported at a recent meeting. Standard specifications for volume controls are now being drafted.



RADIO CYCLE

An illustrated 48-page booklet describing the development and uses of dry batteries and entitled, "The Inside Story of Dry Batteries: A Guide for Students," may be obtained upon request from the National Carbon Company, Inc., 30 East 42 St., New York 17, N. Y.

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A 36-page illustrated catalog describing various types and sizes of stock transformers may be secured free on request to the Standard Transformer Corp., 1500 N. Halsted St., Chicago. Charts are provided to aid in quickly identifying the correct units for various applications.

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A metal tube finer than a mosquito's stinger has been made from pure nickel. The outside diameter of the tube is 0.0010 inch, the wall is 0.00075 inch, and the inside diameter is 0.0004 inch. One pound of the tubing would stretch more than 18 miles. — *Ohmite News.*

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"Battlin' Benny," a shrapnel-riddled battle-announce loudspeaker which was formerly part of the communications system on the U.S.S. *Boise*, is now holding down a war job at the RCA Victor plant in Indianapolis. "Benny" visits various departments with a plea for greater production.

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The electronic wire recorder (see Strays, *QST*, November, 1943, p. 52) is now in mass production by the General Electric Co. under license from the Armour Research Foundation. The wire recorder has many wartime uses, important among them being its employment in observation planes. Instead of using the usual pad and pencils the pilot dictates directly into a microphone and his words are recorded magnetically on the wire, which is 0.004 inch in diameter. When there is no further use for a recording the speech can be "wiped off" magnetically and the wire re-used for future recordings. On the other hand, 100,000 reproductions of one recording have failed to alter its quality in any respect. Sixty-six minutes of continuous speech can be recorded on 11,500 feet of the hairlike wire, wound on a spool no larger than a doughnut.

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The wire recorder was used in producing a permanent record of the invasion by the Marines of Empress Augusta Bay on Bougainville. A descriptive account of the air and naval bombardment was made by Sgt. Roy Maypole, Marine Corps radio reporter, from the deck of a transport a short distance offshore. When the Marines landed Sgt. Maypole went with them, lugging his recording equipment into the thick of the battle.

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That brother of mine, A.C., has taken a job as announcer at a b.c. station. He says the only difference between this and his ham operating is that now he's on the b.c. band. Maybe so, but according to the neighborhood BCLs he hasn't made any change — that's right where he was all along. — *"Eddie Current."*

Third United Nations Amateur Radio Convention

BY CHARLES C. MILLER,* W8JSU

THE third semi-annual United Nations Amateur Radio Convention was held in Cairo, Egypt, on December 7, 1943. Bill Marsh, SU1WM, took charge of the proceedings, assisted by a number of the Egyptian amateur gang.

The noon meeting was held from 11 A.M. to 1 P.M. and was well attended. The boys had a couple of glasses together and held a few ragchews.

At 7:30 P.M. the boys started assembling at the National Hotel for the evening session. It soon became apparent that this convention was to be the best attended of all the affairs to date. By the time the roll had been taken and the gang sat down to dinner, hopes were high that the century mark might be reached. Unfortunately, some of the gang who had attended the noon session could not attend the evening one, but the high spirits of the 97 hams on hand more than made up for the lack of a phenomenal attendance.

SU1WM welcomed the gang and introduced each SU ham present. He also read a message from Jack Clarricoats, G6CL, secretary of the RSGB. Although there were no official speeches nor technical talks, the gang felt that the meeting was a great success. Many informal rag-chews got under way, the discussions invariably turning to DX or postwar frequency allocations. Ham spirit is high in the overseas gang, both among those from the States and the fellows who used to be DX for us.

Unfortunately, some of the fellows left without signing the register, but the following is a list of those present who signed it:

U. S.: W2GLH/8OPJ, 4EHK, 8JSU, 8QMX, 9MWF; Canada: VE3ET/5VE, 4AAU, 4ASL, 4QS, 4RX, 4UR; Egypt: SU1AX, 1CR, 1DB, 1GT, 1MW, 1RD, 1RO, 1SP, 5KW, 8RS; Southern Rhodesia: ZE1JV; South Africa: ZS1DC, ZS6A, ZU6E; New Zealand: ZL2GT, 2JD, 2KF, 2TL, 2WK; Straits Settlements: VS1AJ; India: VU2EO; Scotland: GM3LG; England: G2LK, 2YK, 3IC, 3KB, 3NZ, 3PX, 3TA, 4CG, 4FV, 4JY, 4LV, 4LW, 5NV, 5OI, 5QY, 5SI, 5UH, 5VX, 5WZ, 6GI, 6IX, 6PB, 8DA, 8FF, 8OQ, 8PI, 8VI, ex-2CGY, 2CUZ, 2DKX, 2DTQ, 2FDT, 2FFM, 2FPI, 2FPY, BRS: 3856, 6175, 6482, 6483, 4795, 4905, 4049; prospective BRS awaiting allocation of numbers: A. Phillips, K. Schlesinger, E. Cole, J. Storey, L. Helm, Crealey, K. Fowles, S. Hill, J. Baer, R. Jones, J. Adams, H. Todd, G. Hallifax, F. Adams, W. Kowall and J. Dominick.

No doubt there are many more hams in the Middle East who haven't been able to get leave or to get to Cairo to one of these hamfests, but under wartime conditions we feel this is a pretty good representation.

Plans are being made to hold the next convention about the first of May.

*Hq. USAFIME, APO 787, c/o Postmaster, New York, N. Y.

HINTS AND KINKS FOR THE EXPERIMENTER

A UNIVERSAL-ANGLE V.H.F. ANTENNA MOUNTING

The days when an electrician could build a satisfactory antenna for a radio transmitter seem to have gone out along with unrationed gasoline and Scotch whiskey. The construction crew for many a modern antenna system must include a couple of plumbers and a sheet-metal worker. After this a further complication arises. If maximum advantage is to be taken of the directional effects of such antennas they must be steered, and the mechanism required may call for the services of a steam-shovel designer and an automobile mechanic.

The purpose to be served by the device here described is control of the position of the plane of an antenna, as well as the rotation of the antenna through all points of the compass. Since the energy taken from an electromagnetic wave by a receiving antenna will normally be greatest when the antenna polarization is the same as that of the arriving wave, it is clear that, unless we can expect the arriving wave to maintain a constant polarization, a convenient means of varying the polarization of the receiving antenna is desirable in order to avail ourselves of all possible transmitted energy. In the field of v.h.f. wave propagation, the polarization of the arriving wave seldom bears any definite relation to the polarization of the transmitting antenna. Optimum adjustment of the polarization of the receiving antenna can then be determined only by experiment. The v.h.f. operator will appreciate a mounting device for his antenna which will enable him to control searching motion with the greatest possible ease.

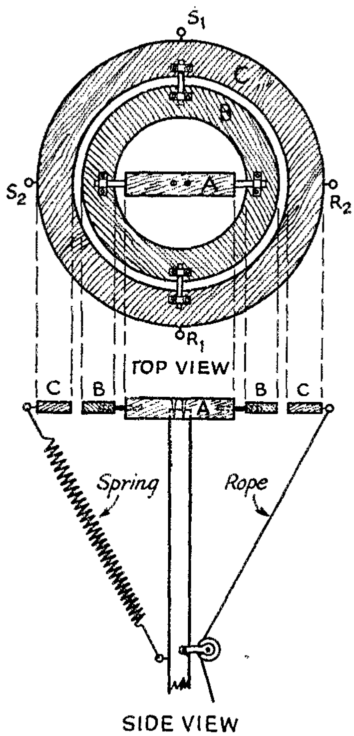

Fig. 1 — Gimbals-type mounting for universal-angle adjustment of the plane of a dipole antenna or a small directive array. Only one rope and spring are shown in the side view, although a second pair is attached at right angles to these, at points S_1 and R_1.

Suppose we let the radio engineers take a back seat for a while, just asking them for a bit of advice occasionally, while we mechanics have our innings with the design of a universal-angle antenna mounting. The design of many an amateur's WERS or postwar antenna will necessarily depend largely upon what he can find in his junk box. There are probably a number of basic mechanical arrangements which will prove to be particularly suitable for mounting antennas for universal-angle motion. The one here described has been found very practical as the mounting of the writer's three-element 10-meter antenna. For antennas designed for higher frequencies the design should prove even more useful and workable.

Yachtsmen and mariners will recognize in the sketch of Fig. 1 a device known as a gimbal, a traditional method of mounting a marine compass so that it will remain level despite the pitch or roll of the ship. A pair of gimbals constitute a sort of universal joint. Concentric rings, *B* and *C*, are cut from properly weatherproofed plywood or other suitable material. The dimensions will be determined by the size and weight of the antenna elements which are to be supported upon the outer ring, *C*. The bearings on which the outer ring pivots about the inner ring *B* may be short metal straps, as shown in Fig. 1, or they may simply be holes in the edge of the ring. In the latter case, for mountings to carry a two- or three-element array, it would be an improvement to line the holes with sections of metal tubing to secure longer-wearing surfaces. The pivot pins may be short sections of metal rod or tubing, mounted tightly on the edge of ring *B*.

The assembly of outer and inner rings is pivoted about a central block, *A*, which may be a piece of hard wood mounted on top of the mast. The bearings between *A* and *B* are similar to those already described. To permit rotation of the complete assembly for horizontal directivity, the central block, A, may be mounted so as to pivot about a vertical pin passing through a hole drilled in its center, or the block may be mounted solidly if the mast itself can be rotated. The latter plan is preferable, since it will simplify control of the rings in the gimbals. Such control can be accomplished by the very simple expedient of attaching ropes at points 90 degrees apart on the outer edge of the outer ring, opposite the axes of rotation of the two rings. Each rope pulls against a tension spring attached between the mast and a point diametrically opposite the pull of the rope. The method is illustrated in the lower detail of Fig. 1, although only the rope and spring controlling the outer ring are shown.

Various types of antennas may be mounted upon the outer ring, parallel to its plane. Since that plane can be varied about a horizontal axis, the radiator, or the elements of an array, may be used as either a vertical or a horizontal antenna. The angle of the main lobe of radiation can be adjusted at will, as well as the polarization. Directional adjustment is taken care of by rotation of the mast. The writer's three-element 10-meter array was mounted on the outer ring of the gimbals, the gimbals in turn being mounted on the top end of a 20-foot topmast, and the whole topmast was rotated in bearings mounted on the ends of crossarms on a telephone pole. Motors were provided to pull the ropes as well as to rotate the topmast, and the whole system was operated by remote control from the usual station operating position. — *F. C. Beekley, W1GS.*

ANTENNA COUPLING CIRCUIT

From time to time I have seen suggestions regarding means for obtaining proper loading of the final amplifier of a transmitter. I use a scheme which may have been used by many of the gang, but I do not recall having seen it elsewhere or hearing it mentioned. It is a simple application, the only requisite being that variable coupling be provided between the final tank coil and the pick-up coil. The system is shown in Fig. 2.

L_1 is a coil whose dimensions are roughly proportional to the frequency limits it covers, though not at all critical. On 14 and 28 Mc. I use 12 to 15 turns of No. 12 wire wound 4 turns to the inch on a 3-inch form. The pick-up coil, L_2, is 3 inches in diameter and consists of two turns close together, to occupy minimum space. This construction allows it to be swung in and out of a small gap between the two halves of the tank coil.

The first step in adjustment is to swing the pick-up coil out for minimum coupling. Then the rig is fired up, the final amplifier is tuned to resonance, and note made of the tuning-condenser dial reading. All four clips are then connected to L_1, a reasonable guess being made at trial settings. With the transmitter running, the pick-up coil is swung into tighter coupling, until the input is in the neighborhood of that desired. The tank circuit is then readjusted to resonance. If minimum plate current occurs at the same dial setting as before, it is an indication that the clips have been set properly.

However, unless the trial setting of the clips is a lucky one, it will be found that minimum plate current appears at a new tank-condenser setting. When this is the case, the clips on the pick-up coil leads should be moved to include a greater or less number of turns. Then the coupling is again adjusted to the desired input and the tank condenser readjusted for minimum plate current.

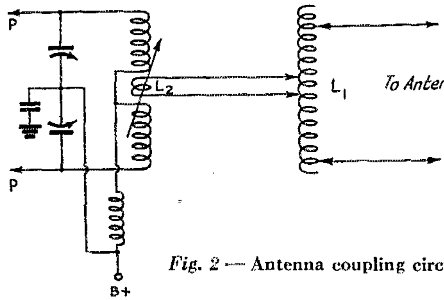

Fig. 2 — Antenna coupling circuit.

The process is repeated until a change in the coupling will produce a change in the load without affecting the plate tuning. When this condition is reached, it is an indication that the nature of the reflected load is purely resistive, with no reactive component.

Since L_1 acts as an autotransformer, it obviously can be used as either a step-up or a step-down transformer. If the impedance of the pick-up coil is less than that of the line at the point where the line is connected to L_1, then the line taps will include more turns than the pick-up coil taps. On the other hand, if the impedance presented by the line is less than that of the pick-up coil, the line taps will be set inside the pick-up taps. A symmetrical arrangement probably is to be preferred, but it is not absolutely essential. — *Henry D. Hall, W1NV.*

TUBE-CHECKER KINKS

I have constructed a free-point test panel somewhat similar to the one described in *QST* for December, 1943, with a few added features which seem to be worth passing on. Provision was made for a gas test by introducing a 500,000-ohm resistor in the grid circuit. If gas is present in the tube it will then be indicated by a change in the plate current, caused by a voltage drop across the high resistance resulting from the flow of grid current which takes place in a gassy tube. A s.p.s.t. toggle switch across the resistor shorts it out when not in use.

I made up four cables, a 9-wire cable with an octal tube-base connector at one end, a 7-wire cable with a 6-prong base, a 6-wire cable with a 5-prong base, and a 5-wire cable with a 4-prong base. Each of these cables has tip terminals at the end opposite the tube-base connector, the wires being cut so that connection can be made only to the proper binding posts (or tip-jacks) on the test panel. A tube may be removed from a set, inserted in a test-panel socket, and properly connected to its original socket by means of one of the cables. In this manner terminal tests of electrode voltage and current values may be made without disturbing the chassis wiring. — *J. Stewart Houston, VE4KJ.*

ELIMINATING PARASITICS IN A MODULATED P.P. 807 AMPLIFIER

Many v.h.f. operators using push-pull 807s or RK39s in a final r.f. amplifier have experienced symptoms of serious instability under modulation. These generally appear in the form of terrific downward modulation. The amplifier will work beautifully without modulation, show output only at the exciter frequency, and give good output. Even when the voltage is raised or lowered from a mean value by hand, the output will rise and fall in proportion without any sign of instability.

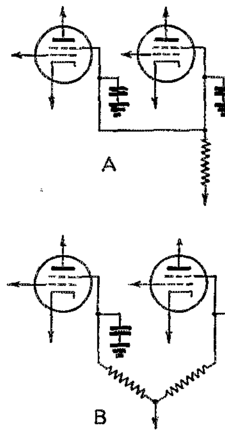

Fig. 3 — A — Original arrangement of the 807 push-pull v.h.f. amplifier, using a common screen-voltage dropping resistor. B — Revised circuit with individual screen dropping resistors which eliminated the parasitic oscillation.

The trouble appears to be a parasitic in which the screen circuit plays a part and, which requires the shock excitation of the modulating voltage to start its oscillations.

In analyzing my own rig to locate the resonant circuit which was producing the parasitics, after noting that all leads were as short as possible, and that the screens were solidly by-passed to ground, I remembered that all along a slight indication of r.f. had appeared at the screen jack on the front panel. The screens were by-passed right at the socket with 0.01-μfd. condensers. As the manufacturers of the tubes had stated that condensers of the value of 0.1 μfd. should be used, they were tried, without effecting a cure. This seemed to indicate that the r.f. appearing at the screen jack must be from a high-frequency parasitic rather than the fundamental r.f.

The screen voltage had been fed to the prong of one socket, and from that by a jumper 2½ or 3 inches in length to the other socket as shown in Fig. 3-A. On examination it appeared that in this way we had a fixed split-stator condenser of 100,000 $\mu\mu$fd. (0.1 μfd.) per section, across this jumper. Since it seemed that such heavy screen by-pass condensers should not be required at very high frequencies, the value of our fixed split-stator condenser was reduced by substituting 0.001-μfd. mica condensers. As an additional precaution the jumper was removed and screen resistors of 50,000 ohms each, one for each tube, were substituted for the common screen resistor as shown in Fig. 3-B, and the parasitic was gone, and with it the downward modulation.

Apparently the heavier screen current, which resulted when the parasitic oscillation took place, resulted in a large voltage drop across the screen resistor lowering the screen voltage, and consequently the output, whenever the amplifier was modulated.

I am now duly impressed by the fact that, when trouble is experienced with a screen-grid r.f. amplifier, it pays to keep in mind the important function of the screen. In particular, its current and voltage under modulation should be checked carefully. — *Jay H. Quinn, W1EJO.*

B.C. RECEIVER CUT-OFF SWITCHING

There are various circumstances which may make it desirable to have a receiver or amplifier equipped with an effective volume cut-off which may be operated from a remote point. A 'phone operator whose family wishes to listen to a broadcast program while he is engaged in a QSO may often find it necessary to switch off the b.c. receiver while his transmitter is on the air, so as to comply with the regulation forbidding transmission of entertainment. If the telephone rings while the receiver is giving out with either rag-chew or b.c., it is a help to have an arrangement which cuts off the receiver and quickly restores its output when the telephone conversation is completed. Such a device may also be used during rapid break-in operation of either 'phone or c.w.

In the circuit arrangement shown in Fig. 4, a switch, S_1, or a relay is used to apply a blocking bias to one of the audio-amplifier tubes. This method is preferable to some others which might be used because it is clickless.

Blocking voltage is obtained by returning the cathode to a point on the voltage divider made up of R_1 and R_2. The bias voltage required for blocking will depend upon the type of tube in use and the final value, which will be somewhat greater than that required for plate-current cut-off, is most easily determined by experiment. R_2 should have sufficient resistance to prevent im-

(*Continued on page 86*)

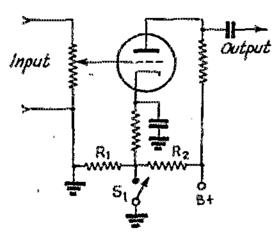

Fig. 4 — Circuit of the switching arrangement to cut off a broadcast receiver by applying a blocking bias.

CORRESPONDENCE FROM MEMBERS

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

QRD?

1357 West 6th Ave., Columbus, Ohio

Editor, *QST:*

. . . I have read the letters in the January issue and agree with most of them. I notice that there is much talk about justifying our existence; naturally, we must do this. If there is no justification for ham radio and no practical purpose accomplished by amateur operators, there is no reason why we should be given frequencies and allowed on the air. . . . Our problem is to determine what course of action will convince the powers that be that we will continue to be a justifiable activity. . . .

Incidentally, the "powers that be" are the ones whom we must convince. There is a lot of talk about presenting our case to the general public. Actually, the great majority of the general public knows very little about ham radio and cares less. So long as we don't mess up their soap operas and jive programs, they won't bother us. They don't want our frequencies. It is the government, the Army and Navy and the commercial interests who are interested in our ham bands. They . . . aren't impressed by beautiful publicity or high-powered horn-tooting of our own. They judge by results; and if we do a worth-while job they should encourage us rather than try to eliminate us. We don't have to worry about the Signal Corps major who didn't want to teach "those pesky amateurs." Maybe the good major was sore because some ham knew more about radio than he did. But the Army men who will help decide our fate are men who know amateur radio. They won't be tossing around remarks like that. . . .

— *James P. McBride, W4BAF*

APO 302, c/o Postmaster, New York, N. Y.

Editor, *QST:*

. . . After over a year in active combat in Africa, Sicily and Italy, I can say without hesitation that the hams have more than proved their worth as radio operators. Throughout the fighting in Africa I was commander of a radio operations platoon furnishing communications for the Second Corps. Just before the Sicilian invasion I took over the job of corps radio officer. From these two vantage points I have watched operators of all kinds. . . . While in many cases operators who were not amateurs were outstanding in their performance . . . it was clear that nearly every ham or ex-ham was as good, if not better, and besides being a good operator insofar as speed was concerned he was also more capable of handling the equipment at his disposal.

The training received on the crowded ham bands certainly proved its worth when QRM and QRN were so heavy that a signal sounded like a .22 in the midst of a barrage of 155s. Those boys were the ones that could be depended on to get the message through. I've seen many an outfit that had an amateur as communications sergeant, and in every case the communications officer had words of praise for him.

Yes, without a doubt the hams are doing a swell job in the Army and in every other branch of the service. . . .

— *Capt. F. H. Palmblad, W5CYM*

APO 253, c/o Postmaster, New York, N. Y.

Editor, *QST:*

In their postwar planning the critics of amateur radio should remember that it was amateur training that provided a good many radiomen for the services.

As a former operator in my unit and now communications chief, it was my experience as a ham that taught me most of what was needed for the job. My training in ham operating and construction made it possible for me to handle Army work with only minor schooling in the Army way of doing things. . . . This is true of numerous hams in the services, both officers and enlisted men.

Add this to ham records in civilian war work — and what more need be said?

— *T/Sgt. George H. Caffrey, W3JOO*

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c/o Fleet P. O., New York, N. Y.

Editor, *QST:*

"Rag-chewing certainly cannot in the future justify our use of frequencies." These were the words of Theodore R. Sprecher, W3DXT, in the January issue of *QST*. I'm sure that those eleven words hit home in the hearts of thousands of American amateurs on the battlefronts of the world. Do you think W3DXT would dream of saying, "Pleasure driving certainly cannot in the future justify our use of gasoline"? . . . In my opinion, both sentences mean exactly the same thing.

Among thousands of other reasons, the amateurs are fighting for that right to rag-chew. They want to go back to the ham bands just as they were before Pearl Harbor. Naturally, the amateur fraternity will be changed somewhat from the prewar days . . . but is that any reason to show a necessity for those bands when the "go" signal is given again? Don't you agree that the amateurs have for the past twenty-five months justified their existence? The invaluable assistance the U. S. amateur has rendered to the armed forces of America has been mentioned over and over again. Had the United States government started from rock bottom in training these technicians, we would be far behind in a field that is proving its absolute necessity in the successful conduct of the war. . . .

— *Edward C. Stephenson, ARM1c, W5HPG*

Bradford, R. I.

Editor, *QST:*

I have been reading with much interest the replies to your question, "How should we state our aims, our policy?" . . . It seems to me, at this time in particular, that this subject should not have been brought up for discussion. The war definitely is not over, nor is its end directly in view. . . . Also, a good percentage of the amateurs are away from their shacks. And they are the fellows who are making the name for amateur radio in the future, its strength for recognition in the postwar era, and as such they are the ones who should have first say in any changes in our postwar status. . . .

Amateurs desire nothing more than their prewar status — the return of their favorite pastime where they left off. Why should amateurs have to state any aims or policy? Amateur radio can stand alone on its merits during this conflict. The prewar amateur was this country's unknown weapon and one of its greatest assets. Little did anyone realize the material value of the amateur fraternity until radiomen were so urgently needed. They responded by going into all the branches of the services as well as into industry. . . . A large pool of practical and experienced radiomen is one of this country's best investments.

— *Walter Tedfor, W1MVL*

LICENSE REQUIREMENTS

616 Greene St., Augusta, Ga.

Editor, *QST:*

I have noticed in *QST* various letters howling for a reduction in requirements for an amateur license. Have you noticed that none of the writers sign with a call? The reason is very apparent: they have no call to sign. Yes, it's the same old story — exerting every effort to find some loophole in the Commission's regulations, bringing pressure to have the code test eliminated, trying to have the technical examination made easier, doing everything possible to get on the air without working for it. If these boys would spend just half the time working for their ticket they do trying to get one without proving their right to possess it, they would have a license in short order.

. . . I respectfully submit the following set of new requirements for obtaining a ham ticket:

Class A Amateur:

Requirements — Send one box top from Whoopledorf's liver pills. No code test. No technical test. License will be sent postage paid.

Class B Amateur:

Requirements — Application blank must be filled out in applicant's own handwriting. License will be sent by return mail, but applicant must enclose three-cent stamp.

Class C Amateur:

Requirements — This grade of license will be issued all applicants who furnish satisfactory evidence that they are holders of social security numbers. Three-cent stamp must be enclosed. . . .

— *Frank Courtney, W4FDX*

15 Colonial Ter., Nutley, N. J.

Editor, *QST:*

. . . One of our best arguments for the return of ham radio is the record of hams in the services. Ham radio is a source of pretrained men who, with a minimum of special training, can take their places in military communication work.

The immediate need of the Army and Navy directly after Pearl Harbor was for communications personnel, and the ham filled the need as no one else could have done. Rather than eliminate c.w., it should be as at present — a requisite to any type of license. There is no training to compare with it. . . .

— *Wallace B. Sunders, W2LXI*

Route 1, Polo Rd., Winston-Salem, N. C.

Editor, *QST:*

. . . It is hard to see why anyone would want to lower the standards of ham radio by decreasing the license requirements. . . . We should not have an examination without code or with lower technical requirements, for therein lies our strength and excuse for being. Ability such as ours is useful in time of war or other emergency and is the very thing that justifies our existence. . . .

— *Lewis Kanoy, W4DCW*

P. O. Box 6528, Baton Rouge, La.

Editor, *QST:*

I am decidedly against having the standards of technical knowledge for hams lowered. We are proud of the fact that hams got the communications ball rolling when we entered the war. Why, therefore, should we admit to our ranks anyone whose only ability is turning a dial on a receiver or flipping an on-off switch? . . .

— *Pvt. William M. Pallies, W3JRG*

201 S. Balliet St., Frackville, Pa.

Editor, *QST:*

. . . I would make only one exception to a no-code-test ticket, and that would be in the case of a person who had lost both his hands or the use of them — even in WERS.

— *Bertram C. Felsburg, W8UD*

55th Flying Training Det., Bennettsville, S. C.

Editor, *QST:*

. . . For the sake of those who will ham after this war, keep the requirements high — in fact, higher than they are now. . . . Anything is worth working hard for if it has any value at all. . . .

— *Lt. R. M. Page, W4DVJ*

SECRET TRANSMISSION

P. O. Box 1796, El Paso, Tex.

Editor, *QST:*

. . . There are many different ways . . . to keep information secret, but I do not believe I have seen described in *QST* the system found to have been used by the Japs in many locations. . . . Perhaps the amateur fraternity would be interested in the possibilities of figuring out what they are listening to.

. . . The system itself is very simple. . . . Sometimes one transmitter is used and again two, but at all times two receivers are used. The transmitter or transmitters are tuned to different frequencies, either widely separated or close together. The key or bug is so insulated that the dots operate one frequency and the dashes another. An ordinary listener hears nothing of any sense, while the listener who has the correct schedule uses two receivers tuned to the frequencies being used, feeds the two outputs into a common amplifier, and receives the dots and dashes as they should be for proper transcription. One job had two crystal oscillators and used the same broadly tuned amplifiers and final, all in a small cabinet.

This system was and is used in the South Seas and has been reported in use in Europe. It is as nearly foolproof as any simple system can be, since by the time anyone trying to eavesdrop locates the two separated signals the sender will have finished and shifted to other frequencies for other messages.

— *W. H. M. Watson, W5NT.*

GRIPE

APO 610, c/o Postmaster, New York City

Editor, *QST:*

. . . I have a gripe coming, so get out your chaplain bars and crying towel. . . . After "sweating out" *QST* for weeks, months and years, I finally see the communicatingist communications outfit in any man's army mentioned—and mentioned is about all. In fact, to hear you people talk, the Signal Corps is the only communications outfit in the Army. Somewhere along the line I think you guys got sidetracked by a Signal Corps publicity man.

Mr. Garand and the Ordnance Department have a lot to do with the M1 rifle, but they are not the ones who use it in the field. So it is with the Signal Corps and about 99 per cent of the communications equipment. What I am driving at is the fact that every piece of equipment that looks like it might have a radio in it is not Signal Corps equipment and is not manned by Signal Corps men, as most of the illustrations and articles in *QST* and other publications would lead one to believe. The equipment is only procured and issued by the Signal Corps, just as Ordnance procures, develops and issues weapons to the various branches of the service.

I've been in Army communications for seven years now, in the Signal Corps and in other branches, and I would almost bet a year's pay that 90 per cent of the communications equipment in the Army isn't manned by Signal Corps personnel. Yet they get about the same percentage of credit for Army communications service.

The next time you are around an infantry outfit, look up the members of a communications section who have lugged a field set about fourteen miles in half as many hours and ask them if they are in the Signal Corps. You will probably be violently informed on the subject. As soon as you are able to write again, drop me a card letting me know which hospital you are in and I will have some flowers sent up.

Don't get me wrong — I have seen some good work turned out by Signal Corps units and they have some good nets; one red-hot one used to be known as the War Department net. . . .

Guess I had better slow down before I blow a fuse or pit a new circuit-breaker. Just remember that everyone who wears cans or swings a soldering iron isn't a Signal Corpsman.

— *S/Sgt. John L. Mohn*

FROM THE HAM IN THE FOXHOLE

APO 302, Postmaster, New York, N. Y.

Editor, *QST:*

My story is of little interest compared to that of an infantry soldier in combat, but if it will help in any way to keep ham radio going after the war, I will know that I have done my part.

We left the States seventeen months ago and duly arrived in England. I'm sorry to say I didn't meet a single British amateur, but I did visit London and called G6CL on the land-line. . . .

We left England on our way to North Africa and arrived at Arzew the morning of November 8th. Arzew is twenty-five miles east of Oran. The battle was short and I had my first taste of war, if you would care to call it such in view of what was to come later. We left Oran shortly for Southern Tunisia. We stayed there until Jerry pushed us out, in February. After things started going our way again we went to Ferriana and then to Gafsa, where II Corps pushed east to meet the British Eighth Army. After the battle of Southern Tunisia we moved to Beja in Northern Tunisia and finally on to Mateur. I saw thousands of Afrika Korps prisoners and talked to many.

Then we left Tunisia for Algeria. It wasn't long before we were on boats again starting out on our second invasion, which this time was to be Sicily. My first glimpse of Sicily was at about 4 A.M. on the morning of July 10th. Not long after that our boat was on the beach. As I started to get off the boat with my beep (which was equipped with an SCR) we had two visits from Me.109s that did their best to get us, but failed. One bomb landed about fifty feet from our boat and didn't do much damage. The next one missed us by only thirty-five feet. Thank God it was a dud, because it was in the neighborhood of 500 pounds.

The night of July 11th was rather rough, with both aircraft and ack-ack fire. After that things calmed down, and the infantry boys got to work pushing the Axis out of Sicily.

Later on in the campaign I spent two weeks with a field artillery battalion which was supporting an infantry regiment with artillery fire. At times it was rough going, but mild in comparison to what the doughboys have to do.

I sent a picture of myself in a foxhole at Gafsa to George Rulffs, alternate director of the Hudson Division. [See *QST* for February, 1944, p. 21. — EDITOR.] That foxhole was used quite often for two weeks, as Jerry came over all night long and dropped flares and bombs. . . . The weather in Italy has been nothing but rain and mud for the past two months. Some fun. Hi. . . .

Good luck and 73. See you in Berlin. . . .

— *Bob Ehrler, W2CTO*

THE INVALUABLE *HANDBOOK*

c/o Fleet P. O., San Francisco, Calif.

Editor, *QST:*

Recently I found need for a good, practical reference book. Out here none was to be had. Then I happened across a CRM who was returning to the States and found he had a copy of the *Handbook*. After much talking I persuaded him to sell it to me. Needless to say, I have found it invaluable and have refused to sell it for five times its original sale price. Of more interest, however, is the fact that I am the fifth owner of this copy.

Can you see the implications in the use and service that this one copy has given? This incident alone shows just how important amateur radio is to the communications art, and how much it means to our country in these times.

May you keep up the good work.

— *Jack Sponeybarger, CRT, USCG, W8DVZ*

APO 525, c/o Postmaster, New York, N. Y.

Editor, *QST:*

I wish to acknowledge receipt of the *Handbook* I ordered. It arrived in perfect condition.

I am one of the operators and repairmen for a medium-power Army outfit, and I find the tables and charts in the rear of the *Handbook* are especially useful to me. . . .

My thanks to ARRL — keep up the good work.

— *Pfc. W. H. Winn*

APO 512, c/o Postmaster, New York, N. Y.

Editor, *QST:*

This is to inform you that I have received the *Radio Amateur's Handbook* and the issues of *QST*. . . . Here in Africa we have found these books to be very helpful in our work, which is in radio repair in the Signal Corps. . . .

— *T/Sgt. J. S. Badis*

SO ONE HAM MAY KNOW THE OTHER

1st Plat., 7th Co., 2nd Bn., 6th Regt. A.S.T.P.,
Fort Benning, Ga.

Editor, *QST:*

As a supplement to a former schoolmate's suggestion regarding some sort of greeting sign, I have a suggestion to make for the hams in the services. We in the Army invariably wear helmet liners the majority of the time. On these helmets are printed our last name; above my name in neat small letters I have printed my call. . . .

If this practice was followed by other amateurs in the Army it would aid us in identifying our brother hams. Wat sa, fellas?

— *Pvt. Clayton D. DeWitt, W9PHB*

CALLING CQ

c/o Fleet P. O., New York, N. Y.

Editor, *QST:*

For the men in service who have a little difficulty in locating hams for the purpose of shooting the breeze, I recommend the following system. This is the way the Navy does it. Last night while W5ARU and I were waiting for a movie to start, we focused a flashlight on the screen and called CQ by using the switch for a key. We got a call from W9FTE, whom we located in the audience by the beam of his light. Just as the movie started we were being called by a W8. We will try for him again soon.

We believe the system to be a good one. No QRM or QRN, and the equipment is cheap.

— *M. J. Metzger, Sig2c, W9NRE*

THE FIRST LINE OF DEFENSE

c/o Fleet P. O., San Francisco, Calif.

Editor, *QST:*

. . . I greatly enjoy the reports from your hams all over the world and make many personal contacts with them in this area. It is my sincere belief, and I can substantiate it with a good many figures, that communications in general for the South Pacific are approximately 50 per cent ham operated. When the war is over, I am sure many stories will come out that will prove to the world that the hams of yesterday proved to be a first-line measure of defense, not only for the United States but for all the Allied nations. . . .

— *C. J. Wertman, ex-XU8CJ*

A "FLIGHT SURGEON" IN INDIA

R. D. No. 4, Binghamton, N. Y.

Editor, *QST:*

After reading the stories about hams in action, it occurred to me that a letter received from Lt. Albert L. Wahl, W8SXR, would be of interest.

After hearing from W8BUN that 8SXR was seriously injured and hospitalized somewhere in India, I wrote to him and received the following reply. For so much brevity, the extent of information, drama and ham spirit that is packed into this one small V-mail letter is amazing. . . .

— *Russell W. Yale, W8RGH*

Somewhere in India

"Dear Rus and Polly:

"Sure FB hearing from you! Tnx for QSO. I'm still in the hospital. We generated too much r.f.

(Continued on page 76)

OPERATING NEWS

GEORGE HART, W1NJM
Acting Communications Manager

CAROL A. KEATING, W9WWP
Assistant Communications Manager

Suspension of Drills. Let's get the right slant on this suspension of practice alerts and drills we all have been reading about in the papers. The release by the War Department and OCD makes it very clear that the primary purpose in ordering the suspension, except for one Sunday every three months along the coasts, was to decrease interference with war production. By this it is not meant that war production has been hampered because civilians have spent some of their free time engaged in voluntary training. No civilian would put his air-raid warden duties ahead of his job to the extent that he would be an absentee for the sake of attending classes in ARP methods. That would be perverted patriotism. Let it be understood once and for all that neither the War Department nor OCD are intimating that there is no longer danger of air raids or other enemy action.

The drills were held in the first place because it was necessary to get the public accustomed to coöperating with ARP officials in the event of air raid and of educating the public in ARP methods. At best, these surprise alerts were a nuisance to most of us, and they have forced important war industries to cease operation for varying periods of time. Men have had to leave their jobs in order to report to their warden posts or other civilian defense duties, and often the whole continuity of a day's production has been disrupted. Factories operate on regular production schedules, and frequent practice alerts might have had a tendency to throw this schedule off.

Now that we have had a good taste of it, and now that we all know what to do when that siren starts to wail, it is not necessary to have drills so often — that is, drills in which the public must participate. *But the Army-OCD announcement is not an invitation to relax,* to take down your blackout curtains, to forget your training, or to go out and leave your lights burning at night. Training of local civilian defense personnel will continue, and the public will participate once every three Sundays in East and West Coast areas. It is by no means impossible that one day we shall hear the air-raid sirens blow when they are not scheduled to blow. In such a case we must know what to do, and we cannot know without continuing our own training and alertness.

Many CD-WERS radio aides have reported to us that their operators are falling off in their enthusiasm and that the attendance at regular drills is diminishing, this in spite of all their efforts to keep the networks alive and active. Despite the continuous pounding by military officials to the effect that the war is a long way from over and that anything can still happen, complacency is setting in even in our WERS networks where operators are increasingly becoming of the opinion that WERS is useless and a waste of time, since the war is about over. In this column we have harangued several times on this subject, but we fear we have not been reaching the right ears. It is up to radio aides to point out to their operators the reasons why WERS must continue, whether or not other sections of local ARP services are functioning at full speed. Some of the reasons, stated briefly, are as follows:

1) The possibility of sneak air raids still exists.

2) Air-raid protection is not the only function of WERS now. The field can be and should be broadened to cover natural disasters.

3) Radio equipment that sits idle does not remain in operating condition.

4) Procedure that is not frequently practised soon becomes rusty.

5) WERS operation, properly conducted, is a lot of fun and good experience.

These reasons have been listed in order of their importance. We have deliberately left out some of the reasons important only to radio amateurs (see "It Seems To Us," February, 1944, *QST*, p. 7) because the above reasons are meant to be ones you can cite to any of your operators who are losing interest or to any new recruits

Honor Roll

The American Radio Relay League War Training Program

Listing in this column depends on an initial report of the scope of training plans plus submission of reports each mid-month stating progress of the group and the continuance of code and/or theory classes. All Radio Clubs engaged in a program of war radio training are eligible for the Honor Roll. Those groups listed with an asterisk teach both code and theory. Others conduct only code classes.

*American Women's Voluntary Services, Brooklyn (N. Y.) Unit.
*Bloom High School Radio Club, Chicago Heights, Ill.
*Iowa-Illinois Amateur Radio Club, Burlington, Iowa.
*Milwaukee (Wis.) Radio Amateurs' Club.
Mountaineer Amateur Radio Assn., Fairmont, W. Va.
Radio and Television Club, Central Comm'l. and Tech. High School, Newark, N. J.
Rose Tech. Radio Club, Terre Haute, Ind.
Tucson (Ariz.) Short Wave Assn.

who may be dubious as to the value of the service WERS can perform.

Mobiles. With further reference to the second reason above, every WERS system should now be preparing itself for service during emergencies other than those caused by enemy action. We have been training ourselves to know what to do after air raids. What do we do after a hurricane, an earthquake, an ice storm, or a particularly bad fire? In many ways, the operation is about the same — that is, directed from a central point through which contact can be made and maintained with fire departments, police stations, hospitals, utility headquarters, etc. But during such an emergency the value of the mobile unit becomes of the greatest importance. These units can be directed to proceed to places hardest hit and to carry on communication between these points and control. If telephone communication is nonexistent in a certain part of a community due to whatever disaster has struck, mobile units can enter this area and carry on the essential communication necessary.

This is not to say, of course, that the mobile is of more value during one kind of emergency than another. It is simply to point out that we have already anticipated between what points we are most likely to need communication during and after air raids, and have located our station units accordingly. During and after a natural disaster it is not so easy to predetermine where the units should be located, because we do not know what kind of disaster will occur, or when or where. While there can be some degree of forewarning of an air raid or storms, there can be no warnings of earthquakes or of fires. Having station units located in cars is one way of being sure that they can locate themselves at any point where they are most needed; and if each car is also equipped with a walkie-talkie unit, the versatility accomplished by mobility is even more complete.

The value of mobile equipment is no new lesson to WERS. Many radio aides have reported that their networks are successful chiefly because of the presence of a number of mobile units. W8AVH, radio aide for Cuyahoga County, Ohio, when trying to impress important officials with the value of WERS, "gives 'em a ride in a mobile" and finds that invariably they emerge ardent supporters of WERS.

With the number of batteries now available it should be possible to construct more walkie-talkies, and by the time the present supply of batteries is exhausted there may be a new supply, or it may be possible to purchase them. Of course, it cannot be expected that the batteries now available will fit into the battery space of already-built units. The battery space will have to be suited to the batteries available; however, it is very possible, if you can take the time to go to the trouble, to dissect the batteries and rearrange the cells so that they will fit the space available. But this is not the Hints & Kinks department. We just want to state a maxim: For best results in WERS, use more mobiles, and to impress skeptical officials, *"give 'em a ride in a mobile!"*

Army Orders. Recently many radio aides have received orders from Army Fighter Commands that they are required to refrain from the use of assigned call letters during all alerts, both practice and real. This is somewhat contrary to the FCC requirement that we use regular identification unless the Army issues a limited transmission order. You will be interested to know that the Army, in view of the FCC requirement, has agreed that regular identification may be used during *practice* alerts. In other words, the situation appears to be unchanged, and WERS stations should use regular identification unless the Army issues a limited transmission order.

Last Call. This will be the last call made for articles for "WERS of the Month." See the box on p. 68 of January *QST* for details. Responses are beginning to trickle in, and we hope that it will be possible to continue this feature; but no contributions, no article. What say, gang? Aren't there any budding authors in your group?

SCM Reports. It has been with some gratification that this office has noted an increasing tendency on the part of the members of a section to write to headquarters to complain that their SCM isn't sending in reports for publication in *QST*. This is a healthy sign.

Some of them want us to "appoint" a new SCM. Let us point out that SCMs are elected by the full members of each section and that it is not possible for us to eject one or install another without going through certain processes as laid down by the ARRL Constitution and By-Laws. On the other hand there are quite a number of vacancies in existence among the ranks of SCMs, as will be noted by reference to page 70, February *QST*. We are not only willing but very anxious that you nominate and elect the man of your choice to fill these vacancies, a list of which appears in every other issue of *QST* along with full instructions. Many of the vacancies are being filled temporarily by Acting SCMs serving either at the request of the SCM who resigned or at the request of this office; but these appointments end abruptly as soon as anyone is nominated and elected to the office. If you like your Acting SCM and want to see him stay in office, you should file a nominating petition for him signed by five full members of the section; otherwise it is perfectly possible for some other group who wants a different SCM to file a petition and do the Acting SCM out of office. If you don't like him, then you can oust him by filing a nominating petition for your candidate. In the event that his supporters oppose your candidate by filing a petition for the Acting SCM, we hold a regular ballot election to decide the issue.

Being an SCM is a thankless task, since it is practically impossible to please everyone. You owe your SCM all the support you can give him, regardless of whether or not he was your candidate. He wants to know what you are doing, where you are and what you think, so he can write it up in his monthly report to Headquarters. The trouble in many cases is that members want to read about the activities of other amateurs but fail to report what they themselves are doing. It is easy to see that, if all section members adopt this policy, the SCM has nothing to report. This often results in members sending us information direct, not having seen their section report in *QST*.

It is one of your SCM's jobs to submit a monthly report of section activities to Headquarters. If he does not do so, you have no kick coming unless you sent in a report. All that is necessary is to send him a postcard on about the fifteenth of each month reviewing your month's activities. If the report does not appear in *QST* for either of the two months thereafter, *then* tell us about it and we shall try to build a fire under him (or maybe explain to you why we had to blue-pencil that part of the report)! The SCM generally mails his report on the twentieth, and we must edit and submit copy to the editor by the end of the month in order to make the issue of *QST* which comes out about the twenty-fifth of the following month. This may seem like rather slow news service, but it is the best that can be done to meet necessary publication deadlines. If your report to the SCM does not appear in the first issue of *QST* after you send it in, look in the next issue. If you do not send anything in, blame only yourself if your section is not reported. Your SCM is not a mind-reader.

— *G. H.*

WERS of the Month

Louisville, Kentucky

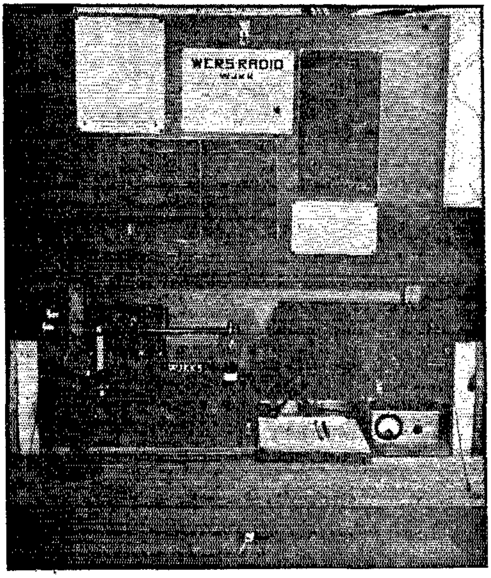
In common with many other WERS units, WJKK of Louisville, Kentucky, found that the negative attitude of the city administration was the greatest stumbling block to early progress. When approval finally was obtained, appropriations were not made for any kind of equipment. It then fell to the lot of the personnel, who were interested and willing to work, to construct apparatus from the materials they could find available.

All the old broadcast sets obtainable were divested of their innards, junk boxes which had lain idle and were the despair of meticulous housekeepers were thoroughly cleaned out, and local radio dealers, who had been pitifully neglected by the hams since Pearl Harbor, were suddenly swamped with calls for tubes, high-frequency chokes, midget condensers, etc. Plumbing, welding and refrigerator shops were besieged with demands for copper tubing and brazing rod for tank circuits and antenna elements.

Many of the amateurs who had neglected the very highs in pre-Pearl Harbor days now began to devour any literature they could lay their hands on which pertained to the subject. Back issues of *QST* and the *Handbook* were scanned with greater gusto than the comic strips in the daily newspapers. At the same time these individuals found that they were learning more about types of tubes and their characteristics than they had previously known throughout years of ham radio operation.

The equipment, when finally constructed, resembled the set-up of WJKK-5, as shown in the accompanying photograph. This was the typical layout of the units scattered throughout the fifth district of the city.

In the left front of the picture is shown the superregenerative receiver, which has a 7A4 detector and two audio stages



The operating position at WJKK-5, one of the sub-net control stations of Louisville's WERS set-up. A description of the equipment is given in the accompanying article.

using a 6J5 and a 6F6. The speaker is built-in. To the rear of the receiver is the transmitter, which uses tuned-plate tuned-filament T20s. (A high degree of stability was obtained by running these tubes at the relatively low input of 25 watts.) In addition, the plate rods, which were cut to the exact frequency at first, are now adorned with a small tuning condenser for more flexibility. After the picture was taken a shorting knife switch was placed across the bars at the proper point, so that the transmitter could be used on the net control and sub-control net frequencies. On the right side of the table, shown from front to rear, are the modulation transformer, the power supply and the speech amplifier, respectively. A crystal microphone is used with the amplifier.

The output of the amplifier is 500 ohms, and that is fed into a modulation transformer whose output matches the r.f. load for plate modulation. The latter form of modulation was used because the speech amplifier and transformer were able to be obtained directly from a local ham station. The frequency stability of this transmitter, in spite of its being a modulated-oscillator type, is unusually good.

The antenna is a conventional "Q" type, fed by an open line with two-inch spacing. It is planned to include a directional array in the near future, so that some of the more remote stations in the district can be contacted without difficulty.

Since the picture was taken, another receiver has been added to this station for the purpose of monitoring the master control station at all times while operating on the local net frequency.

Operating problems were not so bad as were expected because, although there were only two experienced traffic men in the net, the others learned procedure quickly. To speed up the learning stages, the entire network of operators was broken up into three separate sections; one operated on Sunday nights, another on Monday nights, and the third operated on Wednesday nights. In this manner the new operators were able to get practice in handling traffic under natural conditions, without the disturbing element of too much QRM. Some "key-pounding" was added to the mike instruction for experience.

On the whole, operations have been successful. Compliments were received from the Civilian Defense Council for excellent work during one staged bombing incident, and for operation during a blackout.

If the details of operation and construction in this article have been helpful to any other CD-WERS radio operators, the authors will be pleased to hear of the fact, and to compare notes regarding the troubles encountered and corrective measures employed in other WERS networks.

— *W9TXC and W9BAZ*

ARTICLE CONTEST

The article by A. E. Hohman, W2IHP, wins the CD article contest prize this month.

We invite entries for this contest. Regarding subject matter, we suggest that you pick a topic of current interest. Amateur radio is a broad field and our ways of contributing to the war effort need discussion and emphasis. Perhaps you would like to write on Radio Training programs, club methods boosting code proficiency, Emergency Corps registering for CDC selections and WERS activity, organizing or running a radio club, getting local groups QSO by light beam or wired wireless or ground currents now that radio is out!

Space permitting, each month we will print the most interesting and valuable article received. Please mark your contribution "For the CD contest." Prize winners may select a bound *Handbook* (Radio Training Course or regular edition), *QST* Binder and League Emblem, or any other combination of ARRL supplies of equivalent value. Try your luck!

It's Organization That Counts!

BY A. E. HOHMAN, W2IHP*

In some WERS set-ups, little thought has been given to organization within the lines. Where the groups are small and each individual is well known to his fellows, this is of little importance. In larger groups, it can be a catastrophe.

New York City's WERS, being one of the largest in the country, had to devise a rank-and-file system to prevent the organization from turning into a howling mob of individuals who would sooner or later lose interest because they had no specific duties to perform. The organizers of WNYJ decided to vest authority and responsibility in as many of the members of the organization as possible.

When individuals were given specific jobs and charged with responsibility they took more interest in WERS than they did as one of many whose presence or absence was of small importance.

To begin with, each WERS operator in New York City was supplied with a mimeographed form which outlined the organization and the duties connected with each appointment. Each appointee was nominated at a planning-board meeting and was then appointed by the radio aide for the city, or by the boro-coördinator for the boro. The radio aide found his duties lightened considerably and each individual "perked up" to do his best in the new capacity.

This assignment of duties obviated many telephone calls and meetings and much correspondence. When parts and materials were needed, the procurement director was contacted. If more operators were needed, the boro supervisor or radio aide was called upon. When items, such as storage batteries, were wanted from the general public, the publicity director was asked to sponsor a campaign in newspapers, posters, parades — when possible, etc.

In addition to facilitating matters, this system functions also as an automatic replacement for those who are drafted. Someone is always prepared to step in when a vacancy has occurred. The nucleus group had consisted of ARRL Emergency Corps members. Gradually, people were taken in who knew nothing about radio, and then they were trained for FCC licenses. As each of the members received his license, he became part of the civilian defense staff corps and received a helmet, gas mask, arm band and identification card issued by the mayor.

The director of publicity was given another job. This was the publishing of the local WERS news in bulletin form for each of the boro units. A call was put forth for volunteer editors, and one was appointed for the job. The bulletin was published and distributed in the Queens' unit as an experiment. It was well received there, and it is hoped that enough volunteer workers can be assembled to expand the bulletin's circulation to a city-wide basis.

In the event that a wartime AEC does not become a reality a New York City operators' association has been contemplated, with ARRL affiliation the ultimate goal. This should be another means of "cementing" personnel.

* Publicity Director for Queens, N. Y. unit of WNYJ.

The Month in Canada

QUEBEC — VE2

From Lt. L. G. Morris, VE2CO:

Capt. Colin Dumbrille, 2BK, is now a staff officer attached to the Second Canadian Army Corps overseas. Ev Mercer, 2OB, has been promoted to the rank of acting lieutenant commander (SB) RCNVR. Also commissioned in the RCNVR are Sub-Lt. Bruce McKimmie, 2LU, stationed at HMC Signal School, St. Hyacinthe, P. Q., and Lt. Bill Stephen, 2LC, located at Ottawa. Ray Thornton, 2AR, has been promoted to the rank of captain, and is serving overseas with the Canadian Army. Ray's wife is also across the pond working with a Red Cross unit. Lt. Joe Kelley, 2DE, got home to Montreal for a few days at Christmas. He has been stationed at St. John, N. B., for some time. Another promotion is that of Harry Ashdown, 2IO, to rank of wing commander, RCAF. 2CO made a short trip home, but his ham contacts were regrettably few — a chance meeting with Johnny Grant, 2CU, and a telephone QSO with Tom Walker, 2BF. Better luck next time.

ONTARIO — VE3

From Leonard L. Mitchell, VE3AZ:

Flight Lieutenant Harvey Reid, 3ADR, was among those repatriated to Canada on the recent arrival of the hospital ship, *Lady Nelson*. Harvey obtained his commission in the RCAF in November, 1940, and went overseas in January, 1941. After spending a year on radio location work in the British Isles he saw service in Cyprus for about a year and then was transferred to Egypt. He followed the Canadian troops into Sicily and later into Italy where he was stricken with malaria and pleurisy. At present he is convalescing in the Rockcliffe Station Hospital at Ottawa, but by the time this appears in print he likely will be transferred to Christie Street Hospital, Toronto. He would appreciate seeing any of the gang who can find time to call on him.

ALBERTA — VE4

From W. W. Butchart, VE4LQ:

From 4ZI, Elwood Irwin, of Barons, we learn that the shack of 4ADY, Laverne House, of Barons, was blessed with the arrival of a son Nov. 14th, and also that 4ADP, Sgt. Doug Wilson, of Vulcan and Carmangay, became a proud pappy to a son during November. 4ZI is doing a spot of carpentry work on a new barn. 4EA, Roy Usher, of Edmonton, is deep in his new job at CKUA, and is at present making a few changes on the control panel at the studio. 4BW's mother was the winner of a bungalo, raffled off in Edmonton in December. A Christmas card from 4ADW, Jack Gooderidge, of Edmonton, indicates that he and his XYL are located in Saskatoon.

4HM, Chas. Harris, of Edmonton, and YF had their son home for Christmas. Roger has just graduated from E.F.T.S. at Abbotsford, B. C. Betty, the other member of the family, was unable to get home as she is stationed at St. Hyacinthe, P. Q., with the RCN, but sent greetings via a recording.

4ADW arrived in Edmonton Christmas Eve to attend the wedding of 4NU, Gordie Sadler, of Edmonton, to Mary Nelson, the senior YL op out at No. 2 A.O.S. When we saw 4ADW, 4AKK, Bob Lamb, of Edmonton, had him in tow and they were on their way to the ceremony.

5CD, Bob Dunn, of Vancouver, and his XYL are celebrating the arrival of a junior op.

News is scarce this month, boys, so you had better "soop her up" and pass along those news items.

MAILBAG

E. Bodley, VE1PA, who is a WT in the RCN stationed at Dartmouth, N. S., sends in the following news:

"One of the VE4s, who is instructing in radar up at the RCN Signal School, is gathering dope on the hams there as per your request. 5AFG is also instructing there. Neil is from Vancouver, B. C. 4XG, of Winnipeg, is there as a radio artificer. Quite a few more hams also are there.

"1EH, of Hampton, N. B., is the chief radio artificier here at the RCN station. 1EV, of Moncton, N. B., and 5DN, of Victoria, B. C., are here as operators. There are quite a few more but I haven't been able to meet them yet.

"3AEG, of Toronto, is the 'chief' on one of our destroyers. 4WK is home at present on a well-earned leave. 3UD is in the Army. 3YZ and 3AMN, are in the Navy."

AMATEUR ACTIVITIES

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — 3GHM and 3AOJ are now in the Army. 3JBC has been promoted to T/3. 3IJN reports having trouble buying *QST* in Port Arthur. Easton WERS is very active and through the hearty coöperation of the local OCD has put on some realistic incidents. The gang is planning the "natural disaster" type for the future. The Jan. 19th Easton paper had a fine write-up on 3BDV which was very favorable to ham radio. Haverford and Lower Merion ran successful inter-city WERS tests. Lower Merion expects to lose one-third of its radio operating personnel in the next few months. Several have already been called by the Army. 3HFD has his 2½-meter f.m. receiver all done but the trouble shooting. 3HYT is in the Pacific area. 3IXN and 3JKC have laid the groundwork of their postwar rigs. 9RCQ, of the Egyptian Radio Club, was in Philly and gave us the low-down on his fine club. 3DMQ intends to join the merchant marine. 3BSD was drowned when the lifeboat in which he and thirty-one others were pulling away from their floundering vessel capsized. He had set up emergency equipment during a furious gale, after the standard radio equipment had been swept away, to send an SOS from his sinking ship in the North Atlantic, and thus was responsible for the rescue of twenty-nine other crew members. Please see if you can send in more reports. 73.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ — GXX became a benedict last fall, and is now in the services. He can be addressed: Avn./5 A. C. Manious, AAF, Section 12, 338 C.T.D. (Air Crew), State Teachers College, Kutztown, Pa. JHW was married last Sept. He spends weekdays nea North Beach, Md., but is home some weekends

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU — Asst. SCM, Ed G. Raser, W3ZI; Regional EC for So. N. J., N. J. State radio aide and radio aide for Hamilton Twp., H. Dallas Fogg, ASQ; radio aide for Hillsboro/Branchburg Twp. and EC for Somerville and vicinity, including Southbranch, P. Stanley Case, ABS. Hamilton Twp. WERS program again reports good progress through radio aide ASQ. ABS reports progress on the Hillsboro/Branchburg Twp. set-up. Stan also reports that during the past few days they have been demonstrating their mobile units to the police and fire departments and township and defense council officials, who declare they are very well satisfied with results. They are now planning an "incident" test. Stan also reports that the "A" and "B" batteries recently received from OCD in Trenton enabled them to place two more mobile units in operation, both of which are walkie-talkies. As radio aide, ABS is conducting another examination for 3rd-class 'phone tickets. When these tickets are granted, this organization will consist of twenty 3rd-class operators and six hams. The state radio aide reports that Oaklyn Boro has received its license, WMJO. ITS, HTJ and GCU accompanied Radio Aide ASQ at a meeting of the N. J. state communications officers and radio aides on Jan. 14th, at the Essex County Court House, Newark, at which all enjoyed the talk by Major Lawrence Silverborg, AUS, regional communications officer for the Northeastern Section of U. S., who has recently been transferred to the 7th district. ASQ has been appointed a member of the N. J. state technical advisory committee of the N. J. State Defense Council, and has been awarded the insignia designating 1000 hours of volunteer service. George Hulse, formerly of American Radio, Trenton, may now be addressed: Sgt. George Hulse, 32235380, APO 36, c/o Postmaster, New York City. HWT is in the Naval Air Service somewhere in England. HKM may be addressed: PFC. Walter J. Reis, 32369425, 668th Navigation Tng. Sqdn., Ellington Field, Tex. Walt sends his 73 to all the SJRA gang and especially wishes to hear from VX. ASG is now Major F. M. Mkitarian, 0-229754, Ream General Hospital, Palm Beach, Fla.; "Doc" received his promotion from captain to major on Jan. 7th. Many thanks to AWH for the information regarding himself and AMP. Yardley and Charley are doing research and development of special devices for the armed forces somewhere in Cambridge. CUC is in the Air Forces at Harlingen, Tex. JQQ is still at Tilton General Hospital, Fort Dix. AEJ is now a colonel. MD, who has been in Unk Sam's Navy for two years, is CRM at Cape May, and rumor has it he is in line for another promotion. Fred was in the Army in the last war. IBI is a lieutenant in the Army Medical Corps and when last heard from was in a camp in Missi HRJ is getting along OK in the Army Signal Corps. "Little Steve" Czorgo may be addressed: Cpl. Steve Czorgo, 43rd Academic Sqdn., Boca Raton Field, Fla. HLY, a director of SJRA, and Bill Wescott (LSPH) are in Unk Sam's Navy. Thanks to JHO and FDF for the news. GMY is with the Radio Condenser Co., Camden. IFO is with the Aluminum Corp. of America in Burlington, N. J. JFA is with the N. Y. Shipyard, Camden. AVJ is now in charge of one of RCA's crystal development labs in Camden. Ed was transferred from transmitter engineering RCA to take charge of the crystal engineering section. AVJ wishes to pass along his 73 to all the old gang. JNZ is now proprietor of an excellent radio repair shop in Mt. Holly. IIC and JNZ have "licked" their wired-wireless into shape and are now contacting regular schedules between themselves about 1½ miles apart in Mt. Holly. JNZ is using a 9002 super-regen., and reports having heard Fire Island, N. Y.; also WERS Phila. WKIB and Hamilton Twp. WERS, WKPX. FDF has been down with the grippe. BEI, former So. N. J. SCM, who was laid up with a fractured leg, is back to work again. HEO's ice business is "all froze up" due to recent cold spell. CCO has been assigned temporary duty at Ft. Monmouth, and favored the Delaware Valley Radio Assn. with a visit at the January meeting. BWF now has a partner and has opened up another radio repair shop. JJX, who was stationed at Chicago with IBM, is now assigned to that company's N. Y. labs. GNU recently spent a three-day vacation with AFH in Trenton; "Doc" is chief cook and bottle-washer at the North Longbranch Signal Corps School. The January meeting of the Delaware Valley Radio Assn. was held at the home of L. R. Yoder, Director of Publication, at which several items of postwar interest were discussed, as well as some very interesting suggestions by Lt. CCO, former president, now in the Aircraft Research Signal Service. I would appreciate it very much if the persons who sent in the names of those in the services will also send in the addresses for this column. Thanks again and 73.

WESTERN NEW YORK — SCM, William Bellor, W8MC — So many of the boys in the services have asked about what their old friends at home and in the services are doing, that we are going to try to give 'em a little of that kind of dope from time to time. A nice letter was received from TQU, whose address is J. P. Paone, ART1c (R) USNR, c/o Fleet Postmaster, New York City. Since he's been in the services Johnny has acquired an XYL. JIC is doing war work at his same place of employment, as the whole shop went into war work. OGC is servicing radios at a Rochester radio parts store where ILO and RLI are also employed. MC's Helen is keeping quite busy raising the "harmonics" and waiting for ten meters to open up. She has signed on as WERS operator also. Since the "fatal day" RVM has been all over the States with the border patrol and immigration service; he asks about TEP and all the old 1960 gang. SWC is with the AACS; he says the AACS is a natural for the ham who really likes operating. LSG and MLQ have been in the services for over three years. Ted is in Fla. but tells us MLQ is now a 2nd lieutenant with an APO address. I see an old ten-meter contact of ours, 9VGC, is Acting SCM of Colo., and we are including this just to see if he reads other section's reports. Best of luck and health to you all and we'll be seeing you. 73 — *Bill.*

CENTRAL DIVISION

ILLINOIS — Acting SCM, George Keith, jr., W9QLZ — GSB, Lt. Lou Williams, 0-737917, APO 635, c/o Postmaster, New York City, would like to hear from his friends in the Chicago area. Ex-UPG spends liberty enjoying the sights at Waikiki! NLW is now assistant engineer for U. of I. station WILL. NBX is the proud possessor of a 2nd-class radiotelegraph ticket. JTX/3 is now a WAVE and is kept very busy as radio operator at the Norfolk Naval Air Station. Louise recently held "open house" for all the gals at the comms. office there. She would like to hear from any other girls stationed in the area, or from old friends. Address: Louise Baker, 242B Eilers St., Benmorrell Park, Norfolk 8, Va. WWP/1 is quite concerned with the New England climate. She says that her old home town is warmer than Conn. PGB is in a signal depot doing repair and maintenance work. IAW is enrolled in a course of electronics at U. of I. under KJV, chief engineer at WILL. Together with CCB they are "holding down the fort" at Champaign. IWO is listed with the USNR V-12 program. NOM is an Air Force inspector at Newburyport, Mass. and boasts of an addition to the family — a YL. ICE is engaged in plastics research for Du Pont at Arlington, N. J., and is working for a master's degree in E.E. at Brooklyn Polytechnic Inst. He would like to hear from members of Synton. His address is: Donald R. Mason, 120 Rutgers St., Belleville 9, N. J. The Starved Rock Radio Club decided to retain their club officers for the duration: Pres., NGG; vice-pres., BIN; secy.-treas., QLZ. BIN, at Fort Sheridan, is awaiting assignment to a permanent camp where he hopes to get into radio work. DXR, of Amboy, is now doing his part somewhere in the South Pacific where he reads *QST* regularly. His address is: Cpl. Ivan D. Whitver, 36314611, APO 913, c/o Postmaster, San Francisco, Calif. ODT is still struggling with WERS affidavits. KPC, vice-pres. of the Joliet club, expects to enter the services in the near future. NZU reports that ERU is overseas. NZU, in the Signal Corps at Ft. Monmouth, plans to visit 2IOW–ex-YDJ at the first opportunity. From way down under, JAU says, "We get *QST* here, and boy, even if it is late it is good to read." Chuck requests correspondence from the gang. Address: S/Sgt. Chas A. Burt, 16052672, APO 923, c/o Postmaster, San Francisco, Calif. NGG has trouble with those precious "A" coupons. IVU reports the arrival Dec. 29th of a prospective WAC. IHN promises to mail his yearly contribution to the column some time before Christmas 1944. PHB is in ASTP and has been classified to study engineering. MZW is with the Signal Corps at Camp Crowder. IGD submits the following FB report from the Peoria area: New officers of the Peoria Amateur Radio Assn. are: MXD, pres.; QOP, secy.; QOY, treas. Peoria area hams in the services are: Army — TGC, JJW, LSS, RGF, YVH, TWO, YRJ, BIR, YUK, CZS, SNC, FHR, HVQ, REY and ALU; Navy — IMS, OPS, NLU and HJN. Civil service radio keeps LWB busy. CBJ is in foreign service with Westinghouse, WOQ with RCA, JIH with Collins, ZSL, CZK and QAL with Philco. HEQ is still trying to put a signal into WERS headquarters without relaying through Bartonville. UFF recently received and enjoyed a long (?) letter from CZK. The Peoria WERS rigs are all in order just in case "old man river" decides to test the emergency communications facilities of that area. 73 — *Geo.*

INDIANA — SCM, Herbert S. Brier, W9EGQ — EHT is at the Navy Polaroid School in Lowell, Mass. He spent an evening with YMV in Boston. WXG, RT1c, is an instructor at Radio Matériel School, Treasure Island, Calif. IUM has a new home, complete with room for a 160-meter antenna. IIL is back in Fla., after studying in Canada several months for the Army. S/Sgt. TKV writes from the Netherlands West Indies. He has been there twenty-three months and is chief operator of their radio station. He spends much time listening to the Indiana State Police radio; Columbia City has the best signal. UMK and SNF are in the Army in Tex., but while UMK picks oranges and basks in "sub-tropical sunshine," SNF wades around in snow. LG works in a war plant when he isn't teaching. MDJ visited AB in Dec. Hal is teaching a radio class at Culver. SWH has moved to New Haven. VLI/5KRT, S/Sgt. Bivens, is with a fighter squadron in the Pacific. He reads *The Bison* and *QST* with much interest. TIY sent a picture of himself from Hawaii, where he works for the FCC. EBB, Washington, D. C., wants to arrange a schedule for our first postwar QSO. EOC is the only ham left in Bicknell. JIM works at RCA in Bloomington, and recently got married. ZLJ is working in a defense plant in Evansville. CKY is at Ft. Sutton, S. C. DUT is doing engineering development work on v.h.f. for the government. HZY, ACRT, is teaching radar; in his spare time he is experimenting with electronic keys. VW is communications officer for an Air Force squadron in Fla. SVH claims that KBL used a direct coupled antenna, for he didn't have power enough to climb a feeder. SVH now knows that LSPH means "licensed since Pearl Harbor." YWE is an inspector in an Ill. aircraft plant. PBS still DXs on the b.c. band. His latest is TGW, Guatemala; he is also studying Spanish. WEU grinds crystals for the Army. Vic is also a radio engineer for Gary and Michigan City police. The batteries from OCD finally were received in Jan. Send me a report and get an introductory copy of *The Bison*. 73 — *Herb.*

MICHIGAN — SCM, Harold C. Bird, W8DPE — Tom Dearman of Lansing wrote enclosing a letter from 8QQK, Lt. W. G. Bruening to you privates. Bill is now located in Panama or thereabouts. Tom reports that the Lansing WERS is functioning very well. He uses a TR-4 rig and reports handling the net from his car during one Sunday test period with good reports. The Detroit WERS boys have had their licenses modified so that they are planning on constructing twenty-six mobile units. They report very good results throughout the city. In spite of the slowing up of some of the activities, the radio department has received orders to expand rather than curtail its efforts. The Center Line boys do not report although we hear via the grapevine that they are carrying on with WERS and are reporting very successful tests. Flint has asked for the appointment of an EC in that territory but does not report on any WERS activities. The Pontiac WERS gang has started a school in police headquarters for beginners and those who wish to refresh their knowledge so that they can go out for higher grades of licenses. The control center crystal-control job, which has been entirely rebuilt, has been installed and a test will be conducted in the very near future. 8UGR reports that he has been doing a lot of experimental work and is trying his best to keep articles going in to *QST* to keep you boys on your toes. He has also sent in his EC certificate to be endorsed for another year. We wish others had followed this example. If you hams will send in a post card reporting your activities I am sure that the rest of the gang will follow suit and we will have a regular round table. So why not drop your SCM a card when you read this report and tell him about yourself. We were very sorry to note the passing of our good friend in Mt. Clemens, 8RGV, who was a familiar person at our past hamfests. Remember, you fellows at home, that the bonds that you and I buy are going to bring our buddies home that much quicker, so let's all do our bit. Best of luck and 73. — *Hal.*

WISCONSIN — SCM, Emil Felber, jr., W9RH — The Milwaukee Radio Amateurs Club has received the call WMFI for their Milwaukee County WERS stations. Thanks are due NY, the radio side, whose accurate application was accepted the first time it was sent to Washington. Ensign Geo. Pfister has become a proud dad. Lt.(jg) L. Wollaeger has taken unto himself a wife. T/Sgt. Jim Wolff visited the club meeting; he is an operator on a high speed trans. net. S/Sgt. O. Zander also paid a visit on the way back to Drew Field, Fla., where he's an instructor. ACRM R. Hudzinski's visit home was too short to permit time to attend the meeting. GVL's new job is with the Milwaukee Sanitary Police, as a used vitamin inspector (garbage) and rat exterminator. EEL is an instructor of industrial electronics at the Vocational Night School. SYT is now employed with RVA's field crew. UIT's weight is down to 155 from 250 lbs. and the WPDK gang has changed his name from Blimp to Bunny because of his new carrot eating habit. HRM is the new editor of the monthly club bulletin which is being sent to all members out of town. Any Milwaukee ham may receive it free by sending his name and address to Ervin Kreis, 1632 North 35th St., Milwaukee 8. RM1c J. B. Naugle, jr., stepped off his boat in a South Pacific port and ran into Lt. Comdr. Naugle, sr. (his dad), who he hasn't seen for nearly three years. Pvt. Harvey McDonnell writes from Camp Chaffee, Ark., where he is with a radio service group. PFC. Ray J. Behmke is now transferred to Camp Edison, Ft. Monmouth, N. Y., where he is going to operate a rig. JWT, a captain in the USMCR, is now stationed at the Naval hospital in San Diego. 1st Lt. Sid Rose is in China with a transport group. 73 — *Emil.*

DAKOTA DIVISION

NORTH DAKOTA — SCM, John W. McBride, W9YVF — NYF is with Admiral at Chicago. IEZ is still in Mont. and now has a W7 call. UGC is with Midland Airlines at Omaha. Lt. UGM is stationed in Italy. Pvt. RHV is at AAFTTS at Truax Field, Madison, Wis., studying radio. HDD, RT3c, is attending radar school in Washington, D. C. and has 8NAB as a roommate. YTX and GNS are in Hawaii. UDZ and 4GYO have returned to the good old U.S.A. and are now taking Navy V-12 training at Dickinson. NPX is also at Dickinson. JVP is a lieutenant (sg) in the Navy. RPD is with CAA in Tex.; he is also a representative for a leading radio engineering institute. Bob has just received a silver button for giving five pints of blood to the Blood Bank. Can anyone give me the present addresses of PQW, CHB, MCV, ZLP or any other N. Dak. hams? We received many nice cards and letters at Christmas — thanks a lot. 73 — *John.*

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY—

Nominating petitions are now being solicited for SCM for So. Dak. It's been quite an experience for me and I wish to thank all my friends for the letters, cards, etc., I've received. Reports must be sent to the SCM for our activities column. VOD, ex-SCM, now in Chicago, passes on his 73 to all the old gang. ILL sent in news which arrived too late for last month's issue. He says KYD, IQD, ILL and three other members of the Huron club are active in WERS work. ILL took the 2nd-class 'phone exam and is crossing his fingers. FSX is a corporal in the Signal Corps and is in the So. Pacific. DZD is a sergeant, address unknown. YPC is in Radio V-12 at the U of Wis. Ex-WPA, now 5KSW, is senior flight radio officer with PAA and would like to hear from the old AARS gang. His address is: Keith Maring, c/o PAA, Brownsville, Tex. WUU says he spent a very enjoyable evening on Dec. 17th when he found a Dec. *QST* in their day room. He sends regards to the old gang and is sorry he can't tell what he is doing. He would also like to hear from the gang. His address is: Cpl. Melvin C. Johnson, 17169845, APO 958, c/o Postmaster, San Francisco, Calif. OXC is back in Pierre. He has been with an engineering firm and the U. S. Engineers for the past two years. Thanks again, gang, and keep the news coming. 73 — *Phil.*

NORTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — AVT, now a lieutenant, reports from New York. His full address, and others mentioned in this column, may be obtained by contacting the SCM. GKO, USNR, reports from the other side (San Francisco). AZJ is working for Raytheon at Waltham, Mass. YKD, a lieutenant in a fighter squadron, was sent overseas. RVU is in the Navy at Washington, D. C. KQA is servicing b.c. sets. OOK is recovering from an appendectomy and would appreciate hearing from the No. Minn. gang. He may be reached at 224th Station Hospital, Ward 6, APO 183, c/o Postmaster, Los Angeles, Calif. IZX has completed his training at Camp Crowder, and is now on his way to Pittsburg, Calif. BHY, communications officer of the Civil Air Patrol, advises that wing has received its WERS license, KHBI. The lay-out consists of nine units. MTH and RPT, wing training officer and assistant communications officer respectively, assist in the program. Civilian instructors are badly needed in the code instruction, so here is a chance for some patriotic hams to do a job. ZWW, of the Air Transport Command, is located in the Caribbean area. Your SCM's present address is: 2802 So. Western, Los Angeles 7, Calif. Please keep your reports coming in, and back the ARRL with your continued support and suggestions. 73 — *Army.*

DELTA DIVISION

LOUISIANA — SCM, W. J. Wilkinson, jr., W5DWW — K6SBS was in Shreveport between busses and looked fine. BYY is back to stay for awhile. DKR has been nominated to run along with yours truly for SCM. Gene is a swell fellow and has served as SCM previously so, should he be elected, we will have a capable fellow in the driver's seat. GEK is still around and is trying to get in shape for service with the ferry command. CEW and QH, along with several others, are around occasionally. AYZ was home for Christmas. ZS is still functioning as communications chief for the local OCD. HSH has been transferred to the West Coast with the Navy. The RI, DU, was in to see us this month. You can usually find him on 7 Mc. during normal times. KJE is working part time for KRMD. JFM is now living in San Francisco, Calif. WF is working as dispatcher for the railroad. 73, and buy more bonds during the Fourth War Bond Drive. — *Dub.*

MISSISSIPPI — SCM, P. W. Clement, W5HAV — JNR is now in the Navy radio technician's school at Stillwater, Okla. JXV, a lieutenant in the Signal Corps, writes from somewhere in England. Al would like to contact other Miss. hams who are stationed in England, and I will be glad to furnish his address. AWP has gone back to fixing 'em since his stay at State College. Slim is at the same old stand in Corinth. EWD, an alumnus of State College Signal Corps School, is now G. I. instructor at Scott Field. FQL, another State College alumnus, is in Uncle Sam's Navy. FO is back at his work bench in West Point, after a spell as lab. man at State College. BQD, BYN and C. H. Dyess are with the Chicago and Southern as technicians. MO has a nice position with the Fourth Service Command in Atlanta. GXO is with the State Vocational Schools after his stay at State College Signal Corps School as supervisor. He is now located in Pascagoula with a large shipyard training job. AUB is instructing in radio and electronics at Midland Schools in Kansas City, Mo. FCH, after making his quota of trips as radio gunner, is now teaching the new men in North Africa. HKJ is doing vocational work in Hattiesburg. Elmer is now a 1st class commercial. HQC, who was lab. instructor at State College, bought into a very nice radio repair business in Jackson. EPY is operator of the State Highway Patrol radio station in Jackson. CQJ is chief operator at the same station. HHA is in training at the Spartan School of Aeronautics, Tulsa, Okla. HMV is in the Air Corps as radio technician at Grenada Air Base. JGP will spend a short leave at his home in Biloxi. A recent meeting of the Gulf Coast Radio Amateurs Club was held with half the members present in JH's shack and the others in ANP's shack. Talks were made and club business transacted via carrier current rigs, over a distance of 1½ miles.

MIDWEST DIVISION

KANSAS — SCM, A. B. Unruh, W9AWP — ESL changed from K. U. to Notre Dame U., where he is teaching math to Marines and Navy personnel. WIN is teaching CAA school in addition to other duties. PAH was transferred to research staff at KSC. OTV was home on furlough. TYV says, "This Navy is a pretty good outfit, and the food is especially good." UWN says that away back in '42 he purchased some big bottles for a kw. CKV taught in ground school WTS for over a year. He is now 1st lieutenant (group communications officer) with CAP and also does repair work. VEL says he is still "skipper on a local train" and will be glad to get back into the Army net. KCS denies being married — says he's still "shopping around." OZN is still at Camp Blanding, Fla. with the Signal Corps. QEF reports doing OK in the Navy radio school. VPK is in the Army at Camp Adair, Ore. He reports JXI is now a 1st lieutenant. DKB is still servicing radios and farming in Western Kans. PSE/VWT is now a 1st lieutenant in the AAF stationed at Tarrant Field, Ft. Worth. He is officer in charge of radio. CX2AJ sends greetings and says, "Hope to see you on the air again after victory to the democracies in 1944." FWY is now associate radio engineer (P-3) and still in Philadelphia. WQN is ART1c at Corpus Christi teaching radiomen. OZF is now in the armed services, according to FWY. YUQ is working at the Navy Labs in Washington, D. C. DMF, formerly in Boeing's pre flight inspection force, is now in the engineering department. QQT is foreman in Radio-Electrical functional test. LFB resigned his job with KG&E to take charge of radio at KGPZ. BCY had an addition to the staff — a new YL jr. operator. Let's hear from you. 73.

MISSOURI — Acting SCM, Mrs. Letha A. Dangerfield, W9OUD — QDQ, USNR executive officer, would like to hear from DDX, KIC, KCL, KG and others of the K. C. gang. OKF has been transferred by the CAA from Watertown, S. D., to St. Louis as senior radio electrician. GCL has received a similar transfer from St. Jo. to St. Louis as senior radio technician. They would like to contact some of the St. Louis boys. The 160 'phone gang will regret to learn of the death of AWE of Osceola. Mac started hamming in 1924 on 160 'phone and has never strayed far from that band. He was seventy-four years old. His death was reported by DCD, who had known Mac for twenty years. NSU is waiting patiently for warm weather and doing a little special monitoring. Here's hoping it is not straying too far into Iowa's preserves if we mention a letter from GP. Gramp says he gets to Omaha very seldom these days — he is kept pretty busy getting out a thousand papers a week without help, not to mention scrap drives, Red Cross, and so forth. Jim Harvey, RM2c, has received an appointment to the Fleet Service School in Norfolk, Va., and is studying radar. Jim has operated for quite a while but has only an operator license. He says most of the instructors at the school are hams and 1NEU, 4GVX, 8VPV, 9UQP and 9NRC are in his class. In Brazil he met PY7CP and PY7BE. The former is the owner of one of the largest dry goods stores in Recife and would like any of the fellows who are in that city to look him up. ARA was back in Butler for a short time after being in Calif. with his crystal plant and store in Los Angeles for some time. BMS says OUD is turning out to be a pretty good cook for a ham, considering rationing, and so forth. Good luck to all of you and let's have some letters. 73.

NEBRASKA — SCM, Roy E. Olmsted, W9POB — I have had quite a number of requests for the addresses of Nebraska amateurs who are in the services and, in many cases, I am unable to comply. When reporting your news, please try to give me call letters and full addresses of all amateurs so that I can pass the information along to others. I will give you, in this column, as many addresses as I can. I am keeping a file of all letters and news reports received from our fellows in the services, which I expect to put into some kind of published form to record the work and glory of Nebraska amateurs and war-trained communications men. Toward that end, I am very anxious to get all the letters, reports and data that you can send to me. If you read this CQ or hear about it, drop me an occasional note from any spot in the world — V-mail preferred to save space. YOP, assistant airways engineer for CAA at Anchorage, Alaska, recently encountered one of the hazards of Alaskan travel. While enroute by air over rough country his plane was forced down in an inaccessible mountain wilderness. Merwin Markland, S1c, ITS, writes from 1024 South Coast Blvd., La Jolla, Calif., to say that he is cooking for the Navy but hopes to get into radio before long. He has heard from only one ham, LOC, since joining, but wants to get word from other amateur friends. Cpl. Merle Nelson, ZFC, is located at Hq. & Hq. Sq. SASC, McClelland Field, Calif., and writes to commend this dope sheet; he says that the AAC keeps the boys on the run too much for them to carry on any correspondence. SYM is working in the California shipyards, but lack his QTH. VAS writes from Columbus to lament that no nominations had been made on the first call for Midwest director. T/4 Don Grenseman, TRK, V-mails from sunny Italy that he gets to read *QST* over there and enjoys the state news very much. He would like the present address of John Jacobs, CSW, of Crete. Will somebody please comply? Our old AARS friend and former net control of both Army and Navy nets, Lewis Cook, ARM1c in the Navy, writes that he is in dry dock at the U. S. Naval Hospital, Ward 8, Seattle 9, Wash., and expects to be there for the next few months. He is anxious to hear of or from a Navy pal, O. G. Hoffman of Hickman. I hope one of you fellows can attend to this matter and I know he would enjoy hearing from any of his old gang. I have just received an FB Christmas greeting and letter from CX2AJ, famous for his wholesale QSOs from Montevideo. Emil is back in Ogalalla, safe and sound, still wearing that seven-strand scalp lock. Regards to all. — *Pop.*

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — GRS has moved to Los Angeles because of his XYL's ill health. EEM, Waterbury district radio aide, and NGQ, East Haven EC, were both presented with daughters. A pleasant surprise in the form of a Christmas card from our old friend CX2AJ was received at our QTH recently. MJC has passed her examination for restricted radiotelephone permit and is now working at the broadcasting station in Kingston, N. Y., where 2MYW is chief engineer. LFL furnishes the following notes: KSH is a lieutenant in the Signal Corps stationed at Tex. KSC is starting aviation cadet training in N. C. after service as a radio operator for several years. AVS is a lieutenant on special duty near Washington. FDU is chief operator at KGCX in Mont. MXZ, RT1c in the USN, was recently married while home on furlough. FRK is in the radio service business. HKF is serving overseas in the U. S. Army. MPO is a technical sergeant in Sicily. EKD, a corporal at Camp Gruber, Okla., said he hadn't seen any radios so a friend sent him one to fix. T/Sgt. LFK is now in England after 2½ years service in this country. LLM, RT1c in the USCG, is instructing in radio at New London. LFL, after eighteen months as a radio instructor of YLs for the Signal Corps, is going to sea as a radio operator in the merchant marine and would like to know the whereabouts of JRT, JZJ, KGL, KSH and MXZ. We would also like to hear from them and will publish their QTH when received. JHN has been advanced to chief boatswain mate in the USCG. At a recent surprise statewide blackout we were pleased to see that thirty-one WJLH units were in operation. The WJLH district has been averaging thirty-five units and fifty operators during each test period. 1st Lt. Haight of the SG-WERS in New Haven is rapidly making progress with the units in his company. The New Haven Amateur Radio Assn., GB, continues to hold weekly Friday meetings. TD, the president, extends an invitation for visitors to attend. 9ONW, YL instructor for the AAFTC at Yale, will marry Lt. Mark Guera, one of her pupils, in early Feb. They will live on the West Coast.

MAINE — Acting SCM, G. C. Brown, W1AQL — NBK has been reappointed EC for Houlton. EEY has received his reappointment for EC. There must be more whose tickets need the signature of your SCM for endorsement. What say, fellows? BPX is holding down the spare trick at WABI. DAS was home in Ellsworth on shore leave from Trinidad. PQ has gone overseas. QH recently spent a few days with his family in Bangor and left for Norfolk, Va. MN is an instructor at a Naval station in Tex. JTH is a technical sergeant in the Maine State Guard. MDM is in training at Fort Monmouth, N. J. JSY has a new jr. operator, and is teaching a class in radio at the high school. The news this month came mostly from letters received from NBK, EEY and JSY. Thanks a lot, fellows. What about the rest of you fellows? There was no report last month because your SCM was attending a teletypewriter school in Shawsheen, Mass.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — Lindsay Russell, EC for Needham and Dover, reports that WKYG recently had its license modified to include two more stations and also has two more operators, Roger Wye and David Hafley. GAG, director of radio communications for the Mass. Committee on Public Safety, has asked KTC to help him out as deputy regional radio representative for region 5. Kay asks for the coöperation of all radio aides and ECs in this state and says that he will coöperate with everyone to the best of his ability. He has appointed an advisory council to assist him as follows: Lt. Col. MacAdam, ZK, of the State Guard; Capt. John A. Doremus, 3EDA/1, of the Civilian Air Patrol, and myself as SCM for this section. The South Shore Amateur Radio Club held its first meeting in over a year with the following members present: WK, AKY, CPD, CPB, HRF, IHA, CCL, MMH, MGV, LAT, LZW and ALP. It is planned to hold meetings at the Quincy YMCA on the first Friday of each month. Any hams who are around are welcome to attend. CCL is now working at Harvard. LWQ has moved to Florida on account of his health. A very interesting meeting was held at Harvard in Dec. sponsored by Commander John L. Reinartz of the Naval Research Lab., with a description of some captured enemy communications equipment by Raymond A. Gordon. Some hams present were: QT, AKY, BB, BDU, DFS, CGM, WK, JSM, DWY and 8VVN. We are sorry to report that JXU is back in the hospital with malaria at Phoenixville, Pa. DIR is going back to the Bronx Hospital in Bronx, N. Y., for further treatment. DBD reports that he is not in the Army but is still at his job with the Signal Corps in Boston. DID has been doing some traveling through the South; he is working at M.I.T. 9GSQ is a lieutenant in the Navy at present located at M.I.T. JOJ, who is at M.I.T., got married and moved back to Dorchester. KQJ now has an XYL. FI is somewhere in the Pacific. SL has gone to Fla. for the winter. Frank Freeman of KMF is now in Conn., in the Army. IYK and HXM are still at their jobs. Ex-HCR and 2FRD are also working at M.I.T. We are sorry to have to report the death of GVF, who was working with Pan American Airways. He was well known around Boston and was connected with WNAC for some time. FVJ is working in the Middle West. IMS is a captain in the merchant marine and a lieutenant commander in the Naval Reserve. At present he is on the high seas, but was home for Christmas. LDV sends a V-mail letter from the South Pacific. We hear MVF is a cook in the Seabees. HX writes from Patterson Field, Ohio, and says he had a letter from ZW who was in London. A few weeks ago on the "Army Hour" the program was switched to La Guardia Airport and who should come on the air but MZE, who is now communications officer there. He says any hams going through should stop in and say hello. FPU is a 2nd lieutenant in the Army and is now in the Pacific. JKO is a captain in the Army, also in the Pacific. Art Blake of Rockland is in the Air Corps. HM has been married for some time. LXU, a 1st lieutenant in the Army, is now down in Tex. KRL was in the hospital for awhile and is now in Md. BTL is in the Pacific. JKR is traveling all over and says he has met hams from everywhere. MUT is in the Signal Corps attached to the Air Corps at Pendleton Field, Ore.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ — MUW and JMY were recent visitors in Manchester. JKH tells us that Laconia was "snowed under" recently by a big storm, and they had quite a job digging out from under. APK squeezed out enough time from police duties to shoot a buck deer. CEA and IDY had their annual meeting of charter members of the Farmers' Net. ILN is stationed at Presque Isle. KMH writes that he has 2nd-class telegraph and 'phone licenses, and has joined the Maritime Service. CME has been quite ill. LVG thinks that postwar hamming should include plenty of work on the s.h.f. ATE is stationed at Pearl Harbor. APQ is in England, according to word received here. FTJ was glad to hear from some of the boys this month. Keep the news coming, fellows, for it's only with your help that N. H. news can make a good showing.

VERMONT — SCM, Burtis W. Dean, W1NLO — A heavy snow storm during Thanksgiving week disrupted local telephone and electric service in several communities throughout the state. In a couple of instances a local set-up on 2½ meters could have been used to advantage. We should have some facilities for local set-ups to provide emergency communication during natural disasters. Give this a thought, gang. MXG visited your SCM while on a trip to Fort Ethan Allen to dismantle the electric organs. NJP writes from somewhere in England. Sid's address is APO 514, c/o Postmaster, New York City. MET is also in England and his address is APO 638, c/o Postmaster, New York City. MIH is doing radio service work in Hyannis, Mass. Bob was home recently and on his return trip to Mass. met CBW on the train. BOB has his 3rd-class 'phone and expects to go up for Class A and 1st-class 'phone tickets soon. EKU is in the Army at Fort Crowder, Mo., taking his basic training. CGV is awaiting a call from the Navy. Dick Evans (LSPH) and XYL were home for a few days and visited friends in Burlington, Colchester and St. Johnsbury. Dick is an instructor at the AAF Radio School at Scott Field, Ill. L. Edwin Rybakiewicz (LSPH) is working at the WCAX transmitter, Colchester. Ed attended the NYA Radio School at Waterbury and has a Class A ham ticket, 2nd-class telegraph and 2nd-class 'phone tickets. The Pilot Training Division of Northeast Airlines at the Burlington Airport has folded up. HLH has gone to work for Bell Aircraft. JKF has left for Presque Isle, Me., and 9TGI has returned to Chicago. AAJ is working in Waltham, Mass. LML, former chief operator at Fort Ethan Allen, is working for the National Co. in Waltham, Mass. Norma Remily (LSPH) spent Christmas in Burlington. NPM and family spent Christmas in Maine. LPL is working in Springfield, Mass. KUV is working on radar for the Navy. Thanks, gang, for those FB letters and cards. 73 — *Burt.*

NORTHWESTERN DIVISION

MONTANA — SCM, Rex Roberts, W7CPY — I hope, fellows, that you all made a New Year's resolution to keep your SCM better informed during 1944. BCE is doing radio service work in Olympia, Wash. HCV is now in San Bernardino, Calif. CT is enjoying a much-earned rest and is stationed at Miami after two years at sea. AQK is now at Troy, Mont. ANT visited in Great Falls. HZJ, in the WAC, is stationed at Greenville, S. C. GBI is now a lieutenant in the ATC and is overseas. CC is in the Naval Reserve and is overseas. 73 — *Rex.*

OREGON — SCM, Carl Austin, W7GNJ — Thanks to HVX for the following dope from Portland: HTC is trying for radio with the Coast Guard. ESL's call on the restroom wall was followed by other calls until about a dozen hams were discovered at the Willamette shipyards. They are planning "The Restroom Radio Club." DZD may go to Alaska for radio work. It is rumored that HXG bought a NC200 — anyway GSH sold one. It is alleged that HSZ has left KGW and joined the Navy. He was on duty when fire took out the KGW control room, and he succeeded in getting the station on the air in ten minutes. FAL has moved to Molalla and has 240 acres and ten thousand cords of wood. HJI has acquired a movie camera and a recorder, and has bought a home near Portland. He is on the swing shift while the XYL, Beth, is teaching school. GLF writes that he is a corporal with ACS at Sitka. ENU and her jr. operator are in Portland, but her OM, DIS, is still in K7 land. After nearly two years, he broke down and wrote to GNJ/HHH. IM is tech. sergeant in the ACS, somewhere in the Aleutians. If anyone knows the whereabouts of HCW or GXI, please notify GNJ. 73 — *Carl.*

WASHINGTON — SCM, O. U. Tatro, W7FWD — From reports received Everett has the most active WERS in the state. The gang holds drills regularly, experiments with radiating systems and is now using i.c.w. as well as 'phone. Another activity is the policing of the high frequency bands in the vicinity and warning of possible penalties for violations of FCC rules to those not familiar with them. This commendable work has had satisfying results. The newest prospect for WERS license is Bellingham. Seattle's license is pending. Bremerton is organizing. Interest is lagging at Olympia. ECA is in charge of radio at PSNY lab. EYE is with ECA but commutes from Seattle. GP is still with the Air Force as a civilian at Boeing. K7JCO is out from Alaska for a short visit but is returning to the Aleutians. CQK, lt. (jg), USNR, at the Naval Research Lab., Anacostia, D. C., says Navy schools are the best in the world. HBG is working for the Army at Boise, Idaho. DPU is back in Concrete for a holiday from teaching at Corpus Christi and IOQ says, "Bob wouldn't trade his experiences for a million." GUI, former instructor of radio training at Seattle under the V6 program of NYA, is now an electrical engineer for a Seattle house that is building high speed radio and teletype equipment for the war program. GGO is moving back to Paine Field. 73 — *Tate.*

PACIFIC DIVISION

SANTA CLARA VALLEY — SCM, Earl F. Sanderson, W6IUZ — BYY is now a lieutenant colonel in the Marines, back home on a visit after twenty-two months' action in the South Pacific. Robert V. Klein has been promoted to a captain and is teaching radio at Fort Sill. DBK, CRM, home on a visit after seeing nine months of action with the fleet, is getting acquainted with his new son, 4½ months old. DJP is radar repair man in the submarine service. CRK and MOV are going to town in the South Pacific. FMT is located at Riviera Beach, Fla. Remember, you guys, that V-mail goes both ways, so let's hear from you. The address is 600 Acacia, San Bruno, Calif. 73 — *Sandy.*

EAST BAY — SCM, Horace R. Greer, W6TI — EC, QDE; EC v.h.f., FKQ; Asst. EC v.h.f., OJU; OO v.h.f., ZM. Another WERS meeting was held Jan. 21st at the Oakland City Hall. These meetings are held the third Thursday each month, according to EE, radio aide for KFMY. After almost two years the Mission Trail Blazer was sent out in the form of a special edition to the members of the Mission Trail Net. ANR'S QTH is: Permanente Cement Co., near Carputino. AVZ is married. AUZ is with P.G. & E. TSQ is a corporal in the Marines. INU is in the USN. IZM is a civilian employee in the radio department, Sacramento Air Depot. JB's new QTH is Sacramento; the state highway maintenance of radio is keeping him busy. JSB is doing radio war work in San Jose. JWF is a staff sergeant in the AAF. LJX and PZU are at M.I.T., Boston. KZF is a corporal in the Army. LES and LOZ are in the U.S. Navy Radio Lab. in San Francisco. NTU and OAO are at the Naval Air Station, Alameda. PTO and BF are in the Signal Corps. QDE is at the Ford Plant, Richmond, doing radio work on tanks and jeeps. SHM is in the Signal Corps. SPP is a corporal in the Signal Corps. ZM is now repairing elevators and puts in twelve hours a week with the USCG.

MRQ is a sergeant in the Signal Corps. LYQ is Tech. 4th Class, Field Artillery, Hawaii. CVL is making crystals for the Army and Navy with a local firm. RQL is working in a mine. TI was recently elected as chairman of labor-management at Hurley's, where he is employed in the electrical department. GEA is about to become a papa for the second time. AM was a recent visitor to these parts. On Dec. 9th one of the worse wind storms ever to hit these parts almost tore up the place. In the wee early hours a fire started over the hills and was out of control for hours with the possibility of destroying East Bay. OCD called out WERS and the following gang did themselves proud in carrying out all orders given them: SFT, AUZ, SQ, BBJ and P. Coggeshall. EE was ill so AUZ took over control of KFMY, Oakland WERS. The East Bay gang of sixty-two members have done and are doing an outstanding job for WERS. Another Day Closer to Victory. — *TI.*

SAN FRANCISCO — SCM, William A. Ladley, W6RBQ —Asst. SCM, 6GPB; ECs, 6DOT, 6GPB, 6RBQ; Asst. EC, 6WN. 9ICN (husband of 9ILH) is taking a special radio course at Treasure Island. 9ILH arrived in town last week with her mother to keep house for Dale, who is a corporal in the U.S. Marine Corps. Carrie has already inquired about WERS. The Marin Radio Club held its yearly evening banquet at the Travelers Hotel, San Rafael, on Saturday, Dec. 18th. Director McCargar was present and addressed the group. Ex-Director AN also gave a brief talk. Club President OKB acted as master of ceremonies and kept the ball rolling. Lt. Russ Hanlon, USN, KJ and KZP manned the moving picture machine showing Field Day pictures of the San Francisco Amateur Radio Emergency Corps for the years 1940 and 1941, as well as old-time movies of the San Francisco Radio Club taken back in 1926. The following were present and a grand time was had by all: EY, Mrs. EY, AN, ZI, IBA, BFZ, SG, Mrs. SG, MUF, MRZ, UKO, Mrs. UKO, KNZ, Mrs. KNZ, GZE, Mrs. GZE, PAZ, Mrs. PAZ, FVK, Mrs. FVK, HVX, Mrs. HVX, JTP, Mrs. JTP, TIJ, KZP, KJ, RBQ, OKB, Mrs. OKB and Lt. (sg) T. J. De LaSaux, USNR, and wife. GPB and PVC were unable to attend because of illness. Warrant Officer Ken Hughes, CIS, is back in town on a two weeks' furlough. Several incident drills have been held by civilian defense authorities recently and WERS was used extensively with good results. RAH passed through here on his way west; he is a field engineer with Raytheon and is also the proud father of a new six-pound boy. News comes from PIV at Sacramento that LLW is still at Salinas and KME is a 1st lieutenant instructing flyers at Minter Field near Bakersfield. MZ has been laid up with the flu. DAV, of the S. F. Radio Co., is active in WERS and has contributed a lot toward its advancement. KNH has a new 2½-meter rig on WERS with separate receiver. SFW, who is doing his bit as technician for the armed forces at Bremerton, Wash., reports as follows: "STE is in England. ROO is a first sergeant and is in the South Pacific. Alex once operated at WVY, Presidio of S. F. STG is in the Navy and is doing duty at Spokane as a Seabee. TQT is in the Signal Corps and is taking training at Farragut, Idaho. SOM is a radio technician first at Radio Labs. in Norfolk, Va. RZC is a foreman with Heintz and Kaufmann. LDP is home on vacation from San Diego, Calif., where he is doing radio work for the armed forces. MTJ, formerly with Zach Radio, S. F., is with the United Service Command at Centralia, Wash. JWN is a radio instructor at Davis, Calif., with the Signal Corps." Richard Esenault, a member of zone one, S. F. WERS unit, bought a new TR-4 and is now active in WERS. I will appreciate news from as many of you as possible. 73 — *Bill.*

ROANOKE DIVISION

VIRGINIA — SCM, Walter G. Walker, W3AKN — EOV is a radio electrician with the CAA headquarters at Lynchburg. His sector includes: Danville, Gordonsville, Blackstone Army Air Base, plus Lynchburg. He is quite interested in the ultrahighs and c.c. operation. Perhaps some of the boys at any of the above mentioned places may be interested also. HNU is attending the anti-aircraft artillery school at Camp Davis, N. C. 73 — *Walt.*

ROCKY MOUNTAIN DIVISION

COLORADO — Acting SCM, H. F. Hekel, W9VGC — FHC reported from Venice, Fla., and later from the 303 Sv. Gp., Tinker Field, Oklahoma City, Okla. He sends his best regards to all the gang. UPT reported from Bisbee, Ariz.; he is stationed at the Douglas Air Base and is working with 6OBJ and 6QVO. Lawrence A. Munson reports that he has been moved from the Lexington Signal Depot to the Signal Depot at Baltimore, Md., where he is doing the same kind of work. His brother, FPG, is stationed at Ft. Benning, Ga. BFQ, J. E. Wehner, jr., APO 935, c/o CAA, Seattle, Wash., is pounding brass for the CAA and thanks ham radio for his swell job. He sends his best regards to all. EEC, Corp. Edward A. Zobec, APO 256, Camp Cooke, Calif., is interested in hearing from his friends in Colorado Springs, Colo. He has been working with f.m. stuff and has some ideas about it that may be valuable later. Ex-SNB's new address is Bob Landing, Navy 28, c/o Fleet Post Office, San Francisco, Calif. He reports that he will visit K6MVV soon, that REU is awaiting his discharge from the Navy, and that he had met ZOD, RM1c. Bob has a new RME-43 receiver. Many of you who used to work 28-Mc. 'phone should remember 8MC, ex-EBS, Bill and Helen Bellor, Rochester, N. Y. The stork, in making his daily rounds, stopped at their house and delivered two little girls. They will be seven months old Jan. 18, 1944. Bill is SCM in his part of New York State. MGX reports the following about the Grand Junction gang, better known as the Western Slope Radio Club: "GMB is somewhere in the So. Pacific with the Marines. GWK is in the Navy and recently got married. GDC is looking for 2000 ft. of 00 copper wire for his coal mine. GMB is now a top kick in the Marines. FQT and GLT are on freight runs and MGX is on a passenger run to Denver. The WSRC is still hanging together, mainly through the efforts of the XYLs. Ex-LFS, now a W6, is general agent for the M & St. L. in Denver. George Davis is a dispatcher for the D & SLRR in Denver." JBI was in Denver for the holidays and is looking fine. LYJ is the proud papa of a new baby girl. The Electron Club of Denver is still doing business but the January meeting was called off as QYT, the president, was called to Longmont to visit his mother who was ill in the hospital. 73 — *by Heck.*

UTAH-WYOMING — SCM, John S. Duffy, W7DIE — Wyoming: Cheyenne WERS license, KHCW, was issued last August. The radio aide is 7GDI; assistants are 7EUZ and 7BAH. Twenty-eight WERS operator permits have been received and eight more operators are being trained. 7DIE and 7BFC are jointly studying radio engineering. Utah: 6STB writes from Hawaii, giving dope on some of the Utah gang. 6STC is in the Army Air Corps, stationed near Denver, Colo. 6MAV was in Hawaii, near 6STB. 6MSY still works for the railroad. 6PWH is stationed at San Francisco with Pan American Airways. He has recently acquired an XYL. 6STB has met K6LKN and K6MVV, and has taken a few color pictures in the islands, which he promises to show the gang when we hold meetings again after the war. Many thanks for the dope, Carl, and we would like to hear from others in Utah and Wyoming. — *JS.*

SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — Acting SCM, M/Sgt. James W. Marley, W4EW — The pre-flight school at Maxwell Field has several old-timers and two newcomers to hamdom. Your ASCM is in charge of the code school. HKG is now a captain and is assistant senior code instructor of both wings. 1BN is one of our chief code instructors. 1JOS is doing a swell job maintaining the equipment of the school. 9MIC is a sergeant in charge of maintenance at wing 2. GKU is stationed at Courtland, Ala. GKZ is pounding brass on a 40-kw. rig somewhere in Australia. GGC was with a tube concern in Ky. DPX has been transferred from Maxwell Field, where he did a swell job for the 4th com. FUM is stationed in Miss. FVS is still turning out lumber for the war. 1JOS had a nice rag-chew with 3BEQ's son, who is a cadet here. 8JKN is supervisor of instruction in meteorology. 9RGF is a radio instructor in the ground school. 9HM is an instructor in aircraft identification. K6NIN is a flying instructor in the B-24 school. Cpl. R. Plak, of Dayton, Ohio, and Sgt. J. Presti, of Brooklyn, N. Y., are waiting to get on the air with their new tickets. Send all the dope about the job you are doing in the services to GBV, and let's have a swell report for next month. Hope to see you all on the air soon. 73 — *Jim.*

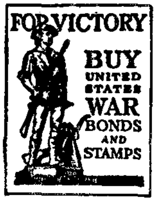
WESTERN FLORIDA — SCM, Oscar Cederstrom, W4AXP — GBM is back on duty. Charles E. Swick, ARM1c/L, paid AXP and the gang at N.A.S. a visit while on leave from his station in Tex. Roger Mangold came in from Corry Field. Lt. Tompkins, PE and AXP have personal rag-chews quite often. Ex-6BRG, lt.(jg), had a battle with a cold or the flu but is on the job again. A nice letter was received from H. M. Chaney, ARM2c/L, now in Alameda, Calif. Lt.(jg) Eddie Collins is still at Corpus Christi. DAO had a letter from him. BQK has two race horses now. He is a civilian airplane pilot besides being a ten-meter band 'phone fan. EC is assistant supervisor at A and R Radio Shop at N.A.S. Lt. Comdr. Pickett is taking a refresher course. KB, Jimmie and Myrt sent us a nice letter with wishes that we would soon be back on the air. AXP had a tangle with the flu but is back on the job now. Sallie Walker is with us again at N.A.S. The ensign bars and stripes look becoming on her. Sallie and AXP share the same office. The Radio Gang has moved into a new shop and it's a pippin. AXP built an electric phonograph from the ground up and fixed plug in connection to radio and can fade radio in or out as desired. FIO, one of the civilian radio instructors, has moved to 1400 E. La Rua St., Pensacola, and will be at home there to visiting hams and friends. QK is a new poppa. Bayou partly froze over here this week, which is very unusual for this part of Fla. Let's have your news, comments and criticisms. 73 and luck. — *The Old Maestro, AXP.*

GEORGIA — SCM, Ernest L. Morgan, W4FDJ — HYW is in Alaska. GPC is in the Navy in the Pacific area. DIZ may leave FCC for the Marines. GQD is RT1c. Wayne Street is going up for V-12 in Feb. DAA and WZ are with WPDQ at Jax. FWD is now a registered engineer in Atlanta besides being radio aide for WKGO. 73 — *Pop.*

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, H. F. Wood, W6QVV — SYP writes from Italy telling a bit about his activities in the Signal Corps; the letter was censored by 2ARZ. Also a nice card was received from MFJ, who will have a lot to chew the rag about on his return. UQL and SSU managed to be home at the same time and with AEL quite a gathering was had. AM reports for Long Beach that RO now has thirty-seven licensees in their outfit under KGWE and they have been very successful in their drills. Don checked in ten units in six minutes at a recent drill. KGIC, Inglewood, has been very active. Their radio aide, MSO, says they now have eighteen units in their group and he sent me a list of eighteen hams, including a W5, that are actively participating. RNN is still clamoring for word from other clubs, so that ideas might be exchanged and that a closer welding of the ham fraternity might be made during these trying times. IFB

(Continued on page 74)



THIS IS AN ANNIVERSARY. Ten years ago this month, we began using this page to discuss technical matter of interest to amateurs and to bring to their attention various ideas and suggestions that we thought might be helpful. We hope that we have filled this specification.

Looking back over the pages of *QST*, we think perhaps we did, for the subjects covered a wide range and we tried to put interest before advertising value. We felt that whatever helped the amateur would help us, so all was grist that came to the mill. For instance, number 15 back in May, 1935, was devoted to electric meters. We have never made meters and probably never will, but we felt impelled to pass along some pointers. We told how a steel panel can make a meter read as much as 20% low, we discussed the hazards of taking a meter apart, and made suggestions on the use of shunts and multipliers. One meter manufacturer wrote us to ask "How come?", and looking back it does seem pretty darn altruistic of us.

Somehow or other, number 48 (February, 1938) seems to us to have been the ultimate folly. In this page we introduced the NC-600 neutralizing condenser, but we devoted the entire space to telling why no amateur needed to buy one. We explained how two pieces of bus wire insulated with spaghetti could provide the required adjustable capacity. We described the screw-and-penny technique. Apparently it was to no avail, for NC-600 still sells briskly after six years. Sometimes we wonder whether this is a reward for frankness, or whether it merely means that amateurs do not believe what they see in print.

Once in a while we handed ourselves a large bouquet of roses. Thumbing through those old issues of *QST*, we found ourselves blushing now and then. Usually it was because we were carried away with enthusiasm for something new, but looking back our enthusiasm seems a little unbridled at times.

We wish we could still write the same kind of a page, but conditions are different. We are helping to win a war now. We are not allowed to talk about the important jobs that we do, and we do not have time to work on gadgets. Amateurs do not spend their evenings in the shack either, these days. They definitely are doing a job. Some day the story of the job they are doing can be told, and we hope that this page can help in the telling.

In the meantime, we will keep this page as interesting as we can and will continue to provide whatever is of technical interest to amateurs, even — so help us — if it turns out to be pin-up girls.

GENE SIMMS

Amateur Activities

(*Continued from page 78*)

has been through the Aleutian Campaign. RNQ is RT1c in Sitka. QVS was last heard from "somewhere in or on the Caribbean." The Inglewood Club wants to go on record as being 100% behind George Hart's plan for an AWEC. GVT, radio aide for the County of Los Angeles, states that under the call letters of KGCL there are now forty-two stations operated by fifty-two operators and that during the next three months they plan to have fifty-six more stations ready for business. KGLV, Los Angeles City, has proven itself before the "powers that be" in recent demonstrations and the roster is about full now with application for modification of the license to include better than 135 units. Tests are being run regularly and it won't be long now. QJW, an aviation cadet at Yale Univ., recently paid a visit to ARRL Headquarters. He may be addressed at: A/C H. F. Shepherd, jr., 19100776, Sqdrn. O, Class 1944CL, Tech. School, AAFTTC, Yale Univ., New Haven, Conn. SMC would like to hear from any of his pals in any of the services or at home. His address is: Lt. J. T. Gaffey, APO 520, c/o Postmaster, New York City. Give me some news. 73 — *Ted.*

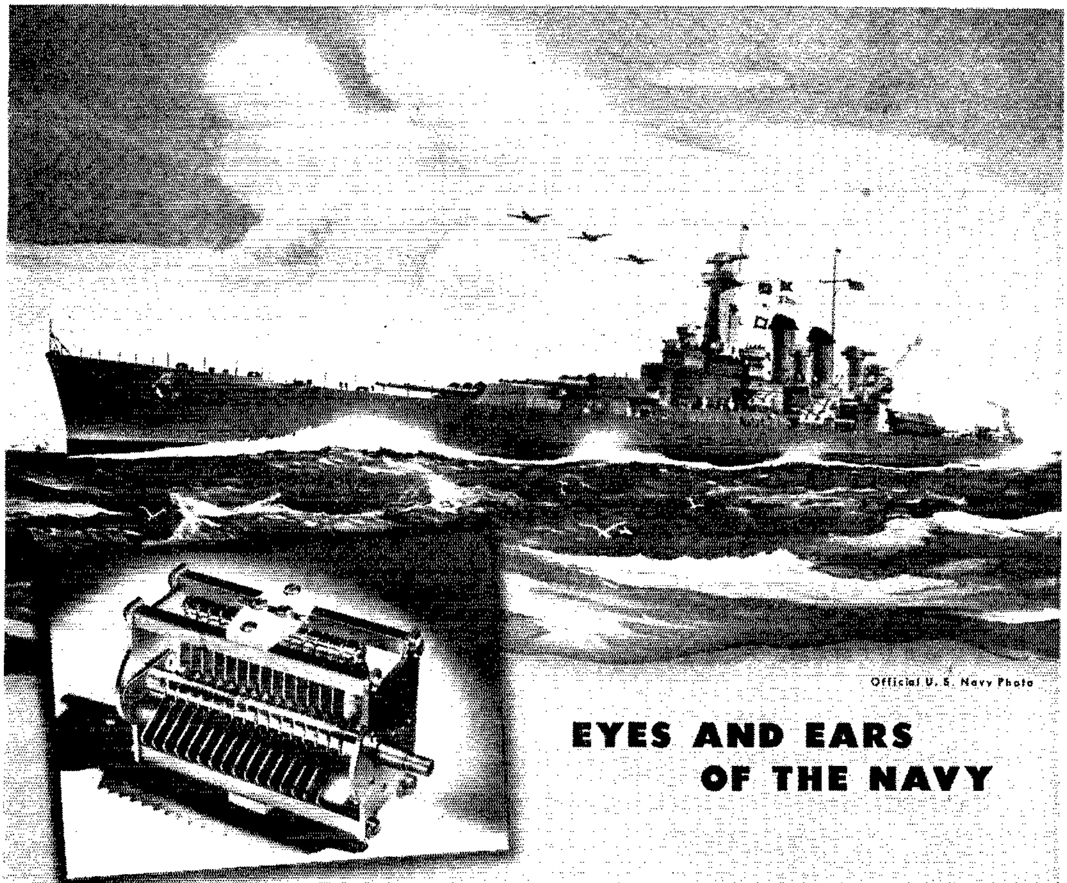
ARIZONA — SCM, Douglas Aitken, W6RWW — A nice letter was received from RJN, who is seeing a lot of the country as radio operator for PAA. QUP has taken a job with American Grace Air Lines and is in South America. UPF is now a flying cadet. UNY has joined the Navy. OZM has been installing a public address system at one of the air bases. GS says *QST* is on the "best seller" list at the air base where he works. The Tucson Short Wave Assn. sent cards to all their members, scattered all over the globe. SOB still dreams about being on ten again. QLZ is now an active member of the Salt River Valley WERS and his expert knowledge of the very highs is a big help. MDD has joined the Navy as metalsmith 1/c. FZQ hopes to go to radar school. TYD, in the Marines, is doing a tour of deck duty. IXC is too busy with railroading to even remember the good old days! JFO is snowed under with BCL radio repair work. TOZ is taking a Navy course at the U. of Calif. and says they sure pour it on. UKB is at a small Navy base, but hopes to get an assignment to a torpedo squadron. HBR is an instructor in a Navy school in Tex. We are still anxious to hear from more of the gang. 73 — *Doug.*

WEST GULF DIVISION

SOUTHERN TEXAS — SCM, Horace Biddy, W5MN — We would like more reports from the fellows. BD is still dividing his time between the farm and sailing the seas as a radio operator. BTK reports from San Francisco, where he is radar-ing. Ex-EDD reports that ex-DLZ–WLJN, now 4HBN–4HFT, has been on foreign duty for quite some time. Capt. Biggs' address may be had from ex-EDD, 1802 William St., Valdosta, Ga. Ex-CBF, now 4HNT, wants to be remembered as a native of San Antonio and is now in D. C. where he is doing duty as a captain. Bradley (WO), who swung a mean bug for WLM in the good old days, reported from New Orleans and a short time later reported from somewhere in Britain. HNH sends in dope to the effect that ITK was last heard of in the Army in Greenland. FNA sends a nice censored letter from Iceland. FAJ, coming in R9 via V-mail, reports that he is doing a little flying for Uncle Sam down South Pacific way. FEC writes from Okla. City where he is doing some control tower work for Douglasair after a spell in the Signal Corps. S/Sgt. Parsons is teaching at present in N. J. Alex Fabris, at Yale, boning up to become a lieutenant AAC, and Calvin Graf, Marine corporal at Corpus Christi, are doing nicely. 8NEM was in the Temple, Tex., hospital for a while but is probably back in N. Y. by now. 73 — *Horace.*

NEW MEXICO — SCM, J. G. Hancock, W5HJF — ZM/ZU is still at Arlington, Va. ENI, back at Walter Reed Hospital after a thirty-day furlough at home, hopes to be assigned a base soon, possibly as an x-ray technician. KKS is now an operator in a bomber for Uncle Sam. Francis Gormley (LSPH) is kept pretty busy in the State Guard but still finds time to drop a line now and then. Pvt. Harold Wheeler (LSPH) is now at Pasadena, Calif. HJF has had some nice visits from bomber operators from near-by Clovis Base. None of them are hams as yet but some are avowed to be as soon as possible. HJF is still playing chess and trying to keep this page alive. Reports are needed for this column, gang. 73 — *Jake.*

HAMMARLUND RADIO



EYES AND EARS OF THE NAVY

As our Navy prowls the seas, searching out and destroying the enemy, Hammarlund Radio products help guide our great ships to certain victory. In commercial type marine equipment too, you'll find Hammarlund products are outstanding for their record of service.

THE SIGN OF QUALITY

THE HAMMARLUND MANUFACTURING CO., INC.
460 WEST 34th ST., NEW YORK, N. Y.
Established 1910

Silent Keys

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

W1DYA, Arthur N. Fay, East Springfield, Mass.
W2JHB, Owen J. Dowd, Elmhurst, L. I., N. Y.
W3BSD, S/Sgt. William T. Betts, Cynwyd, Pa.
W8TGA, C. W. Morrow, Warren, Ohio
W9AWE, E. E. McKinney, Osceola, Mo.
W9FJH, Pfc. Alex C. Rules, Waukegan, Ill.
W9HHQ, Harold M. Grant, West Springfield, Ill.
W9WDR, Lt. Frederick C. Harrington, USN, River Forest, Ill.
R. H. Theis (Class-A operator license), Houston, Texas

Missing in Action

W7HLW, RM2c Charles M. Rafferty, of Seattle, Wash., has been reported missing in action.

Prisoners of War

KB6CBN, Roy C. Henning, is reported to be a prisoner of war in Japan. Formerly W6CBN, he had been at Guam for about two years before being taken prisoner.

Correspondence

(Continued from page 62)

in a 500-foot slither down the aerial with all 'B' supplies turned on full, and ground potential neutralized our ambitious experiment in no uncertain terms. We had a hot load, and in the resulting explosions and fire only one small chassis nut remained — yours truly. . . .

"Well, a few nights ago, bong on the stroke of midnight, a violent earthquake tumbled a brick building about my ears. I'm still trying to figure out how a fellow can see *white* stars when he's clunked with a *red* brick. I must be getting color-blind, although let me hasten to dispel any incipient doubts in your mind — the malady has not spread to the social senses. — *Lee, W8SXR*

"P.S. I resent being called a 'pill pusher'! I'm a 'flight surgeon.' Let's get that straight! . . . Great things are coming on the ham bands after this is over."

YOU NEVER KNOW . . . .

Oriley General Hospital, Springfield, Mo.

Editor, *QST:*

. . . I have just finished reading the November, 1943, issue of *QST* and I am more convinced that no ham should be without it. I am pleased to

Who Said The "Ham" Is Finished?

THERE have been rumors to the effect that the radio Amateurs were going to be denied their old frequency bands, and given new bands of such high frequency as to be useless for medium and long distance communication.

Some rumors say "Remember the last War? We are going to get the same treatment this time!"

Now, we don't believe the "Hams" should be denied their rightful place on the air in bands suitable for communication beyond the horizon — — and further, we do not believe that our Government would want to see those privileges denied.

Are not the "Hams" fighting on many battlefronts, working in war factories and laboratories for a New World wherein the individual will be able to live and enjoy his hobbies, his church and other personal freedoms which go to make up a healthy, happy world?

It is well-known among Government officials whose task it was to build our great war-time communications system that from the rank and file of amateurs came executives, instructors and thousands of engineers and operators. Without this nucleus of experienced men, it would no doubt have taken a much longer time to reach the present high degree of perfection in the communications branch of our fighting forces.

In every emergency Amateurs have proved their ability and willingness to come to the aid of their Country — — who would be so unjust as to want to deny them their small place in the radio spectrum? We do not believe these rumors that the "Ham" will be denied his privileges, we believe rather that those who speak so much of justice coming out of this war will see to it that the Amateur receives his just reward.

The entire radio industry knows well, and appreciates the many contributions "Hams" have made for the advancement of high frequency radio communications, and surely they too can be counted on to assist the "Ham" in regaining his privileges *when the right time comes.*

(Continued from page 76)

say that in recent tactical operations we had plenty of *QST*s on hand for reference, and it surely helped a lot. Since we hams had to give up our amateur frequencies for the armed forces, reading *QST* is sort of like a QSO with all the boys.

We have used a lot of circuits published in *QST* and they have done a tremendous job towards improving radio communications. As you know, military communications must be carried on, rain or shine, and a few little additions here and there help to make them more efficient. I believe I can truthfully say that, wherever there is a station doing a good job, you'll find a ham or ex-ham doing the work. I hate to think what our communications would have been at the start of the war, if it hadn't been for the thousands of hams all over the country ready to go to their jobs as radio ops.

Keep up the good work, and give us more transmitter circuits. You never know where or when this information will be of use. . . .

— *S/Sgt. Clifford L. Whipple, W9DMN*

QSO BY TAPE

APO No. 333, Fort Bragg, N. C.

Editor, *QST:*

Sometime ago I read a letter in *QST* in which the writer suggested that hams might exchange voice recordings as a substitute for the QSOs of the good old days. Although I am unable to make voice recordings, I will be glad to exchange inked tapes, for use with graphic keying units, with anyone who has the facilities to make voice recordings or inked tape code recordings.

— *Pvt. Don Edwards, W5KCP*

CAA'S NEW REQUIREMENTS

720 McCleary Ave., Dayton, Ohio

Editor, *QST:*

. . . Five stars to ex-CAA man W7HGA for his letter in September, 1943, *QST*, page 68. I would like to add some additional qualifications which must be met by CAA aircraft communicators very shortly: air navigation and meteorology for pilots. So, CRM T. S. Lym, it appears that after passing the above exams you and I should be eligible for flying tickets when this mess is over. . . .

— *Jack J. Carney, W8TYH*

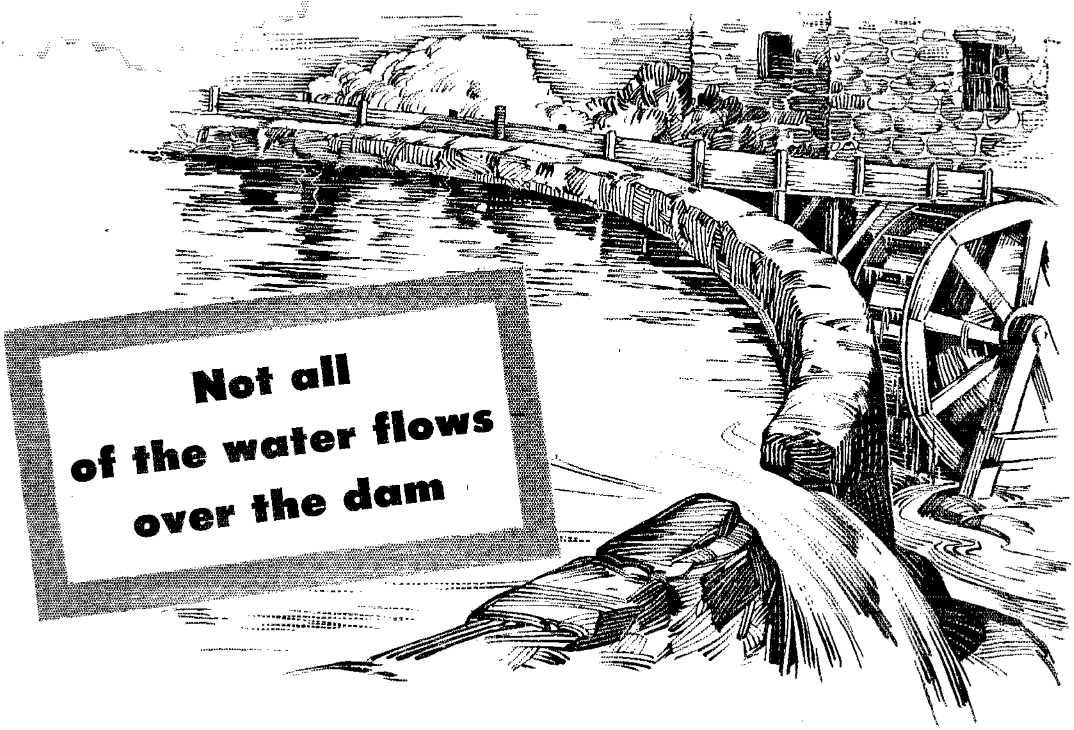
AIRPORT ANECDOTES

5712 Berkshire Lane, Dallas 9, Texas

Editor, *QST:*

I have been modulating a mike at an Air Corps ground station for the past fifteen months, and during that period I have heard a few funny things happen which I thought might be of interest to the gang.

My station is located close to an airport which at times has more customers than the staff of its efficient radio control tower can get off of the

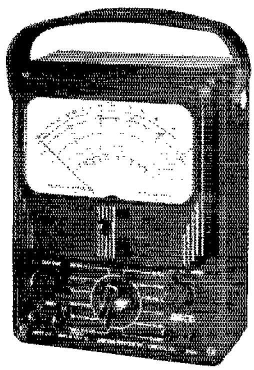


BEFORE it becomes just "water over the dam", every working hour, every problem solved, contributes in some measure to the reservoir of practical knowledge we call experience.

There is a wealth of such experience behind Simpson instruments and testing equipment. Into their making has gone all the knowledge acquired during the more than 30 years which Ray Simpson has devoted to the design and manufacture of electrical instruments—all the experience and know-how of a group of men who have long been associated with him.

The important thing today, of course, is that this enables Simpson to build instruments of proven accuracy and stamina, at a rapid rate. Each one has a full bridge type movement with soft iron pole pieces. For the first time this admittedly finer design has been made a matter of mass production—with all the resulting economies and speed.

When it comes time to apply the many things learned under the impetus of war, remember that true progress has its roots in the past. For the utmost in lasting accuracy, and value, look to Simpson.



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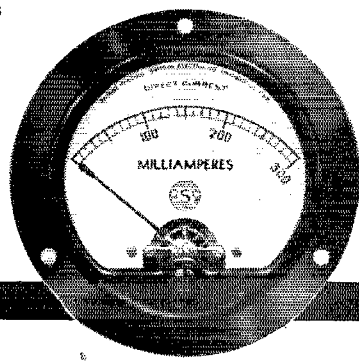
INSTRUMENTS THAT STAY ACCURATE

Buy War Bonds and Stamps for Victory



(*Continued from page 78*)

ground as fast as some desire. That's when the good old "beefing" gets going — especially during some of our "cool" Texas July days. One of the regular complaints that the tower hears at this time is the old stand-by: "I am going to run out of gas if you don't let me leave here soon." On another occasion a pilot called the tower to cancel his hotel reservation at a town only a short distance away, claiming that he would never make it to his destination that day.

Also located at this airport is a radio-equipped jeep which works in conjunction with the control tower. Well do I remember the day when a new jeep driver appeared on the scene. He kept calling the tower for permission to "make a low approach to the tower." (I often wonder when he will be out of the guardhouse. Anyway, it's been a long time since I have heard his voice.)

Then there was the day when everything was pretty quiet for a while until a Navy blimp which was making a cross-country flight appeared in the sky and a bunch of training planes spotted him. The blimp immediately broke the temporary silence my speakers were enjoying by emitting loud calls of help to the trainers' base to call the ships home. They were looping him, scaring the wits out of the skipper of the blimp.

There are also the "lost" and "found" ships which suddenly appear in training flights. Occasionally a flight of trainers comes over and all at once discovers that one of the group is a.w.o.l. About the same time a similar group is making the startling discovery that it is larger than it was.

Bad weather sometimes has its fun. I remember two ships that came over one very overcast day. It appeared from their conversation that the pilot of the lead ship was much more experienced than another who was following too close behind him for comfort. The leading pilot announced that he thought it would be a good idea for them to go above the overcast. Then it happened — upon coming into the clear, the pilot in the rear ship lost sight of the leading ship. The last I heard they were still trying to figure out some way for each to tell the other where to look for him.

Just today I heard an interesting conversation between two pilots. They were trying to find each other in the air over a small town, pointing out their positions from such visible items as small lakes, etc. Comparisons did not match up so well. Doubt began to enter their minds when each counted a different number of railroad tracks leaving the town. The catch was that each ship turned out to be over a different town!

— *Jack T. Moore, W5ALA*

A HAM GETS AROUND

Hq., 9th Airways Communications Region,
Harvey Bldg., West Palm Beach, Fla.

Editor, *QST:*

First let me say that it really is wonderful to be back in the good old U.S.A.! I was in the Air Corps at Langley Field, Va., as a first lieutenant (pilot) and communications officer, enjoying ama-

(*Continued from page 80*)

teur radio to the fullest extent and operating on all bands under the call of W3HZU, at the time of Pearl Harbor. The next day I was on my way to parts unknown.

I flew my B-26 to the West Coast, and then to Hawaii and Australia. We were the first medium-bomber group to arrive out there. After two months of operational flying against the Japs I was pulled into Allied Air Force Hq. My "opposite number" (as the Aussies call it) or "offsider" was Wing Commander Bob Cunningham, VK3ML. I had many happy associations with him and the many other VKs on our staff. They were all in the RAAF as signal officers and held key jobs over there. We got together on numerous occasions and swapped QSL cards and stories. Those boys are doing a swell job. . . .

The Fifth Air Force was organized in Australia and I was absorbed into the Fifth Bomber Command as signal officer. Later on, because I was a pilot, my title was changed to assistant operations officer. Then my primary duty was running the air-ground radio station for the bombers on missions. Some interesting reports came into my office every day. One memorable one was the sighting of the Jap convoy which was annihilated in the Bismarck sea battle.

After being away from home for twenty months, I was sent back to the U. S. A. My new duty is regional communications control officer for the AACS. . . .

— *Major Guy H. Rockey, W3HZU*

THE BOYS IN THE PACIFIC

APO 27, c/o Postmaster, San Francisco, Calif.

Editor, *QST:*

Since many of the letters printed in the Correspondence section seem to come from the European theater of war, I thought I'd let you know about the boys in the Pacific.

In my particular outfit there is only one other ham besides myself. He is W6LYQ, and he manages to keep our radio sets running.

I guess all the boys out here feel the same as I do when it comes to congratulating you on the excellent work you are doing back there. *QST* comes to us right on time, for which we all are thankful.

The articles . . . on the Japanese code have come in handy out here, too. We usually copy some of the Jap commercials when there is nothing better to copy. We have succeeded in making sense out of a few of the transmissions, using the articles printed in *QST* as a guide. . . .

— *Sgt. A. Hobling, W2MMP*

SEAGOING OPERATING IS SWELL

3120 Oak St., Kansas City, Mo.

Editor, *QST:*

Just returned from my fourth voyage this year. This trip took us into Naples, Italy, and in spite of Jerry we had a good trip. I rather feel that he (Jerry) very much resented our presence there,

(Continued from page 82)

based on the number of bombs dropped on the harbor area too darn close to our ship for comfort. He succeeded in scaring hell out of everyone (and no one feared to admit it, either). Hi! But in spite of this air-raid business, I know of no operator quitting his job. My luck has held through other raids, and I'm confident that I shall again open up the peanut whistle at W9WAP after the war. . . .

The letter from L. D. Kelsey, jr., on page 70 of September, 1943, *QST* inspired this. . . . I note he says his transmitter is sealed — mine has never been sealed except in some ports. At sea it's always ready for instant use on 500 kc. Again, he mentions the "crowd" in the shack — on my ship no one except the operator(s) or the officer on watch is allowed in the shack! And, furthermore, how does he get a mate to call him for watch?

I fully agree with him that seagoing operating is a swell job, and advise any ham . . . to get his commercial ticket and get out on a ship. It is being away from one's family that hurts the most — but when, by reason of financial difficulties, a married ham is unable to make ends meet as a radioman in the Navy or Army, the answer can be found in the merchant service. I know, for I have four children and a wife to support. I am a civil engineer ashore, and have made more ashore than at sea, but when I had to choose between operating at sea and being away from home on an engineering job, I chose the sea and I'm not sorry I did. . . .

— *W. H. McClement, W9WAP*

NUMBER ONE ON HIS HIT PARADE

Santa Ana Army Air Base, Santa Ana, Calif.

Editor, *QST:*

QST is still number one on my magazine hit parade, only it is so much in demand on Army posts that the copies are all sold out before I get there. Now I've cured that difficulty by joining up — and I am completely satisfied.

Keep up the good work; we are all for you.

— *A/C Jack E. Menick*

IN HOT PURSUIT

c/o Fleet P. O., San Francisco, Calif.

Editor, *QST:*

I received the November issue of *QST* today with great joy and elation. It is now but a couple of hours since I received it, and already it is in a W3's hands, with a W6 in hot pursuit. . . .

— *Malvin S. Dolmatz, ART1c*

FROM HAWAII

C.H.A. No. 3, Honolulu 62, Hawaii

Editor, *QST:*

. . . *QST* is sought for, fought for, and most of the time yearned for, out here. I have been reading it for years, and find it more and more interesting and helpful in my work.

— *Charles Bellerose*

MT. CARMEL WHERE ELECTRONICS IS KING

Keen Eyes and Sensitive Fingers: Here's skill—plus imagination! A typical scene at Meissner's Mt. Carmel plant as vital war supplies, precision-made in every detail, are kept moving to world battle fronts.

Precision Family: It is said that Mt. Carmel, Illinois, has more electronics technicians per thousand population than any other city on earth. Shown here are five of the six members of the Collins family — one of the many families helping to make the delicate, sensitive equipment for which Meissner is famous.

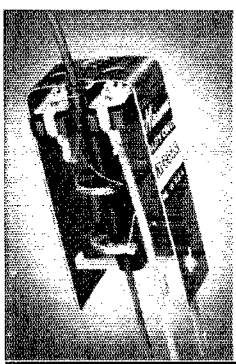
Can He Qualify? Even in wartime, Meissner prides itself on its "hand-picked" personnel. Here Personnel Manager White is interviewing a promising applicant. (See main caption at right.)

Your Guarantee of Perfection: Down through the years, the Meissner name has come to stand for the ultimate in radio quality. These two, along with hundreds of other experienced technicians, are very good "reasons why"!

PERSONNEL? Here It's PRECISION-EL!

Mt. Carmel, Illinois, (population 7,000) is famous for two things: music and electronics. The first reputation is based on its top-flight civic and high school music groups — on such outstanding home-town "products" as Howard Barlow, renowned symphony conductor. The reputation for great electronics ability centers around the humming Meissner plant — where scores of employes have spent their entire working lifetimes on the exacting requirements of Meissner's "Precision-Built" line. Their flying fingers, now assigned to war orders of tremendous strategic importance, long ago lifted them above mere "personnel" into the radio industry's highest honor—"PRECISION-EL"!

Ready for Delivery



Good news! You can now obtain a quantity of the highly popular Meissner "Plastic" I. F. Transformers. As you know, these are particularly suitable for use in small receivers — where space is at a premium, yet superior performance is required. Meissner "Plastic" I. F. Transformers are famous for remarkable stability, high gain, wide range and double tuning. Typical of Meissner precision building, they are only 1¼" square x 2½", yet are not affected by temperature, humidity, or vibration. Specially served Litz wire! One-piece molded plastic coil-form and trimmer base! Order at once for prompt service.

MEISSNER

MANUFACTURING COMPANY • MT. CARMEL, ILL.

ADVANCED ELECTRONIC RESEARCH AND MANUFACTURE

Hints and Kinks

(*Continued from page 58*)

posing an excessive load on the power supply when S_1 is closed. A value of 50,000 ohms or more should be satisfactory.

Since plate current should be cut off completely, the blocking voltage will be in proportion to the ratio of R_1/R_2. If the plate voltage is 250 and if a bias of 25 volts is required for blocking, then R_2 should represent approximately 9/10 of the total voltage-divider resistance $(R_1 + R_2)$, since the blocking voltage is 1/10 of the total plate voltage. Thus, for example, if a resistance of 100,000 ohms is selected for R_2, the total resistance should be 100,000/0.9, or 111,111 ohms. Therefore, R_1 should be somewhere between 10,000 and 15,000 ohms. The exact value will not be found to be too critical, but the blocking voltage should never be appreciably more than that required, since it appears also between cathode and heater if one side of the heater is grounded, as it is in most cases. R_2 should have a rating of at least 2 watts, while a 1-watter will do for R_1.

In general, it is advisable to apply the blocking voltage to a stage using a high-μ triode, since a tube of this type requires a minimum of voltage for blocking. The approximate voltage required for cut-off may be estimated by dividing the plate voltage by the amplification factor of the tube.

The switch may be incorporated with any of the usual transmitter-control switches. In the case of the 'phone operator, S_1 may be one pole of a multipole switch which also is used to close the microphone circuit, assuring automatic cut-off of the b.c. receiver output while the rig is on the air. Shielded wire will help to prevent stray pick-up. If the lead is too long, a small relay may be installed in the receiver in place of S_1. — *Joseph Zelle, W8FAZ, WABC.*

On the Very Highs

(*Continued from page 43*)

and report his observations. Few amateurs, in the whole history of the art, have had either the facilities or the knowledge to embark on any very technical research program, and it is improbable that many of us ever will be so equipped — but by our willingness to jump into an unknown field and "give it the works" we have turned up most of the fundamental discoveries in the field of wave propagation. The value of the "useless" short waves, the world-wide range of the ten-meter region, the effect of temperature inversions on v.h.f. signals, the vagaries of sporadic-E and aurora reflections — all these and more resulted from the insatiable curiosity of the genus ham. There will be more such discoveries when amateur radio gets back into gear after the war.

Strays

One-tenth of all the electrical energy generated in the U. S. A. during 1943 passed through electronic devices. — *Science News Letter.*

Book Reviews

(*Continued from page 81*)

tilities, there has been a dearth of suitable material on wire telephony. Therefore, this new volume fills a definite need.

Much of the material in the opening chapters is a condensation of parts of the author's widely used "Electrical Fundamentals of Communication." Starting with a chapter on d.c., the fundamental electrical concepts are explained. This leads into alternating voltages and currents. Throughout the chapter on a.c. subjects necessary to the telephone man are treated.

In the chapter on electric networks, the author explains the components and their functions, each item being subjected to mathematical scrutiny. Circuits and problems involving *R*, *L* and *C* are fully discussed. He goes into the intricacies of series and parallel resonance and the effects of *Q* and frequency upon impedances in such circuits. Other details covered are constant-voltage and constant current-circuits, series-parallel connections and circuits involving mutual inductance, impedance transformation, repeating coils and power transfer. Of special nterest are the paragraphs on insertion and transmission losses, the decibel, volume-level indicators and bridge measuring circuits.

Since, in telephone work, intelligence is to be communicated by the sound of the voice, the author deals with the nature and behavior of sound, showing how such waves may be reflected, absorbed or transmitted. He shows how these factors may be measured and how they affect the human ear.

The remainder of the volume covers applications to telephone work of the principles discussed earlier. The various types of telephone transmitters or microphones and their modes of operation are explained. Then comes a similar treatment of telephone receivers, followed by descriptions of different types of telephone sets such as the inter-communicating, local battery and magneto sets. The functions of ringing, switching and communicating are explained. Antisidetone, party-line and station protection also receive attention.

Dealing with complete telephone systems, the author first takes up the manual type where all connections are made by operators in the central stations. Descriptions of several types of switchboards and methods of calling, ringing and answering are included. The details of an exchange for handling up to 10,000 subscribers and the method of connecting calls from one central office to another are explained.

Dial telephones are given detailed and expert treatment at the hands of Mr. Dwight L. Jones of the Automatic Electric Co. The four better known types discussed are (1) the step-by-step or Strowger system, (2) the all-relay panel system, (3) the panel system, and (4) the cross-bar system. The details of these systems are discussed with reference to the number of subscribers — from a small PAX station with 100 outlets to a larger system with 10,000 subscribers.

Moving on from the subscriber and the central office to transmission lines, the theory of electromagnetic waves on lines is discussed with reference to circuits containing distributed constants. Phase constant, attenuation, signal strength and phantom circuits are covered in detail. Circuits with lumped constants, such as pads, attenuators and filters, are treated mathematically. Various types of balanced networks and filters are introduced. The use of loading circuits as a method of reducing distortion brings out the necessity for good engineering in telephone work.

The servicing of lines and equipment, calls for the use of measuring devices. The application of ammeters, voltmeters, bridges of various types, the Varley-loop and other instruments for the determination of the condition of lines and stations receives ample space.

Inductive troubles are frequently encountered in telephone circuits. Methods of locating and correcting cross-talk is one of the principal offenders, and noise, leakage from linkage with commercial power lines, grounds and crossed lines, are considered.

The volume concludes with a chapter on telephone repeaters and carrier systems. Vacuum tubes and their characteristics and uses are discussed. Telephone repeater types and classifications and the reasons for their use are explained. The theory of oscillators, modulators, filters and demodulators is explained with reference to carrier telephony and telegraphy. Types C, J and K carrier systems and simultaneous telephony and telegraphy are covered.

One of the first strictly telephone textbooks, it is practical and to the point. A working knowledge of high school mathematics is a prerequisite. Beginning students and workers in the field of telephony will do well to digest its contents.

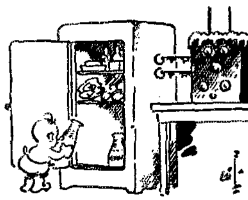
— *T. A. G.*

The New Contrapolar Frequency Spectrum

(*Continued from page 53*)

to flow to the cathode. Resistors are also inversely affected. One must use only those which are vitreous-enamel coated. You see, power dissipated in a resistance at contrapolar frequencies causes the resistor to cool.[9] If a resistor is severely overloaded, icing results, thereby shorting the resistor. Carbon resistors may be used only in the grid circuits of Class-A amplifiers, a.v.c. lines, or other applications where they are not required to dissipate appreciable power. Thermocouple and hot-wire ammeters are rendered useless after a brief period of operation because they ice up and the movement jams. In this connection, one very convenient application is suggested for postwar use. A highly effective refrigerator unit could be made consisting of an ordinary heating element subjected to a large flow of contrapolar current.

A CONVENIENT POST-WAR APPLICATION IS SUGGESTED



In conclusion, I think it would be wise to obtain channels for amateur experimentation in this new spectrum. In so doing we would guarantee a bright future to embryo hams and also the old-timers who are tired of battling heterodynes, QRM, and all the evils of a jammed channel. At least it would save them from having to junk their rigs in favor of model airplanes and paper dolls.[10]

[9] The exact relationship between electricity and heat has always been a puzzle to science. Early scientists spent several centuries, for example, debating the question of whether an electric spark was fire or not. Finally, in 1744, it occurred to an inquisitive professor named Ludolff to discharge a high-voltage condenser across a spark gap in a vessel containing an inflammable fluid. We have no record of what happened to Prof. Ludolff, but ever since then current flow in the conventional direction has resulted in heating. Sgt. Wildenhein's results with current flow in the opposite direction are, therefore, only to be expected. — EDITOR.

[10] Could I interest anyone in a windmill or a rocket ship?

Adjustable I. F. Selectivity

(Continued from page 60)

should equal that of L_2. With the switch in the first position, only L_2 is in the circuit and, as the corresponding curve of Fig. 4-B shows, the band-width measures approximately 8 kc. at 2 times down for a single stage. With the switch in the second position, both L_2 and L_3 are in the circuit. The inductance of L_3 is extremely small, and therefore the detuning of the secondary is negligible. However, the close coupling between L_3 and L_1 broadens out the band-width to 16 kc. The gain is kept high by virtue of the much closer coupling.

In the third position, L_2 and L_3 are cut out and L_4 is connected in the secondary circuit. L_4 is tightly coupled to L_1, and therefore the band-width is wide. There is only slight detuning in the secondary circuit, because the inductances of L_2 and L_4 are about equal. With this arrangement a band-width of 40 kc. is easily obtained. The gain is kept rather high by winding L_4 with Litz wire to increase its Q. The three characteristic curves obtained are shown in Fig. 4-B.

The proper adjustment of the relative positions of L_3 and L_4 will require a little experimenting to obtain the desired characteristics. After the three positions have been determined, the leads can be brought out to a switch on the panel.

The author feels that more advantage should be taken of the principles of variable i.f. selectivity, especially since it is so easy to obtain.

Correct Answers to Radio Historical Quiz Questions on Page 40

1. Benjamin Franklin, in 1733.
2. Thomas Edison in 1877.
3. Pierre and Eve Curie of France, in 1880.
4. George Ohm propounded the law named after him, in 1825.
5. Stephen Gray, in 1725.
6. The term "microphone" was coined by Sir Charles Wheatstone in 1827.
7. Thales of Miletus in 640 B.C. observed that amber, after being rubbed, acquired the electric property of attracting straws.
8. Van Musschenbroek of Leyden, in 1745.
9. Paul Nipkow, of Berlin, in 1884.
10. Heinrich Hertz, in 1886.

AACS—Part II

(Continued from page 23)

After open ragchewing was abolished, however, the monitoring operators found themselves ferreting out new discrepancies. Soon certain peculiar "Z" and "Q" signals began to be heard — private codes developed among the operators for their own use. These, too, were banned — if necessary, with threats of demotion or even court-martial.

If the fraternal camaraderie of the hams proved troublesome in this one instance, however, in other ways it was an invaluable asset. For it was the ham spirit and friendliness permeating the System that animated its coöperative accomplishment. In particular, this spirit supplied a common bond between officers and men which enabled them to work closely together without restraint while still preserving essential discipline. This discipline was based on the sincere respect of one ham for an experienced veteran rather than on nominal differences in rank, however.

Since most AACS officers were men who themselves had risen from the ranks by virtue of their ability, they commanded the respect of their men. This respect was mutual, for the enlisted men also were of the highest type. In fact, Brig. Gen. McClelland has been known to boast that they are the smartest in the Army!

It takes a smart man with plenty of genuine operating skill to hold down an ACCS circuit. Even on the point-to-point circuits, because of the great distances involved the signals often are weak and down-in-the-mud, and it takes a DX-trained ear to pull them through. Mobile units on aircraft and the smaller fixed stations have a tendency to drift, even with modern stabilized transmitters, and it takes the old ham touch to find the signal and hold it in the 'phones.

One of the toughest problems the AACS has encountered is that of teaching the GI-trained ops to "feel around" the nominal dial settings for the stations they're supposed to contact. For a ham who has done that automatically for years when sitting down to keep a sked, it's an instinctive habit. The GI op, on the other hand, has a hard time learning the knack of it, and the telltale result is a series of "nothing heard" entries in the log.

However, most communications failures of this kind have been traceable to the aircraft radio operators rather than to AACS personnel. Many of these operators were without previous experience, and were unable to receive at normal transmission speeds. Their fists often were so poor that the AACS stations were forced to place their most experienced men on the ground-air circuits, rather than on the point-to-point circuits where they should have been. It wasn't uncommon for aircraft transmitters to be so far off frequency as to be practically useless, and some operators did not even know how to tune their sets.

There's a story about a B-17 crew which, with blood in their eyes, descended en masse on the officer-in-charge of a station in Labrador, demand-

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ing: "Why didn't you call us?" Their operator had been trying to work the station for some hours past. With hundreds of miles of water ahead, their fuel getting lower by the minute, and no answers, they'd had plenty of time to build up a fine state of indignation. Duly sympathetic and apologetic, the AACS officer tactfully succeeded in uncovering the fact that the radio operator aboard the Fortress was a new man just out of school who had never worked a station from aboard an aircraft in actual flight. During the ship's initial cross-country shakedown trip the only communication required had been on the air-to-ground and with control towers on the fields, and this the pilot himself had handled on voice. There had been nothing for the radio operator to do until they started on this first overseas hop. Then, when the crisis came, the inexperienced lad got confused and called the Labrador station on the wrong channel. It was no wonder they couldn't hear him.

Carelessness in message procedure also was extremely common. Strictly routine messages were unnecessarily long. Messages containing nothing more important than a request for food or cigarettes frequently would be coded and sometimes even marked "extra priority," causing a loss of valuable time in cryptographic rooms.

To cure these faults, attempts were made to educate the aircraft operators by some of the "in-station training" which is AACS practice with its own men. Radio operators in newly formed bomber crews were encouraged to work ground stations whenever they could, whether there was need for communication or not. Nowadays AACS control tower operators make a regular practice of calling aircraft in flight on their own initiative, to make sure that contact can be established as well as to provide training for neophyte operators.

Cool, Calm and Collected

These control tower operators have a particularly difficult job. They must be alert, cool and intelligent, with quick reactions and good perception, ready for any emergency. Many an AACS man in a control tower has guided pilots to a safe landing despite impenetrable fog or storm.

Nor are they all men. More and more WAC operators are going on duty in the AACS daily. They're good, too. One WAC control tower operator, a student at Freeman Field, recently displayed the same qualities which distinguish her male compatriots. Two students in identical trainer types were coming in for a landing. One was just above and behind the other, so that each was in the other's blind spot. Each thought he was the No. 1 man, and each prepared to land — the one in the rear preparing to let down squarely on top of the front man. Without a trace of excitement or hysteria the YL control operator explained the situation in the fewest possible words and got the front man to pull up and circle the field again. Meanwhile his fellow-student landed, still not fully aware that he had escaped what might have

(Continued on page 98)

(Continued from page 96)

been a fatal collision only by a matter of inches. After it was all over the WAC operator, still with no sign of tension, tossed back her curls and looked calmly around. "Close, wasn't it?" she remarked.

That story recalls another concerning a control operator handling student flights at West Point's Stuart Field. An oil line on an AT6 advanced trainer broke while a student was coming in for a practice landing. Black oil smeared the entire windshield and part of the greenhouse, and the pilot literally was blacked out. Lacking blind flying instruments, he was in a bad predicament. The control tower operator — himself also a student — was on his toes, however. Calmly and matter-of-factly he talked the pilot down to a perfect landing, giving him horizontal and vertical directions much as a truck driver's assistant guides a huge trailer truck backing into a narrow driveway by hand signals from the curb — except that the airplane was moving in three dimensions and the action occurred in seconds, not minutes.

At a time like that the control operator must know what it's like up there in the cockpit. This is why all AACS control tower operators receive blind-flying instruction in the cockpits of Link trainers — almost enough, in fact, to qualify them as blind-flying pilots. All they lack are the silver wings and the authority to fly an airplane!

"They Saved Our Necks"

AACS operators feel that their reward for such performances as these comes from the appreciation expressed by the pilots for services rendered. AACS is widely commended by military fliers everywhere for outstanding devotion to duty, as in this letter from a radio operator now assigned to a Flying Fortress based in the British Isles and making regular bombing raids over Germany: ". . . You ask about the AACS — I do indeed know them; moreover, it is not an innocent reverence for all that is military that urges me to give them the heartiest of endorsements. Many is the snowy night . . . they have saved our necks . . . and found us a place to sit down; more than that, they even relayed to our home base *our* location and condition. They have the best and most obliging operators I know; we Army flying operators are not in their class, but they will slow down and repeat with almost infinite patience once you let them know you are in trouble.

"We used beams and beacons constantly, too; they are fundamental guides in all cross-country flight, and no one could conceivably do the night or bad-weather flying we did without them. Indeed, I have seen spots where every one of us would happily trade his hopes of Paradise for one little 24-hour beacon somewhere within a couple of hundred miles. . . .

"If I seem enthusiastic, it's because I really think that radio navigation and communications are about the most important of the present and future developments of aviation, both military and commercial, and my small experience tells me that a fine job is being done."

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangements, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.
(3) The Ham-Ad rate is 30c per word, except as noted in paragraph (6) below.
(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 7c per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7c rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 30c rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

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

QUARTZ — direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. *Diamond Drill Carbon Co., 719 World Bldg., New York City.*

COMMERCIAL radio operators examination questions and answers. One dollar per element. G. C. Waller, W5ATV, 6540 Washington Blvd., Tulsa, Okla.

USED TELEPLEXES, Instructographs bought, sold. Ryan's, Hannibal, Mo.

WHY NOT turn your unused equipment into ready cash which may be applied towards new and better equipment after the war? Leo, W9GFQ, offers you the best cash prices for communications receivers and test equipment. Write today for large illustrated catalog. Wholesale Radio Laboratories, 744 W. Broadway, Council Bluffs, Iowa.

CRYSTALS available — all types, including 100 KC, 465 KC and 100 KC. Broadcast and Aircraft given prompt attention. Scientific Radio Products, Council Bluffs, Iowa.

METERS: quantity of multi-range Triplett 673 ac voltmeter, 670 ac ammeter in stock. Each in portable leather case. Price $14.99 prepaid net each. New. Don't delay. First rate, like-new panel meters accepted in trade, also up-to-date tube checkers, etc. Hatry & Young, 203 Ann Street, Hartford 3, Conn.

PROMPT Repair Service on Meters and Electronic Instruments. Braden Engineering Company, 3317 Kenmore Ave., Dayton 2, Ohio.

HIGHEST prices paid for used receivers, test equipment, bugs, oscillators. What have you? W9ARA, Butler, Mo.

IN STOCK without priority: Meter rectifiers $1.95, meters, transformers, panels, chassis, radio supplies of all sorts. Your inquiries and orders invited. Henry Radio Shop, Butler, Mo.

IN STOCK on priority: New SX-28s and SX-25s for immediate shipment. Henry Radio Shop, Butler, Mo.

SW3 coils, Nos. 14A, 10, 18, 19, 20. W1BB.

SELL — RCA police transmitter 30-36 megacycles. Reasonably priced. Condition good. All inquiries answered. Box 424, St. Mary's, Penn.

WANTED — National Equitone Cond. 350 $\mu\mu$fd. Bliley 456 k.c. mounted crystal, R-meter, PWO cond. drive unit, type HA2 .05 mica cond. Meissner unit 13-760 & 238211. Schwenzer, 3619 Peach St., Erie, Pa.

WANTED — 3.5 to 7 Mc. and broadcast coils for HRO. Russell Payne, 1000 Carlton Ave., Charlottesville, Va.

FOR SALE or swap: pr 872/S with fil. trans., an 845., mobile P.A. amplifier, turntable, speaker. Want TZ-40 or what have you? W8BXY, Parsons, Raquette Lake, N.Y.

CRYSTALS — If in need of crystals, any type, frequency or service, write us. Best delivery and attractive prices. Eidson crystals are backed by years of time-proven performance. "Eidson's", Temple, Texas.

KILOWATT final, $100. complete with T200's and Thordarson power supply, also other equipment. Will trade for model railroad equipment. Runde W8NCL, 1531 Anita Road, Grosse Pointe, 30, Mich.

SALE — Final amplifier with three RCA 810's. Speech amplifier 6L6's output — surplus parts. Kern, W3KJ, 50 Shelburne Road, Springfield, Del. Co., Penn.

WANTED — HRO coils 1000-2000 KCS; 175-400 KCS. Albert Webb, Box 453, Northampton, Mass.

WANTED — New or slightly used Stancor 100-watt phone. Cw transmitter either wired or in kit form. Also want power transformer 600-ct-600 volts, and 600 volt 4$\mu\mu$fd. oil filled filter condenser. Pfc John Cann, 100 TSS, Barracks 1614, Truax Field, Madison 7, Wis.

WANTED — Hallicrafters receiver, Super Skyrider, Sky Champion, or any other. L. Sugarman, Nutt Road, Phoenixville Pa.

WANTED — Ink tape recorder capable 100 wmp. Also tape puller. Give make, price and condition. W5MN, 1746 Schley Avenue., San Antonio, 3, Texas.

WANTED — Set 5 LW coils, 50 to 2050 KC, for National HRO Superhet. Name your price immediately. P.O. Box 99, Milwaukee Junction Station, Detroit, Michigan.

WANTED — Riders Manuals 7 to 13. Good VOM Resistance checker. Microphone preamplifier commercial unit. RCA PM speaker MI-6255, 60 or 100 Watt. Jos. G. Tabor, 20420 Riopelle, Detroit, Michigan.

FOR SALE — *QST*'s from January 1929 to January 1944. Some issues missing. W9OWQ, Hamilton, 1415 West 4th St., Sedalia, Mo.

WANTED — Small transmitter. Holstein, 246 East 148th St., NYC.

SELL Recording table Crystal recorder and pick-up carrying case. Want power supply. W9ZAL.

WANTED — Thordarson T19P60 transformer and T19C36 and T19C43 chokes. Give price and condition. J. F. Manship, 4388 Lafayette Ave., Omaha 3, Nebraska.

WANTED — AC SW3, SW5, SW45 or what have you in receivers for sale. Vernon E. Congleton, 335 Desha Road, Lexington, Kentucky

HAM in Navy wants Hallicrafters Sky Traveler. Kenneth Walker, Hope, R.I.

WANTED — Amplex rotary complete for twenty. W2LHQ, Cantor, 944 East 24th Street, Brooklyn, N.Y.

WANTED — Communications receiver National NC45A, NC100, SX-24, HQ120 or others. State price and condition. S/sgt. Wm. J. Holt, Post Signal Det., Fort Huachuca, Ariz.

WANTED at once, RK-62. Will pay top price. Must be good. Boye Hagerty, 600 Main, Honesdale, Pa.

WANTED — Multitester with output range, signal tracer, electronic voltmeter. Erickson, W9WXS, 116 N. Oak, Fergus Falls, Minn.

WANTED — September 1942 issue of *QST*. W. L. Gilpin, 4201 Hillen Road, Baltimore, 12, Md.

WANTED — Hallicrafters S-29 Sky Traveler. W6SIZ, Robert Wallace, 3640 Jenifer St. N.W., Washington, D.C.

WANTED — Plug-in coils for AC model SW-3 covering 600 meter band. Answer by mail. W9UWE

WANTED — Overhead type 16-inch recorder 33⅓ and 78 rpm with or without amplifier. A. F. Bruck, 201 Walnut St., Hamilton, Ohio.

WANTED — 902 or 913 oscilloscope tube, perfect. H. Scheer, Newark, N. Y.

SELL — *QST* 1928-1937 run, deceased W8BRH; list or best offer. W8DOA.

OSCILLOSCOPE — RCA 3-inch; model TMV 122-B; good condition. Two 1-kw radiotelephone transmitters, every circuit metered; best parts obtainable. X-EC frequency control unit like new. Tubes: Pair TW 150's; pair Eimac 100TH's; pair 805's; one 251-A. J. N. Blair, W9YJS, 600 City Bank Bldg., Kansas City, Mo.

SELL — Sky Buddy, S-19R, like new. Best offer. Green, W8GMB, 35237 Michigan Ave., Wayne, Michigan.

WANTED — Power transformer, Stancor P-6010 or equivalent. R. Rose, 406 Clinton Springs, Cincinnati 17, Ohio.

$40 Lafayette Professional "9". Used in ham station. 550 KC-31 MC. 4 bands, 1 stage preselection, 3 I.F., B.F.O.; relay rack mounting. Arthur J. Hill, 800 Cody Street, San Antonio 8, Texas.

McELROY Tape Pullers and Electronic Keyers slightly used. Originally cost over $100.00. Our price $49.50 each. R. G. Dougherty, 158 Market St., Newark 2, N. J.

HEADPHONES: Trimm I.C.A. New Yorker, Philmore, Frost, Teleplex, Brandies. $2.00 Each. Code Keys: McElroy, Signal, Brach, Navy Speedex, $2.00 Each. Also some Specials $1.00 Each. R. G. Dougherty, 158 Market St., Newark 2, N. J.

RADIO TESTS — Pre-examination Tests for Radio Operators. Tests your knowledge before you appear for commercial radio operator license examinations. Avoids failures. Guides your preparation. Saves your time. Worth investigating at once. BOOKS to help you master technical radio. Practical Radio Communications, 1943 Edition, $6.00; Radio Operating Questions and Answers, $3.00; Radio Code Manual, $2.50. Postpaid. Money back if not satisfied. Write for free circulars 5Q. NILSON RADIO SCHOOL, 51 E. 42 St., New York 17, N. Y.

Echophone Model EC-1

(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on three bands. Electrical bandspread on all bands. Six tubes. Self-contained speaker. 115-125 volts AC or DC.

Echophone Radio Co., 540 N. Michigan Ave., Chicago 11, Illinois

Index to Advertisers

All of the above advertisers are coöperating with the A.R.R.L. to permit publication of an editorially adequate *QST* during this period of war-rationing of paper. Using less advertising space but at higher rates, they continue their customary support of *QST*. Some are using smaller space in each issue and some are using space only every second or third issue. Of the latter, those whose advertising does not appear in this particular issue are indicated by the ** above.

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» It's an old tradition for National equipment to do the tough jobs at inaccessible outposts. Long before the war, National receivers had already become the first choice of expeditions to the far corners of the earth.

» Pan American has long used National equipment, and many years of experience with the ruggedness and dependability of National receivers were back of Pan American's choice in the picture shown above.

NATIONAL COMPANY, INC.

MALDEN, MASS.

WHAT'S COOKING FOR POST-WAR?

More small tubes . . . lighter rigs . . . the kind Amateurs did so much to develop

SEEMS like more light, compact, inexpensive radio equipment than ever will be graduating from designers' drawing boards, come Victory.

So the ham, the experimenter, and the portable-packin' public—maybe the light plane radio buyer, too—can look for a trend, post-war, that the ham and experimenter did plenty to get started 'way back when.'

RCA's Miniatures made history

Keep your eye on RCA when the fun starts! Remember, it was RCA that developed those original 4 Miniature tubes—1R5, 1S4, 1S5, and 1T4—that made portable history with the "Personal Radio" announced by RCA in 1940.

And if you don't think Miniatures have been places since, just ask the next paratrooper you meet about his "Handie-Talkie"!

On the Army/Navy's list

Did you know that 13 out of 15 of the Miniatures & Midgets on the Army/Navy "Preferred List of Vacuum Tubes" were developed by RCA?

You're probably pretty familiar with some of RCA's Miniature and Midget line of tubes, but you might like to look 'em over, all together. They're listed below, with some of their features.

Every month from now on, here on this page, we'll be trying to keep you posted on what's new in tubes — especially those for light, compact equipment.

RCA MINIATURE & MIDGET TUBES

Type No. and Name	Feature	Heater or Filament Volts	Amperes
MINIATURES			
1A3 H-F DIODE (Heater Type)	For use as discriminator tube in FM receivers and in measuring equipment.	1.4	0.15
1L4 R-F AMPLIFIER PENTODE (Filament Type)	Has sharp cut-off characteristic—no external bulb shield needed.	1.4	0.05
1R5 PENTAGRID CONVERTER (Filament Type)	Has conversion transconductance of 300 micromhos at 90 volts on plate.	1.4	0.05
1S4 POWER AMPLIFIER PENTODE (Filament Type)	Capable of handling audio power output of 270 milliwatts.	1.4	0.1
1S5 DIODE-PENTODE (Filament Type)	Combines diode and a-f pentode providing high voltage gain.	1.4	0.05
1T4 SUPER-CONTROL R-F AMPLIFIER PENTODE (Filament Type)	Useful as r-f or i-f amplifier—no external bulb shield needed.	1.4	0.05
3A4 POWER AMPLIFIER PENTODE (Filament Type)	In r-f power applications, can deliver about 1.2 watts output at 10 megacycles.	2.8 series 1.4 parallel	0.1 0.2
3A5 H-F TWIN TRIODE (Filament Type)	Has class C output of about 2 watts at 40 megacycles.	2.8 series 1.4 parallel	0.11 0.22
3Q4 POWER AMPLIFIER PENTODE (Filament Type)	Can handle relatively high audio output of 270 milliwatts.	2.8 series 1.4 parallel	0.05 0.1
3S4 POWER AMPLIFIER PENTODE (Filament Type)	Similar to Type 1S4 but has center-tapped filament.	2.8 series 1.4 parallel	0.05 0.1
6AG5 R-F AMPLIFIER PENTODE (Heater Type)	Has sharp cut-off characteristic and high transconductance—useful up to about 400 megacycles.	6.3	0.3
6AK6 POWER AMPLIFIER PENTODE (Heater Type)	Can handle a-f power output of 1.1 watts.	6.3	0.15
6C4 H-F POWER TRIODE (Heater Type)	Has class C output of about 5.5 watts at moderate frequencies and 2.5 watts at 150 megacycles.	6.3	0.15
6J6 TWIN TRIODE (Heater Type)	Useful as mixer at frequencies up to 600 megacycles—also as oscillator.	6.3	0.45
MIDGETS			
9001 DETECTOR AMPLIFIER PENTODE (Heater Type)	For uhf service—has sharp cut-off characteristic.	6.3	0.15
9002 DETECTOR, AMPLIFIER, OSCILLATOR (Heater Type)	An uhf triode with moderately high amplification factor.	6.3	0.15
9003 SUPER-CONTROL R-F AMPLIFIER PENTODE (Heater Type)	Useful as mixer and as r-f or i-f amplifier in uhf applications.	6.3	0.15
9006 U-H-F DIODE (Heater Type)	Suitable for uhf use as rectifier, detector, or measuring device.	6.3	0.15

RCA

RADIO CORPORATION OF AMERICA

Camden, N. J.