In This Issue: Under Cover in Italy
Workable Gear for 221-Mc. WERS
Kinks for Liberty Ship Installations
Pioneering is another "AMPEREXTRA" which has contributed much to the excellence of the more than 100 different types of transmitting and rectifying tubes developed by AMPEREX. For instance, it was AMPEREX engineers who were first to incorporate specially processed graphite anodes in many of our exclusive designs. One superiority of our graphite anodes is reflected in lower average operating temperatures, more uniform temperature distribution, freedom from warping in processing and operation, absence of change in characteristics with time, and a higher initial vacuum which keeps tubes harder and assures longer life. If you are designing new equipment, or plan to improve existing facilities, talk to an AMPEREX engineer.
The United States Navy has awarded the men and women of Hallicrafters a special "Certificate of Achievement"... first award of its kind... for outstanding service with the radar-radio industries of Chicago in speeding vital war material to the Navy. Added to the four Army-Navy "E" awards, this makes five times Hallicrafters workers have been cited for distinguished service. They promise that this kind of service will be continued until total victory is ours.

* BUY A WAR BOND TODAY

hallicrafters RADIO

THE HALLCRAFTERS CO., MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U.S.A.
LIKE MONEY FROM HOME
$200.00 Each Month for Prize Winning Letters!

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

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

It's just like money from home! Write today to get your share. Tell us your story in your own way. You can't lose and you can win as high as $100.00.

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

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

Open to service men around the world. Monthly winners will be notified immediately upon judging.

SERVICING MEN ALL OVER THE WORLD

THE HALLICRAFTERS COMPANY, MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT, CHICAGO 16, U.S.A.
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### Section Communications Managers of the A.R.R.L. Communications Department

**Reports Invited.** All amateurs, especially League members, are invited to report communications activities, training programs, emergency exercises, civic-defense classes, and other New England Division affairs that may be desirable to the SCM for inclusion in the magazine. Reports of organizational news are especially desired for inclusion in the annual USFN-ARRL meeting held in conjunction with the National Convention. Reports of new appointments, with the exception of the Emergency Coordinator 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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*Officials appointed to act temporarily in the absence of a regular official.*
ANNOUNCING BULLETIN NO. 143

Every engineer in the electronic field will appreciate the concise method in which the Electrical and Mechanical properties together with the design and dimensions of AlSiMag High Frequency Insulators have been arranged and tabulated for easy and quick reference in new Bulletin No. 143.

The AlSiMag insulators described are those most commonly used in high frequency applications. Deliveries can now be made within a reasonable period.

AMERICAN LAVA CORPORATION
Chattanooga 5, Tennessee.

The insulators described in Bulletin No. 143 represent only a small portion of our output. Specially made insulators to customer's specifications are our principal products. Our Engineering Staff will be glad to cooperate on your designs.

ALCO has just been awarded for the fourth time the Army-Navy "E" Award for "continued excellence in quantity and quality of essential war production."

ALSiMag
CERAMIC INSULATORS
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.

Enrollment is granted only to licensed amateurs.

All 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.

All general correspondence should be addressed to the Secretary at the administrative headquarters at West Hartford, Connecticut.

Past Presidents

Hiram Percy Maxim, W1AW, 1914–1936
Eugene C. Woodruff, W8CMP, 1936–1940

Officers

President: GEORGE W. BAILEY, W1KH
Washington, D. C.

Vice-President: CHARLES E. BLALACK, W6GG
Yuma, Arizona

Secretary: KENNETH B. WARNER, W1EH
West Hartford, Connecticut

Communications Manager: F. E. HANDY, W1BDI*
Chevy Chase, Maryland

Treasurer: DAVID H. HOUGHTON
West Hartford, Connecticut

General Counsel: PAUL M. SEGAL
1026 Woodward Building, Washington 5, D. C.

*On leave of absence. Address correspondence to the Acting Communications Manager, Carol K. Witte, West Hartford 7, Connecticut.
"IT SEEMS TO US—"

CYCLES & KILOCYCLES

These are busy times for us at Headquarters. The thing that's in the back of all our minds is frequencies. We ourselves are living an exaggerated sort of commuter's life, shuttling forth and back to Washington or New York for committee meetings, hearings and more meetings, as the country tries to make up its mind about frequencies. (We figure that by now we ought to have at least a half interest in the Federal Express — the night train to Washington — although fellow-passengers these days don't seem to realize it.) Several hundred other people in the radio science and industry are doing the same thing. It is the familiar story of countless meetings, of seemingly endless sessions with hours of talk, mimeographs by the bushel, small net progress. Yet these are the ways of democracy and we know that eventually we shall have a solution, and a solution that makes adequate provision for amateur radio. On the factual developments of the month we have given you a report in another department of this issue. The activity is at white heat now. All the things the League has worked toward during the past couple of years are up for decision this autumn. In another month or so there should be more definite news. Although the situation is difficult and the outcome visible only in broad outline, we are confident that it will be good news.

The other day in Washington there wasn't a taxi in sight, so we grabbed a street car, on our way to a committee meeting on Capitol Hill. The car stopped before a stately building and we craned our neck to get a look upward to identify it. Archives of the United States of America, it said. But what had first caught our eye was an inscription on a pedestal at the base of the steps: WHAT IS PAST IS PROLOGUE. We reflected on that a moment, on how fittingly that simple statement set the perspective in which we file the historical records of our nation. And then, as is usual with us, we went through the same thinking process in terms of amateur radio. We amateurs are prone to think that we were pretty hot stuff in the days before the war. If we could have things just that way again, how happy we would be, we say. Well, it seems to us that our hiatus during the war draws a clean line between the old existence and the new. We shall not want to live in the past nor to dwell too long on that past. It's our opinion that we shall have a marvelously better and more interesting and more useful amateur radio when we are reestablished after the war. All that happened in our art in our unbelievably active years before Pearl Harbor serves simply to set the stage for the great and exciting scenes that will unfold in our postwar life.

The frequencies above three hundred megacycles have never been allocated to services in this country. Now they are about to be — for the brave new postwar world. Put a bunch of men together in an allocation committee room, arm them with blank allocation tables, and you get a funny spectacle. The tables have figures — hundreds, thousands, tens of thousands of megacycles. The men try to get the names of their services written down opposite certain megacycles of their selection. They argue why they have to be in a certain range, they clamor, trade horses. What impresses itself most on us is the inescapable feeling that most of them don't know what they are talking about. The megacycle figures have become mere numbers and they only know that they want some of them. If they stopped to think that a half-wave antenna for some of these magic numbers is only a few inches long, they'd probably be quite startled. We've been glad that it was the amateur service for which we were speaking. We would be hard put to it to explain how we propose to generate power on some of these frequencies, or why we feel we must have a certain band for a certain distance in a realm where man's knowledge is decidedly limited. Fortunately for us, such considerations don't enter the amateur matter. It has already been proved that it's worth the nation's while to give amateurs assignments about an octave apart, right through the spectrum. This new field will be much the richer for the ham's restless curiosity and his indisputable ability to make things work. We don't have to know in advance. We'll find out by doing, licking the problems as we come to them, and passing on our information for the good of the art.

If you listen-in much these days you're aware that we are at or near a sunspot minimum and that most DX frequencies are work-
ing at their longest possible range. You hear some weird stories: the police all over the country yelling bloody murder because their communication is being periodically wiped out by long-distance QRMs in the thirty-megacycle band, short-range military stuff in the European theater coming over to this country, signals from “down under” breaking up northern traffic, and so on. Somewhat similar has been the reception — via sporadic E, of course — of New York City television programs in Indiana. DX on what used to be the popular amateur frequencies has been grand, in other words, and we’ve missed a couple of swell years for DX Contests.

The sunspot half-wave is something over eleven years, the full cycle about twenty-three years. Twenty-three years ago was 1921. It was in December of 1921 that Paul Godley, at Ardrossan, Scotland, during the ARRL Trans-Atlantic Tests, succeeded in copying so many American amateur signals on 200 meters. The following December saw our fantastically successful Third Trans-Atlantic Tests, again on 200 meters. And the first two-way trans-ocean amateur working occurred in November of 1923, on about 2700 kilocycles. What a break it was for us that we were at a sunspot minimum then, or we should never have been able to do it! We didn’t know, of course — nobody did. Considering the elementary technique of those days, we would probably have tried for years without success if we had been at a midpoint on the cycle. It was a fortunate thing for the whole science of radio that the time at which we made our effort was the one time at which success was possible — for all the complex high-frequency technique of today has flowed from the inspiration of that amateur success.

K. B. W.

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**SPLATTER**

**OUR COVER**

He may be in uniform — but he still can dream, can’t he?

This cover may seem a bit premature — but a high proportion of our correspondence recently establishes that this scene depicting a GI ham dreaming up a glorified ham rig for postwar days is a fairly general one these days.

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**FOOTNOTES**

Our roster of authors this month reads more like an in-the-services listing. The first one on our roll call is Captain J. Wm. Hazelton, W8UBN/4, of the Signal Corps. While he is a newcomer to the pages of QST, W8UBN is an old-timer in the field of amateur radio, having first become interested in 1910 while attending dental school in New York City. Now we’ll let him continue: “I never did become a dentist, but physics intrigued me to the extent that I became a regular visitor to the salesroom and factory of Mr. Gernsback’s Electro Importing Company down on West Broadway. On one of my visits to this shop I must have been badly bitten by the radio bug as I have broken out with the fever on several occasions after believing a cure to have been effected. I built and operated about all the several types of radio equipment of the day, both transmitting and receiving. I also built on a piece-time basis many of the gadgets then being offered the ham through the pages of his Bible, the catalog of the Electro Importing Co. However, motion picture photography became my career and, until sound was put to film, I thought the radio fever was cured. But along with the sound came tubes and, with the necessary handling of the glass bulbs in the day’s work, I again contracted the disease — no doubt from the tube line. Considerable treatment was of no avail and I took the exam for my ham ticket in 1939, renewing it in 1942, right after Pearl Harbor. During this time I had been a member of the New York National Guard, served in Mexico with Madero’s Army as a captain, then on the Mexican border and got back from chasing Villa in time to go overseas in World War I. As a captain in the Signal Corps I am now with the State of Florida as their communications officer.” It is this last phase of his work that he describes on p. 45 in this issue.

Samuel J. Semel, Sic, whose 224-Mc. WERS equipment is described on p. 9, has exchanged WERS drills for Navy drills. For eighteen months before entering the service all of his spare time was taken up in WERS work in New York City. He was on the staff of the Queens Boro control station and in one seven-month period he operated during every scheduled drill. In addition to operating, he built and had licensed three other WERS units besides the rig described in this issue. This building program was called to a halt when he joined the Navy under the radio technician program. Receiving the immediate rating of seaman first class, he took boot training at Great Lakes, and returned home on leave just in time to operate and do maintenance work in his WERS network during the September 14th hurricane. At present he is back in Chicago completing “pre-radio” before going on to “primary.” Before entering the Navy he had completed two years of electrical engineering at Pratt Institute, where he was vice-president of the amateur radio club and trustee of its station, W2NOD.

Having accounted for both the Army and the Navy, our other newcomer this month, R. H. Whittaker (p. 22), is a member of the merchant (Continued on page 98)

QST for
It is nice to have a frequency band to fall back on when the regular 112-Mc. band becomes crowded. Sometimes in a thickly populated area like the Queens Borough of New York City, there is QRM enough to slow up WERS traffic. Even in much smaller cities, ham activity may be great enough to produce the same QRM problem. Much of the “short-haul” traffic can be handled in an “overflow net” using 224-Mc. gear similar to that described in this article.

It may seem strange to many of the WERS gang in outlying districts to talk about QRM. This, of course, is natural enough since the 112-Mc. band provides enough room for a network of the proportions usually found in the average town with a population of several thousand. But in the larger metropolitan areas, interference between stations and between local nets is becoming a serious handicap in the efficient handling of emergency traffic. For instance, in the concentrated New York area there are over 350 licensed WERS units!

The problem is one which has been recognized for some time and a considerable amount of progress has been made in the improvement in design of both transmitters and receivers for greater frequency stability and higher selectivity. However, the cost of better gear and the lack of skilled operators to handle it impose practical limits upon the amount of relief which may be obtained in this manner. What we need is more frequencies. The solution to this problem is not so difficult as it might seem at first. It is quite probable that many have forgotten that the 224-Mc. band also is assigned for WERS work.

So far as gear is concerned, it is unfortunate that 224 Mc. comes somewhat outside of the limits of the frequencies where reasonably good performance can be obtained from the standard receiving tubes around which most 112-Mc. WERS gear is built. However, we have had no particular difficulty in picking up several factory rejects of the WE 316-A type as well as plenty of acorns. HY75s and 615s also work well at this frequency and it seems probable that by the time this article appears in print the market on other h.f. tubes may be eased appreciably. This will eliminate many of the headaches connected with 224-Mc. gear, since proper tubes are most important for satisfactory results.

**Design Considerations**

In physical size, the transmitter unit shown in the photographs is small and compact. The receiver is in a separate unit which contains audio equipment for use both in the transmitter and receiver. By this arrangement, the receiver and transmitter may be placed in different locations and the transmitter operated remotely when desirable. A separate antenna is used for each unit, chiefly as an operating convenience. The outfit in this form is suitable for fixed, portable, or even portable-mobile operation.

Thus far, we don’t know a great deal about what can be expected in the way of practical results. Increased shadow effects with a corresponding decrease in range over some paths must be expected, but it is certain that many of the circuits now helping to crowd the 112-Mc. band can be covered just as effectively at 224 Mc.

A side view of the 224-Mc. oscillator unit. The inverted “U”-shaped grid and plate resonant rods are tuned by means of a sliding fixed condenser. On the left end of the chassis is the WE 316-A “doorknob”-type tube. On the opposite end, a hairpin loop is coupled inductively to the tank rods for antenna pick-up.

*Comp. 1508, USNTS, Great Lakes, Ill.*
The circuit of the transmitter, shown in Fig. 1, is an ultradion with a linear tank. A WE 316-A "doorknob"-type tube is coupled to the parallel resonant line which is bent in the shape of an inverted "U" to conserve space. The 316-A requires a filament transformer which will provide 2 volts at approximately 4 amp.; or a 2.5-volt transformer can be used with a 10-watt 200-ohm resistor in series with its primary, as shown at R1. A hairpin loop for antenna pick-up is coupled to the grid and plate lines. R.f. chokes are essential in each filament lead because the filament is not at r.f. ground potential. When the circuit is oscillating, grid bias is obtained from the voltage drop across the grid leak, R2. This resistor is connected between ground and the grid line, Lg, at a point which is "cold" so far as r.f. is concerned. In the plate circuit, current is fed through the metering resistor, Rs, and RFC2 to a similar "cold" point on the plate line, Lp. The mica condenser, C1, is fitted with metal clamps so that its position may be changed, like the customary shorting-bar, for tuning purposes. The reactance of this condenser at 224 Mc. is so low that it is virtually a direct connection for r.f. but it blocks d.c. from the power supply from flowing across the bars to ground through R2. The self-quenched superregenerative circuit of the receiver is shown in Fig. 2. A type 955 acorn tube is used, but an HY615 or a type 9002 tube can be used with satisfactory results by proper adjustment of tank dimensions. Tuning is done with the 7-µfd. variable condenser, C1, which can be made by taking off two of the plates of a regular 15-µfd. midget variable. Regeneration is controlled with the potentiometer, R2. A two-stage audio amplifier is coupled to the detector output through one winding of the dual-primary transformer, T1. Gain control both for the receiver and transmitter is accomplished with the potentiometer, R4. For microphone current, the battery, B, may be used, but it is possible to tap the "mike" current off the 6L6 cathode resistor. In this case, the line for mike current goes to the juncture of R3 and Rg instead of to the negative side of the battery. The output transformer, T2, is shown to be of the push-pull type because one of this type was easily obtainable, but a single-ended transformer is perfectly all right provided that it will properly match the 6L6-plate and speaker impedances. The change-over switch, S, is a four-section ganged arrangement with a s.p.d.t. unit in each section. The function of all sections is evident from the diagram except perhaps that shown near the speaker in Fig. 2. Here it will be seen that the positive side of the power supply is connected constantly during operation to the two stages of the audio-amplifier so that they are ready at all times either to boost receiver output or to plate-modulate the transmitter. The switch then serves

Fig. 1 — Circuit diagram of the 224-Mc. transmitter.

Fig. 2 — Circuit diagram of the 224-Mc. receiver and audio amplifier.
the purpose of changing this positive lead from the 955 receiver circuit to the WE 316-A transmitter, as desired.

**Construction**

The dimensions of the transmitter chassis are $5 \times 9\frac{1}{2} \times 1\frac{1}{2}$ inches. This small size is accounted for partly by the inverted “U” shape of the grid and plate tuning rods, as shown in the photographs. Since the WE 316-A tube does not have a standard base, the socket which was built for the purpose is shown at the right in the top-view photograph. The binding posts which hold the tube pins are mounted on spring-metal strips which in turn are mounted on stand-off insulators. The metal strips not only act as shock absorbers for the tube, but may be bent slightly to fit individual tube pin dimensions. However, care must be exercised not to rupture the glass at the base of the tube by placing a mechanical strain on the pins. Soldering at the tube pins therefore should be avoided in order not to crack the glass.

The plate and grid lines, $L_1$ and $L_2$, are bent so that their ends fit into the screws in the stand-off insulators used for mounting. The ends are then sweated onto the screws. With such short lines, rigid support is obtained in this manner. The same is true of the antenna-coupling loop which is made of a piece of No. 10 solid copper wire, four inches long.

Photographs of the receiver unit are not available, but the following description is given to aid those who may want to build a similar rig. The receiver and modulator are built into a can $7\frac{1}{2} \times 7\frac{1}{2} \times 7$ inches. With these dimensions the parts are not jammed together. They are mounted compactly enough, however, so that wiring may be “shorter than short.” For example, the 955 acorn tube is mounted in a vertical plane so that the plate pin of its socket touches the stator section of the variable condenser.

If a dual-primary transceiver coupling transformer cannot be found to use at $T_1$ in Fig. 2, some measure of success can be had by winding 30 turns of No. 34 magnet wire over the existing winding of a common 3-to-1 audio interstage transformer. The output lead from the modulator to the transmitter is brought out on the side of the cabinet through a feed-through insulator. On the other side of the cabinet, the permanent-magnet speaker is mounted. The four-pole, double-throw, ganged change-over switch, $S$, is mounted in the top right-hand corner of the cabinet, and all wiring to the switch is cabled for neatness. A large vernier-type dial is coupled by means of a shaft-coupling link to the rotor of the variable condenser. Binding posts are brought out in the rear for the external $4\frac{1}{2}$-volt microphone battery. Insulation in the r.f. circuit of the receiver should be of either ceramics or polystyrene in order to reduce losses.

**Antennas**

As mentioned previously, separate antennas are used for transmitter and receiver. Constructional drawings of two types which have been used with

(Continued on page 94)
Radioteletype in the AACS

Putting Radio Signals to Use to Operate Teletypewriters

BY CPL. GEORGE HART,* WINJM

PrACTICALLY everyone has seen in operation the kind of teletype equipment which makes use of a direct line between two or more points to operate printers and keyboards at each end. This equipment is operated by means of electrical pulses sent over a metallic conductor; these pulses cause a printer at the receiving end to reproduce the exact intelligence transmitted from the keyboard at the transmitting end. No technically skilled operators are required. It is simply a matter of running a teletypewriter in one place and having it print in another.

There is nothing very new about this. It has been in use for years, and it is by no means becoming obsolete. However, over long distances, especially distances separated by large bodies of water over which direct wire communication is not possible, it has become necessary to use radio more and more as a means of military communication, particularly to and from remote points which suddenly, in the course of the war, have become locations of vital military installations and operations.

Prior to the advent of radioteletype, there were several ways of communicating by radio which, for the purpose of this discussion, can be divided into three categories as follows: (1) direct voice; (2) manually-operated c.w. circuits, and (3) c.w. circuits using automatic code transmission and reception to the extent that the received signals are printed on inked slip in the form of dots and dashes, which then must be copied manually at a slower speed by a skilled operator.

The unavoidable disadvantage of all three of the above methods of transmission and reception are more or less obvious. Voice operation is effective only when signal strength is at a comparatively high level. Manual c.w. circuits require a signal that can be heard and understood by the human ear in addition to trained operators at both ends. Automatic c.w. circuits, while probably the most effective of the three methods listed, still require trained operators at the receiving end, and these operators are subject to fatigue and exhaustion not characteristic of machinery.

The Army Airways Communications System was among the first military organizations to recognize the value of the newly developed radioteletype for military communication, and has been the first to put it to actual use on a worldwide scale. At its headquarters in Asheville, N. C., a hard-working detachment of the 107th AACS Squadron conducts a radioteletype school and operates a training station for radioteletype operators and maintenance men. The personnel of this detachment consists of specialists variously at work instructing classes, analyzing and testing new equipment proposed for AACS uses, and maintaining and operating all equipment, mostly for instructional purposes. A radioteletype station has been set up for student training purposes, complete with receiver and transmitter sites three miles apart and six miles from the headquarters building, at which is located the operating position which remotely controls both transmitters and receivers. This installation is an exact duplicate of the type installed in the field, even to the equipment inside the buildings, so that students trained to operate and do maintenance work here will be familiar with all radioteletype equipment used.

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A four-channel 400-watt-output radio transmitter used in radioteletype operation. The unit just below the Hammarlund receiver is used as the exciter for the transmitter and provides a system of frequency shifting to produce the signals required for radioteletype operation.
by AACS. As a result of this standardization, radioteletype men trained by the detachment at Asheville have given a good account of themselves when out in the field.

**Transmission**

As mentioned above, the conventional teletype machine utilizes electrical impulses which are transmitted over a wire to the receiving point. The problem of its adaptation to radio transmission consisted mainly of finding a means of transmitting a signal which, upon being received, could be converted into pulses which would operate a polar relay. In other words, it was not considered desirable to alter the teletypewriter machines themselves, nor has this been found necessary. All that has been necessary is to substitute a radio signal for the metallic conductor which ordinarily carries the teletype pulses. These pulses, in order to operate the polar relay which actuates the teletype printer, must consist of two values, called "mark" and "space." The simplest way of accomplishing the operation is to use a keyed carrier, a signal causing the relay to "space" and no signal causing it to "mark." Such a system is known as "neutral signals." While it has been used with some success, there has been one important drawback: that atmospheric noises or interference frequently caused the relay to make space contacts when there was no signal, thus giving a garbled text on the printer.

In order to overcome this difficulty, a newer and more successful method of sending mark and space signals is to use a constant-carrier signal which shifts its frequency to another point less than a kilocycle away in accordance with the pulses transmitted by the teletypewriter. Thus the pulses, instead of keying the transmitter carrier, simply change its frequency. One frequency, the normal transmitter frequency, represents a mark while the shifted frequency, slightly less than 1 kc. lower, represents a space. Of course, there are a number of ways of effecting this frequency shift, the one mainly used being a system of condensers across the crystal controlling the transmitter frequency. Separate oscillators can be used. The extent of the shift is important in that it must be great enough to enable the receiving equipment to make a differentiation between the two frequencies and still not be so great that the two frequencies cannot be received without retuning the receiver. On frequencies generally in use by AACS the shift utilized is slightly less than 1 kc. On higher frequencies the shift could be greater, while on lower frequencies it would probably be necessary to decrease the amount of shift. The transmitter itself can be any conventional circuit operating at any power.

**Reception**

Reception, however, is somewhat more difficult. The two main problems at the receiver can be summarized briefly as follows: (1) to discriminate between frequencies, and (2) to use signals obtained from this discrimination to operate a polar relay.

While the emphasis in this article is on the application of frequency-shift transmission to commercial radioteletype operation, potential advantages may be found in amateur postwar use minus the automatic equipment—requiring in lieu thereof perhaps only a modified electronic key at the sending end and a relay-keyed audio tone for reception.

Frequency discrimination is accomplished first of all by the high-frequency oscillator which beats against the incoming signals to produce i.f. frequencies, one for mark and one for space, centering around 465 kc., the space signal exactly as far above 465 kc. as the mark signal is below it. Note that the space signal is now the higher of the two due to normal frequency inversion in the first detector. The output of this stage is beat against the second b.f.o. which produces the correct audio tones for the receiver output of the mark and space signals, but the frequency of the second b.f.o. must be lower than that of the i.f. stage in order to prevent a second frequency inversion. The two resulting mark and space frequencies, as long as they are the correct number of cycles apart, are not necessarily critical. However, since the band-pass filters following the receiver output are standardized in equipment used by AACS, two certain audio frequencies are always adhered to.

These signals are passed through a band-pass filter which passes only the two signals and all frequencies between them, thus eliminating much noise. They then go through a limiter (which is a real limiter) that keeps the signals at constant level.

**Fig. 1** — Transmission and reception of polar signals. Note that the receiver itself is but the first of many steps in the receiving process.
coming through them directed through separate sets of filters and limiters. One receiver is designated Channel A and the other Channel B. These two channels are each identical to that described in the preceding paragraph with the addition that each contains a noise-suppression circuit following the detectors for the purpose of measuring the signal-to-noise ratio in each channel and by an interpolating action decreasing the current supplied by the poorer channel and increasing the current supplied by the better channel to actuate the polar relay.

**Operation**

Radioteletype circuits can be operated either simplex or duplex, depending upon whether or not the two transmitters are on frequencies far enough apart to avoid interfering with each other. If they are on the same frequency (simplex operation) it is impossible to send and receive at the same time because the local signal would blot out the one from which reception is desired. In this case, therefore, it is necessary that the carrier at one end of the circuit be cut in order to receive signals from the other end.

Here a bit of trouble arises. Teletypewriters which are running "open," which is to say that they are not being controlled by mark and space signals, have a habit of chattering and printing garble, which makes a mess out of otherwise neat

**Diversity Reception**

Since the operation of radioteletype equipment is adversely affected by fading and generally poor receiving conditions, it being necessary to maintain the strength of the signals at a constant level, diversity reception is usually resorted to, along with two directive antennas spaced far enough apart to effect (theoretically) a phase shift. Rhombic antennas terminated in the direction from which reception is desired have been found to be the most satisfactory.

When diversity reception is used, two receivers with common beat oscillators are utilized and the signals
copy. In the case of simplex operation, then, the printer would be running open from the time one operator switched his carrier off until the other switched his on, for during this time there would be no controlling signal and the printer would be operated spasmodically by whatever noise happened to be coming in over the circuit. Thus it is essential that a steady mark signal be sent out to the receiving equipment in order to render the printer inoperative when there is no controlling signal; yet the receiving equipment must continually monitor the frequency and commence operation immediately as the transmitting carrier comes on the air.

The system of relays which accomplishes this operation is known as the “monitor lock-up.” The relays are operated manually from the remote operating position to close, or lock, the equipment so that it will not operate without a signal, but once the signal returns to the air the monitor relays are released automatically and the receiving equipment put into normal operation. When a transmission begins, a period of ¼ second must elapse before the monitor lock-up circuit will be broken. In this way noise will not disturb the monitor circuit since noise will seldom be of more than ¼-second duration.

**Duplex Operation**

For duplex operation, when separate frequencies are used, the monitor circuit is not generally used for the simple reason that the carriers of both transmitters can be left on the air continuously and it is at no time necessary to supply an artificial mark signal to keep the receiving equipment inoperative. When one transmitter is not transmitting anything its carrier is automatically set on a mark, which will render the receiving printer inoperative until the frequency again shifts. Duplex operation, of course, is preferable to simplex for, given the proper amount of equipment at both ends, it is possible to transmit and receive simultaneously. Where two frequencies far enough apart to avoid local interference are not available, however, simplex operation with a monitor circuit is mandatory.

The versatility of radioteletype is further enhanced by the fact that perforated tape can be, and more often than not, is used to actuate the polar relay which does the transmitter keying. While the use of tape is not mandatory, its use gives more speed and accuracy of transmission. The teletypewriters in use are capable of a speed of 60 w.p.m., and when tape is used can transmit continuously at this speed. Manually, it would not be possible to attain this speed for the obvious reason that the human element does not allow a constant speed to be maintained; in other words, even though a given typist may be capable of typing at 60 w.p.m., or even higher, nevertheless his depression of the keys would not be steady enough to allow him to maintain a constant speed of 60 w.p.m. over any great length of time. The perforated tape, however, does accomplish this steadiness and allows the equipment to operate at its highest possible speed.

**Automatic Relaying**

Messages can be relayed automatically through a radioteletype station by means of a “reperforator.” The signals are received and directed to the perforator which, in addition to printing the message on a tape as it comes in, perforates the same tape with that message. The “reperforated” tape then is fed into a sending head which is connected to a transmitter, usually remotely controlled, which automatically repeats the same message that has been received. Since the reperforated tape can be fed directly into the sending head, a message received can be retransmitted from five to ten seconds after reception. By means of reperforation, a receiving station also may repeat back to a sending station the exact message received for checking purposes, assuming, as is generally the case, that both transmitting and receiving equipment are available at both ends of the circuit.

**Summary**

From the above somewhat elementary explanation of the equipment used by AACS in radioteletype, it should be clear that much can be accomplished by radioteletype that has not been or cannot be accomplished using other means of radio communication. Unfortunately, much has had to be left unsaid, for security reasons. The publication of schematic drawings and detailed technical analysis of the equipment are, for the time being, out of the question.
The principal causes of failure in radio circuits are interference, noise and fading. Since the system employed in radioteletype requires the use of a very narrow frequency band, interference is not much of a problem since it usually can be eliminated by sharp selectivity in the receiver.Directive antennas also help to eliminate interference and at the same time minimize noise. The balanced, two-tone system further minimizes the effects of noise. In practice, the equipment will print perfect copy when the noise level is so high and the signals so weak that they cannot be heard by the human ear. Failures due to fading are cut down by the use of diversity reception. Two-tone operation, diversity reception and directive antennas are the principal means employed to obtain the very high degree of dependability.

**Personnel**

The personnel who are AACS specialists in radioteletype work are mostly former amateur operators; in fact, it is generally conceded that amateurs are the backbone and nucleus of the AACS. Of the 107th AACS detachment in Asheville which operates the demonstration station and conducts the radioteletype school, the officer in charge is an amateur, the non-commissioned officer in charge is an amateur and the non-commissioned officer in charge of the transmitter site and his assistant are both amateurs. Other members of the group have expressed their intentions of becoming amateurs after the war and “getting on the air with my own rig.”

The detachment officer in charge is 2nd Lt. G. V. Dawson, jr., W9ZJB-W3JSL, who was well known in the amateur world for his meritorious achievements on 56 Mc., particularly the feat of being the first ham to work all U. S. districts on that band. He has been with AACS for over a year and is a newly-commissioned officer, having risen from the ranks via OCS at Miami, Fla.

Directly under Lt. Dawson as the non-commissioned officer in charge of the detachment is an old timer with 18 years of active service in the Army, M/Sgt. Thomas J. Broderick, W9NJL, who has attained considerable communications experience background in his many years with AACS. M/Sgt. Broderick does a good job of keeping the detachment on its toes and operating efficiently.

M/Sgt. Cecil Harris is our installation specialist and does some instructing on the side. He also is in charge of the supply room. He has no amateur aspirations that we know of, but he does know his radio.

In charge of the remotely controlled transmitter site, which is located about six miles from the controlling point at the City Building in Asheville and three miles from the receiver site, is T/Sgt. Harold I. Johnson, W9JGQ, who previously served with United Airlines and the Iowa State Police as an operator and mechanic. Working under T/Sgt. Johnson is another amateur, Cpl. Ralph J. Porrazzo, WILLW. “Haggy” and “Poggy” make quite a team at the transmitter installation.

T/Sgt. Robert H. Hansen is in charge of the receiver site and has expressed his intention of becoming a ham after the war. Bob is an excellent technical man with extensive training and experience in electronics and will, we know, make a good amateur.

The writer, himself a neophyte in the technique of radioteletype, wishes gratefully to acknowledge the assistance of the above-mentioned in preparing this article.

HAPPENINGS OF THE MONTH

FREQUENCIES
It is immensely difficult to make any sensible reporting, in a monthly magazine, of the confused and complex progress of the American study of postwar allocations. Each item we write seems dated before it appears. But we do want to keep our members informed on what’s happening as well as we can, so we’ll try again.

The Planning Committee of the ARRL Board (Messrs. Blalack, chairman, Caveness, Dosland, Noble and Norwine, plus Bailey ex-officio) met for two days in Washington in September, reviewed our whole situation, checked our course for the immediate future, reported to the Board.

RTPB's allocation panel worked hard throughout September on the part of the spectrum that lies above 30 Mc., trying to get agreements to present at the FCC hearings. RTPB, in a way, is a creature of FCC, since it was set up at the suggestion of the latter's chairman.) It made no particular progress, demands greatly exceeding the available frequencies. RTPB will have a prominent part in the FCC hearings. Allocationwise it will only be able, at the outset, to report the frequency requests it has collected.

As the hearings progress it hopes to have further meetings and to be able to report some agreements and recommendations when it takes the stand again near the end of the hearings in early November. ARRL is represented in the RTPB work by Secretary Warner, Technical Director Grammer and Assistant Secretary Read.

FCC's ponderous hearings opened Sept. 28th and are scheduled to last into November. It hears both RTPB and the individual agencies of the art and industry. ARRL will speak for amateur radio. The League has prepared comprehensive testimony, approved by the Planning Committee. President Bailey and Secretary Warner are our witnesses, with George Grammer as technical adviser; and with our presentation stage-managed and advised by Acting General Counsel P. J. Hennessey, jr., member of Segal's firm. In November FCC is expected to get up its proposed postwar allocations, based on the hearings, and to attempt reconciliation with the plans of other branches of the Government.

The study committees organized by the Department of State have been carrying on but deferred consideration of allocation matters until after the opening of the FCC hearings. They are expected to get down to frequencies during October, with the so-called IRAC proposal as the basis for discussion. The result will at least serve to show the Department what the public reaction is to the proposals. ARRL representation in these studies is being handled by Messrs. Warner and Read, with President Bailey participating as the situation requires.

In all this work ARRL pursues one uniform policy, originally laid down by the Board of Directors and approved in its detailed application by the Board's Planning Committee. You can see just what it is in the article on amateur frequency requirements on the following page.

Precisely what happens after the above-described phases are completed is still uncertain as we write. The matter will lie pretty much between IRAC, appointed by the President to look after Government frequency needs, and FCC, legally responsible for the administration of civilian radio. Final determination of the U. S. plans and point of view is to be expected to be put into the hands of the Department of State some time in December. The amateur position remains definitely strong as of this writing.

A word about this so-called IRAC proposal, which is causing some reverberations in amateur circles. A subcommittee of IRAC, acting as a subcommittee of the Dellinger technical subcommittee of the Department of State's special committee on communications, got up a proposed allocation ladder last June. The Department put it forward as a basis for discussion in the public phase of its preparatory work which began in August. It is a "classified" document, restricted to those directly concerned with the work; and in all the agencies dealing with postwar radio planning the attendance is restricted to U. S. citizens. The classification of this paper as restricted prevents our publishing it or discussing its details, even though it has had so large a circulation that some impression of its contents has leaked all around the country. If the classification is removed, we shall report and discuss its contents with you. * Meanwhile, disabuse yourself of the idea that it has been conceived in a spirit of hostility toward amateur radio, as some of you think. Quite the contrary, most other radio services are very jealous of the protecting arm which the Government services have thrown around amateur radio and we have reason to be grateful, although disagreeing with the plan in

* Just at our deadline the classification was removed, to permit discussion of the document at the FCC hearings, but with insufficient time for writing up the matter in this issue of QST. We shall report next month.

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.

November 1944

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spots. It is not true, as some of you report to us, that IRAC proposes the elimination of four amateur bands. Some changes and shifts are proposed, also some additions to our frequencies. Many worse things could happen to us than to have to live under the IRAC plan. But in any event it is only a proposal, a target for discussion; there has to be a start somewhere. Before this job is done there will be dozens of proposed allocation ladders. It just happens that this was the first one. We believe that the eventual U. S. allocation will bear a strong resemblance to the IRAC plan, but unquestionably there will be modifications. Don't permit yourself to get excited over what you hear about it.

WAR SERVICE RECORDS WANTED

Despite the fact that the form at the bottom of this page should by now be familiar to every QST reader, we continue to get many hundreds of them back for our files every month. Are you registered with us?

ARRL, as the amateurs' own association, is compiling at its headquarters a card-file record of the war services of United States and Canadian amateurs, to supply the statistics necessary to defend the amateur position. We believe our form is self-explanatory. It will take you only a moment to fill it out. Be sure that the data on your wartime employment of your amateur talents is on file at ARRL headquarters!

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 23 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.

**AMATEUR WAR SERVICE RECORD**

<table>
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| Call, present or ex; or grade of op-license only |

| SERVICE |
| □ Army |
| □ Navy |
| □ Coast Guard |
| □ Marine Corps |
| □ Maritime Service |
| □ Merchant Marine |
| □ Civil Service |
| □ Radio industry, 100% war |

**“THE FREQUENCY REQUIREMENTS OF THE AMATEUR RADIO SERVICE”**

Would you like to know exactly what position ARRL is holding in the matter of post-war frequencies for amateurs? This is it.

This is part of the testimony which the League offered in the formal hearings on allocation begun by FCC on September 28th. It represents only about a third of our total testimony but is the portion dealing with frequency requirements. It was preceded by extensive testimony on the nature of amateur radio and its contributions to the security and welfare of the nation, data which you'd find interesting reading but for which we can't find publication space right now in this time of paper rationing and smaller issues; and even this part we must give you in small type.

Fundamental League policy in the matter of frequencies has been laid down by the Board of Directors. In the details of the application of that policy to the Government planning activities of this autumn, the Planning Committee of the Board has approved the present document. It presents the position which the League is uniformly taking not only before FCC but in RTPB and in the study committees of the Department of State's teleplanning.

The Frequency Requirements of the Amateur Radio Service

This portion of our testimony relates to the frequencies needed by the amateur service to permit its activities in aid of the national life. At the outset, it seems desirable to review briefly the history of amateur allocations in this country so far as they are pertinent to this hearing.

When the first comprehensive radio law was adopted in 1912 it provided that, except for what were called special-license stations, no amateur station should use a transmitting wavelength in excess of 200 meters — that is, a frequency below 1500 kilocycles. The entire spectrum from 1500 kilocycles upward was at the disposal of the amateur. This condition arose through no great magnanimity but because it was desired to banish the amateur — in those days regarded as more of a nuisance than otherwise — to frequencies that no one else valued. For many years amateurs congregated as close to the 1500-kilocycles frontier as
arrangement, the amateur service received frequency allocation from the very beginning. Under this strictly American concept of even-harmonic allocations first arose, serving the purpose of allocating the radio spectrum to the amateur radio service. Every amateur is then authorized by the radio administration of this country to operate at any frequency band or frequencies to individual amateur stations. It is interesting to examine what these assignments were. They consisted of the following bands:

- 1,500 to 2,000 kilocycles
- 3,500 to 4,000
- 7,000 to 8,000
- 14,000 to 16,000
- 28,000 to 32,000
- 66,000 to 64,000

The American amateur continued in the enjoyment of these frequency bands until the first of 1929. In Washington in 1927 there was held the first international radio conference since the one which had resulted in the London Convention of 1912. This conference made the first international determination of high-frequency assignments, its provisions becoming effective January 1, 1929. The delegation of the United States fought hard to maintain the current allocations of amateurs but was unable to do so in the face of foreign objections; and, as a result, the amateur bands were halved by the conference in the area of even harmonics.

These reduced allocations have remained substantially unchanged since that date. The Government of the United States, firmly convinced of the value of the amateur institutions, has successfully defended the amateur allocations at international regulatory conferences at Madrid in 1932 and at Cairo in 1938, and at the two inter-American regional radio conferences held in Habana and Santiago. These are the American amateur allocations of today, consisting of the following frequency bands:

- 1,750 to 2,050 kilocycles
- 3,500 to 4,000
- 7,000 to 7,300
- 14,000 to 14,400
- 18,000 to 18,400
- 28,000 to 30,000
- 56,000 to 60,000
- 112,000 to 116,000
- 220,000 to 220,000
- 400,000 to 401,000

And shared rights above 300,000 kc.

With this bit of history behind us for background, we are now in position to examine the future. **Amateur Stations Operate in Bands**

It is neither feasible nor desirable to assign individual channels or frequencies to individual amateur stations. It is world practice to allocate certain bands of frequencies to amateur radio. Every amateur is then authorized by the terms of his license to operate at will anywhere within any of these bands, under the strict requirement of confining the entire effect of his radiated signal within the limits of the band and of complying with certain fundamental stipulations in order to maintain the general usefulness of the frequency. Thus, referring to the Commission's call for the adoption of certain technical data at this hearing, we wish to point out that there is no applicability to the amateur service of any suggestions as to the width of a communication band, the frequency tolerance, etc. The basic principle in the allocation of facilities for the amateur service is the assignment of bands of frequencies, available to all amateurs, depending on their various interests and needs, with the details specified in your amateur regulations.

**The Bands Must Be Diversified**

Amateurs are experimenters and investigators — of radio, divergent and changing interests, and with many subdivisions of specialization. It is the function of the Radio Act of 1912 to assign to the amateur service bands of frequencies useful for all types of emission, from telegraphy and telephony to facsimile, television and pulse transmission. It is also necessary that these allocations be distributed throughout the spectrum above the standard broadcast band to permit what might be called the sampling of the performance of all kinds of frequencies.

From our brief review of the history of amateur allocations you will have noticed that, in practice, this desired distribution has always taken the form, since the frequencies above 1,500 kc., of the amateur allocation scheme. At times the frequency assignments not over an octave apart. That is to say, the amateur allocations in principle are a family of harmonic bands having different performance characteristics and useful for operating by different modes, at different distances, at different times of the day, and in different seasons. Thus another basic principle in providing for the amateur service emerges: the amateur allocation should consist of test portions from each octave of the spectrum above the standard broadcast band, these successive allocations preferably harmonically related, so that amateurs may investigate their potentialities and have at their disposal frequencies for any given undertaking. It is essential that frequencies be capable of operation over all practicable bands, independent of diurnal or seasonal conditions, be available. Considering the usefulness of the amateur body in gathering data on the performance of the whole spectrum as determined by experiment with small separated assignments, it is also of great importance that there be no gaps in the family series.

**The Location of These Amateur Bands**

Strictly from a technical standpoint, there is nothing particularly sacred about the present specific locations of the amateur bands in the spectrum. We have pointed out that the actual beginning figures for each amateur band were the chance determination of an American conference, later becoming the basis for the international agreements. From these early engineering considerations alone, the whole amateur family of bands could be shifted a modest distance up or down in the spectrum without serious consequence. But from practical considerations we believe there are compelling reasons why the present locations are the best. Entirely additional to the present investment of American amateurs and their suppliers in apparatus and tools for the present bands, it is of the utmost importance to observe that these bands have been allocated to amateurs since the very beginning of international treaties on the subject, and that therefore the other radio services of the world have been built up around the amateur allocations. Any endeavor to shift the amateur bands, as a whole, up or down in the spectrum would inevitably prove difficult and costly to the other services involved, as well as to amateurs, and it is therefore indicated that the present locations are the most desirable.

It will be of interest to the Commission to know that, without a single exception of which we are aware, the present amateur allocations are bands of frequencies in the history of this country have never been assigned to any service other than amateur. They constitute test slices reserved for the amateur from his one-time assignment of all frequencies above 1,500 kilocycles. With the exception of the small territory occupied by the 400 megacycles and below frequencies, they are all the subject of international treaties to which the United States is party, in addition to their exclusive assignment to amateurs in your regulations.
The Needs of the Amateur Service
Below 60 Megacycles

In coming now to the frequency needs of the amateur service in the future we shall discuss the subject in two sections, dealing with the spectrum at 60 megacycles and below. Our selection of that figure is dictated by amateur technical practice. Below 60 megacycles it is of very great technical desirability that the amateur allocations be in harmonic relationship, at least as concerns a portion of each band. This facilitates easy frequency change-over from band to band, makes for much economy in equipment. Above 60 megacycles the principle is of much less importance. We shall treat first the frequencies below 60 megacycles.

As indicated, we do wish to ask you for one additional band in this part of the spectrum. Several of the amateur bands are long-distance ones, of worldwide effect, occupied by the nation, as we are, in no other, in the longer distances within the United States. It is to be expected that the same factors that make for a great increase in our own numbers will be operative in many other countries and that many of these countries, particularly the English-speaking ones, there will be a comparable percentage of increase in the number of amateurs after the war. We are thus led to expect that our greatest congestion and interference problems will be in the bands for long-distance work. While our studies do indicate to us that it would be difficult to widen any of our present long-distance bands, we believe that space can be found for a new amateur band beginning below 60 megacycles, and an assignment would be harmonically related to the amateur band which begins at 7 Mc., permitting operation by tripling frequency from that band. Frequencies of the order of 21 Mc. are marginal in value, rated as of only sporadic long-distance performance, and consequently are of less commercial worth than lower frequencies. For this reason this part of the spectrum has never been heavily occupied. Yet for amateur purposes such an assignment, midway in the octave below that which the present band begins, would provide a useful supplementation of our congested long-distance facilities, relieving some of the pressure of occupancy in the 7- and 14-Mc. bands in all the countries of the world and being of value for the purpose of over-all control of the portion of the solar cycle than is our 28-Mc. band. We therefore ask the Commission to provide in its postwar plans for the assignment to amateurs of a new band of frequencies from 21,000 to 22,000 kilocycles.

To make the record perfectly clear, we here rotate the bands of frequencies below 60 Mc. which we are requesting for amateur radio:

Above 60 Megacycles

<table>
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<tr>
<th>Band</th>
<th>Frequencies</th>
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<tbody>
<tr>
<td>1310</td>
<td>13,000 to 13,500</td>
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<tr>
<td>2300</td>
<td>22,000 to 22,500</td>
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<td>3300</td>
<td>31,000 to 31,500</td>
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<tr>
<td>4300</td>
<td>40,000 to 40,500</td>
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<td>5300</td>
<td>50,000 to 50,500</td>
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<tr>
<td>6300</td>
<td>60,000 to 60,500</td>
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</tbody>
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Below 60 Megacycles

<table>
<thead>
<tr>
<th>Band</th>
<th>Frequencies</th>
</tr>
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<tbody>
<tr>
<td>1300</td>
<td>12,500 to 13,000</td>
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<tr>
<td>2300</td>
<td>21,500 to 22,000</td>
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<td>3300</td>
<td>29,500 to 30,000</td>
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<td>4300</td>
<td>37,500 to 38,000</td>
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<tr>
<td>5300</td>
<td>45,500 to 46,000</td>
</tr>
<tr>
<td>6300</td>
<td>53,500 to 54,000</td>
</tr>
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Before leaving the frequencies below 60 Mc. we wish to make a further reference to our band from 1,750 to 2,050 kc. During the past year our representatives have encountered in several Government circles the feeling that the national interest after the war will require the diversion of part of this band for some purpose of a character that will have continuing national value after peace returns. The service in question has been established on some of our frequencies in that band by the military services during their wartime employment of our frequencies. When this device was invented and a search was made for frequencies for its operation, our band was standing comparatively idle and the service was established therein. Originally contemplated only for the purposes of the war, it is now perceived to be of similar usefulness in peace. We of course fervently hope that it will be found possible to transfer this service to other frequencies, to permit restoration of the band to our use. It would play an important part in our short-distance operations. But in the event it is decided that it is impossible to restore it in its entirety to amateurs, we urge that at least some remaining portion of it, preferably beginning at 1,750 kc., be continued as an amateur assignment, so that the band will not be completely canceled from the amateur family.

Such a provision is of considerable importance. The major portion of our organized short-distance work is based on complex networks and trunklines, occluding the band 3,500 to 4,000 kc. This is the band most used for telegraphic record communications during emergencies brought about by acts of nature. But there is a band in every cycle when frequencies in this band slip out and interrupt communication, making a shift to a lower-frequency band necessary to re-establish contact. Your amateur regulations contain special provisions for amateur operation in this band during emergencies, including designated calling channels and listening periods, and some amateur groups have constructed considerable special apparatus for operation in this band. A secondary reason for our request is to make available some frequencies of this lower order for the use of amateurs who are investigating the performance of radio waves and who need access to as many octaves of the spectrum as possible. For these two reasons we believe it would be manifestly in the national interest to retain some provision for amateurs in this band, and we so request. We would suggest, for example, 1,750 to 1,800 kc. as a practical minimum. But we repeat that we do need the whole band and we hope for radical arrangement that can be made to transfer the present wartime operations to other frequencies.

The Needs of the Amateur Service
Above 60 Megacycles

It has been the policy of the Commission, each time you allocated a higher portion of the spectrum to radio services, to make additional assignments to amateurs in extension of our harmonic family. You now have before you the question of extending general allocations from 300 Mc. up to 35,000 Mc.

Between 60 and 300 Mc. there are at present two amateur bands, one from 112 to 116 Mc. and the other from 224 to 230 Mc. You have told us that these are harmonically related to our lower bands. In the region from 300 to 30,000 Mc., pending specific allocation to services, we have shared rights with other experimental services but only one exclusive amateur allocation, the small assignment at 400-401 Mc. This assignment was made available by the Commission mainly for a special purpose, and has always been regarded both by Commission engineers and by ourselves as subject to change whenever a general allocation to services was made in the range above 300 Mc.

You will understand our immense enthusiasm to get hold of the ultrahigh frequencies and the superhighs after the war. It has been the constant history of amateur radio that its pioneers explore and open new territory at successively
higher-frequency frontiers for the use of the amateur body generally and to the benefit of the whole art. We want a chance to apply to the problems of amateur communication at such frequencies, some of the new knowledge born of this war. Although there has been a great increase in man's knowledge of such frequencies in the last few years under the imetus of military necessity, we can be certain that the surface has hardly been scratched, that much work remains to be done, that there are untold treasures to unearth. It seems to us inevitable that there will be found to exist progressive differences in the performance of frequencies through this region, after the general fashion of the behavior of the lower portion of the spectrum, and again the amateur should have at his disposal some of these frequencies of every type of performance. That will be a wise arrangement to set up, because the amateurs can be counted upon to contribute new knowledge. Some of these allocations should have sufficient width to accommodate experimental work in wide-band methods of emission, since we amateurs have a definite interest in expanding our work with television and in applying facsimile to amateur communication and in determining to what extent we can adapt pulse techniques to our work.

When, from the above considerations, we come now to the point of asking the Commission to allocate to the amateur service specific bands of frequencies in this part of the spectrum, the arrangement that immediately commends itself from the standpoint of logic is to extend the present harmonic family upward by the addition of new bands an octave apart. Our needs would be satisfied by such an arrangement, where the amateur bands logically ought to be located. Therefore, picking up the two amateur bands already existing above 60 Mc., we now ask the Commission for the following specific assignments:

Now although the specified figures for these requested bands commend themselves from engineering considerations and from the standpoint of logic, some information has been disclosed on postwar planning by various Government agencies, particularly the military services, which would indicate that some of our requested assignments for amateurs would be in conflict with Government postwar intentions, and that from the Government standpoint there may be other more logical locations for these amateur bands. As we have already said, the preservation of harmonic relationship is only a convenience and not a necessity to our operations in this part of the spectrum. Other locations for the amateur bands would be acceptable to us. We therefore wish to state that if it be found that military planning requires such allocations to the requesting amateur harmonic family as an amateur allocation, and if it be found easier to provide for us in a manner that takes account of the postwar planning that has been done by the military services, our needs would be equally satisfied by the following alternative allocations:

144 to 149 megacycles
218 to 225
420 to 460
840 to 900
1,125 to 1,225
2,500 to 2,700
5,200 to 5,750
10,000 to 10,500
31,000 to 32,000

And shared rights above 30,000 Mc.

Thus we conclude our statement of needs. Under your administration there exists in this country an increasing body of eager and skillful amateur investigators and communicators. It has been the policy of this country to protect and encourage the amateur, in the confident knowledge that this was in the national security and welfare. There is admittedly great demand for frequencies. But the amateur allocation is so small a portion of the spectrum that if, in any given octave, the entire width of the amateur band were diverted toward the relief of the frequency problems of some other radio services, no other problem could be solved for longer than a very brief while. Yet there is no employment of radio frequencies that contributes more to the welfare and security of the nation as a whole than do the allocations to the amateur service.

New Weather Maps for Making DX Predictions

With the partial lifting of military restrictions on the publication of domestic weather information a new type of weather map is being published in some morning papers. In addition to the usual isotherms and isobars outlining temperature and barometric pressure conditions, the U.S. Weather Bureau daily maps now chart the positions and daily movement of continental air masses. The symbols employed show the locations of cold fronts, warm fronts, stationary fronts and occluded fronts. These boundaries differ considerably and generally develop the conditions of temperature inversion which make possible extended ranges of v.h.f. wave propagation by tropospheric refraction and reflection. Postwar v.h.f. operators who scan the new weather maps probably will be able to predict coming DX with at least the degree of accuracy possible to the forecaster of weather conditions.

Subscriptions by individuals to the daily weather map (Map C, 19 by 24 inches) are being accepted by the Superintendent of Documents, Government Printing Office, Washington, D. C. The cost is 30 cents per month, $3.60 per year.

November 1944

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So You're On A Liberty Ship

Some Hints on Improving Standard Cargo-Ship Radio Installations

BY R. U. WHITTAKER

So far in all my reading of QST, there has been no mention of how the marine ops, or Sparks, many of whom are hams, overcome the difficulties of keeping the radio equipment humming while at sea. To those familiar with only Caribbean pleasure cruises in peacetime (boy—they’re nice!), the question may arise as to why the gear on a wartime cargo ship doesn’t always keep humming at sea. The most realistic and lasting answer to that question can be obtained by shipping out on a Liberty.

Antenna Troubles

First of all, after a particularly windy day, Flags, the Navy signalman, is about to cry since most of his pennants now are flying partially from the signal-flag halyards and partly from the main-antenna lead-in, with both sections well disconnected. The main antenna lead-in usually runs from the antenna trunk, which is located on the port side of the flying bridge in such a position as to make it necessary for the lead-in to be within a few feet of all five signal-flag halyards. Some operators overcome this trouble by changing the type of feed to the main antenna. However, it is desirable to operate the rig as designed, i.e., with an end-fed flat top, and it is a relatively simple matter to add about 10 feet to the main antenna feeder and then bring the feeder aft to the port side of the engine-room smoke stack where there are several suitable places for attaching a type “CBO” high-voltage insulator. From the stack, there is a clear path to the antenna lead-in trunk. This change increases the antenna capacity which necessitates a new setting of the antenna variometer (loading inductance). An antenna rigged as described does not interfere with the d/f sense antenna nor with any of the flag halyards and complies with the FCC order which rules that main and emergency antennas shall not cross each other so that should one fall down, it would not ground the remaining transmitting antenna.

Dismantling Antennas

Because they interfere with the maneuvering of the jumbo (35-to-50-ton capacity) and main cargo booms, it is necessary almost always to take the antennas down while the booms are in use in port. The forward portion of the main antenna is coiled on top of the flying bridge wheel house when such is necessary. The lead-in still remains attached to the stack and antenna trunk, while the aft portion is coiled on the deck aft of the stack on the flying bridge. All antennas will last infinitely longer if they are put up and taken down by the operators. It cost me a new flat top to learn that the bos’n and deck gang are adept at putting no less than seven kinks in a newly made job.

The auxiliary antenna, which is used on the main receiver when using the d/f, and the emergency antenna can be conveniently coiled, tied, and hoisted up the signal-halyard mast so as to be out of the way when the booms are in operation. If you are not sure each time how tight to make the antenna halyard before taking a turn on a mast cleat, a few turns of scrap wire wrapped...
around the halyard at the point where it should bend around the cleat will serve as a good marker and won't disappear when the ship is painted.

The B. C. Receiver

The first time I saw the Scott broadcast receiver I said to myself, "There's a job that'll keep the news hounds from pestering us in the operating room." Fortunately for the dial twisters our b.c. receiver is located in the officers' chow, rather than in the chart room. However, during a three-month trip, I was convinced that the E. H. Scott Laboratories had sold to the WSA the best reason for continuing the manufacture of 2-ampere fuses. An investigation showed that the electric refrigerator was responsible for this trouble. When the refrigerator motor starts it draws some 70 amperes. This results in an excessive dimming of lights unless the generator output voltage is boosted to around 123 volts. Then, when the ice machine cuts off, the voltage takes a momentary leap, and — exit one fuse and frequently one or more dial lights.

Since the ship supply is d.c., a.c. for operating the receiver is obtained by the use of an electronic converter. Some operators overcome the difficulty by altering the spacing of the vibrator points. This remedy is all well and good so long as the vibrator lasts, but the procedure usually results in a drastic reduction of vibrator life. A better arrangement consists of placing a 50-watt, 16-ohm, 1.82-ampere rheostat in series with the d.c. input line to the vibrator. In the past four months not a single fatality among fuses or dial lights has occurred, but previously a screw driver and a spare fuse were standard equipment when heading for breakfast in the salon after the 4 to 8 watch. The line voltage supplied to the vibrator was tried at 115, (normal operating voltage for the receiver), 110, and 105 volts and no difference was noticed in receiver performance. Therefore, it now operates at 110 volts and draws approximately 0.82 ampere which causes the rheostat to operate relatively hot, but with plenty of safety factor. Vibrator points last much longer now than before installing the rheostat.

As for mounting the rheostat, the most suitable thing that could be found was a new bracket intended for supporting a life-saver light in the inverted position (thanks to the second mate). With a little time in the engine room it was converted into a very broad-bottom "U"-shaped device which had flanges extending in opposite directions and at right angles from the top side of the "U," as shown in Fig. 2. The flanges, with the assistance of a couple of wood screws, serve as a means of supporting the bracket on the bulkhead. The rheostat is mounted through the hole in the central and bottom portion of the "U." At the time of installation, the idea of slotting the shaft so that a screw driver could operate the rheostat reared its ugly head, but was rapidly turned down since it seems to be second nature to Americans to turn knobs and a drawer full of table knives is only an arm's reach away. Now it is just a plain round shaft and operates quite well with the application of gas pliers, or by pushing the moving contact from behind the rheostat, when no voltage is present. So far the need for adjusting the voltage from the initial 110-volt position has not occurred. Before it was possible to obtain a rheostat (at sea), two 200-watt light bulbs, easily obtained from the chief engineer upon informing him that without them there would be a strict QRT on the b.c. receiver, were connected in parallel, and the whole combination placed in series with the a.c. line to the b.c. receiver for convenience. This combination resulted in a 7-volt drop which cured the fuse trouble, but the job didn't look neat.

Another rather common fault with the 2-ampere fuse holder on the receiver is that a side contact may spread with the same results as a blown fuse; new fuse holders of this type have the side contact welded and not soldered.

The antenna lead-in trunk is in the lower right-hand corner with the lead-in bushing for the main antenna emerging from the top. In the original installation, the main antenna lead-in passed close to the signal halyards at the right. By first running the lead-in to an insulator attached to the stack at a point near the whistle, and thence to the lead-in trunk, the wire is swung out far enough to avoid interference with the signal halyards without adding appreciably to the antenna length.
An Antenna for the B. C. Receiver

The Scott instruction book states that a model “SDD” antenna (double doublet) is part of the required paraphernalia for the receiver, and that each receiver is shipped with one in the case. It seems that the shipyards must have an infinite number of these model “SDD” jobs, as I have yet to see or hear of a Liberty or other ship which has one, nor have I seen the broadly tuned transformer which is supposed to be used in conjunction with the double-doublet antenna, although I don’t doubt that through a misunderstanding some probably have been utilized.

The b.c. antenna installed at the shipyard is a straight-wire job which runs from the lower port bridge wing (forward bridge lookout position) and thence aft 35 feet to the No. 6 gun tub, which is aft on the port side of the flying bridge. This arrangement is definitely n.g., as well proved by a six-month Far-East trip, since it is below most of the midship house.

The new replacement is made of regular emergency antenna wire (7 strands of No. 18), and is a “V” type which has been the object of considerable experimentation (again thanks to the captain for tolerating us while in the process, and to the other two ops who assisted materially). The vertex of the “V” is at the port wing of the flying bridge, one leg going aft to the No. 6 gun tub, and thence to the port side of the coal box which is located aft on the boat deck, two decks below the flying bridge. The other leg goes up to the end of the halyard holding the auxiliary listening antenna, which runs aft, and thence aft to the galley smoke stack (alias, Charlie Noble). This arrangement is well clear of the decks either when the auxiliary antenna is in operating position or when it is coiled and heaved up in port.

On ships having the Scott in the chart room, a very good “V” antenna could be made with the vertex of the “V” at the outboard and aft side of the starboard bridge wing. One leg may run to the starboard side of the stack and thence to the galley smoke stack, while the other leg could run to the No. 7 gun tub and thence to the starboard side of the coal box. Either type will work R5/S5 on the three bands. The lead-in used in getting to the salon mess is attached to the overhead of the lower port bridge wing. From there the lead-in goes down to a pipe which is pointing in the general direction in which the antenna lead-in runs, with the top portion of the pipe located several feet above the reach of a stevedore (these blokes are certain death to an antenna, as well as to numerous other items). This arrangement offers complete protection to the lead-in. Another 1-inch pipe is welded horizontally across the midship house, and runs from the elbow where the antenna enters the officers’ mess to the pipe which points toward the lower port bridge wing. The idea of all these pipes may seem a bit out of line, but just try getting up for three days running to find that the lead-in has failed while serving admirably as a handrail for some stevedore and it won’t seem so funny. Running the antenna for about 15 feet through a pipe does not seem to impair in any way the performance of the receiver. This was verified by operation both with and without the pipe, but in this section of the lead-in the shielding is not grounded.

Inside the officers’ mess the lead-in connects to a lightning arrester and then to a two-wire lead-in which has the shield grounded. The lead-in should be soldered to the antenna plug, since this makes an appreciable difference in signal level.

Just one more thing remains to be done with the antenna circuit, and that is to look in the instruction book and find the antenna tuning condensers for each band and give them a try, noting the results on the tuning eye. This is necessary since the receiver is adjusted for an “SDD” antenna at the factory. The opening for this adjustment is at the back of the receiver. A metal screw driver may be used.

Noise on the b.c. band was quite serious, so the vibrator case was grounded with a pleasing decrease in the QRM, which is particularly desirable when several days out of port and running across.

Looking aft from the mizen mast on a Liberty ship. The port wing of the flying bridge is behind the No. 6 gun tub just to the left of the center of the picture. The galley smoke stack is the small-diameter pipe at the center, while the coal box is in the foreground. Apparently, proper space for antennas is the last thing to be considered on a modern cargo ship!
**A Time-Tick Line**

Unfortunately this ship was not equipped with a time-tick line to the chart room. (The ship's chronometer is checked daily with radio time for accuracy of navigation.) The mate did not like listening for the tick with full volume on the receiver, and the shack and chart-room doors open, and the ops didn't enjoy holding the face full of air necessary to activate a speaking-tube whistle on the minute. I might also say that a sneeze at the right instant could utterly confuse the mate taking the tick. Therefore it seemed worth the time required to install a time-tick line between the radio shack and the chart room where the chronometers are located. About 55 feet of any two-conductor line will be more than sufficient for this circuit.

Placing a plug on one end of the line involved very little difficulty, but making a neat job of the box to house the jack in the chart room involved more hunting around in the engineer's workshop and electrical locker. But even that was not too difficult since the ship happened to be in port and the relief engineer with a little persuasion usually can be seduced into giving up anything you may need. As a hint, it pays to snoop around, so when you need something you don't have to accept someone's "we don't have it" because you can tell him where it is.

A waterproof switch complete in a box (Type 9-S-4581-L) was found and appropriated for the cause. The cover was removed by taking out the four screws, and then the push-button switch was removed to make room for the jack which is attached to the cover instead of the rubber disc. Since the opening in the cover was too large to permit attaching the jack directly, it was necessary to make another trip to the workshop and get a washer of suitable dimensions so that it could be secured in place by the threaded ring. The switch box includes a bracket for mounting on a bulkhead and, if the chart room is green, the box is already painted for the occasion. Hereafter when the time-tick transmitting tape breaks, the mates will hear it, and the op will not be accused of trying to "shuteye" on watch, as they can be depended upon to do whenever anything goes wrong in the radio shack.

A final and very important precaution to be observed when running the line into the chart room is to drill a separate hole in the chart room wall. I was about ready to pack up and leave when I found my nice job of enlarging ended up perfectly in the center of the gyro wires which made a right angle bend on the other side of the wall. Whew!! However, I stayed with the job as it is most difficult to sign off while sitting out in the anchorage ready to sail.

After installing the b.c. antenna, you can let the other op enjoy some music on the band while you go topside and take the portable blinker light, which has an internal buzzer, and send a "wartime SOS" in close proximity to the antenna lead-in and the other op will immediately report distress much to his later chagrin.

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**Vindication**

**A "Hey Marge!" Story**

UNLESS your memory is of the "convenient" type, you may recall that:

You dumped the Quaker Oats in a mixing bowl and threw away half a package of corn meal so that you could start your 3,000-meter loose coupler. You smoked up the house with melted paraffin and pitch. You ruined her rolling pin when you wound your first tank coil.

You sneaked down cellar every evening and left her to play solitaire. You invented all kinds of excuses to avoid movies, visiting friends and attending church socials so that you could keep a sked with a guy up in East Beuhla — whom you’d never seen and probably never would see.

You borrowed her knitting needles on which to wind v.h.f. chokes, and her darning needles to scratch chassis layouts. You confiscated her embroidery scissors to cut scotch tape, and then ruined them on lead foil and 20-gauge wire.

You cleaned out her stamp box repeatedly to mail QSLs.

You allowed the family radio set to go on the rocks and stay there while you spent three successive nights tuning up a brother ham’s rig.

You jammed the neighbors' radio reception and when they phoned she had to sit and take it.

You neglected her and to most people seemed to go to extremes to exasperate her:

But you still have an undeserved chance to redeem yourself. You can once more be her hero; the man she thought she was marrying. Once more she can hold up her head and let it become known at the Red Cross sewing meeting that you are little less than a genius.

And how, you ask, can this miracle be accomplished?

Do you know what she misses most since the war started? It isn’t avocado pears, or bobby pins, or nylon hose. It isn’t whipping cream, chocolate bars, or butter. What she misses most are those copper pan scrubbers! She has tried steel wool, plastics, scouring powders and sand. They simply don’t work. The result always is slivers or frayed fingernails, or pans that can’t be cleaned.

Happily, you have the solution in your junk box. That burned out audio transformer contains thousands of feet of very fine copper wire which, when unwound and matted into a loose ball, makes an ideal pan scrubber.

— Wh1t, WSIBX

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**November 1944**
This department has undergone another change in ownership. John Huntion, W1LVQ, assistant secretary, sired ITS in 1941. Charles Service, W4IE, also assistant secretary, took over when John answered the Coast Guard call, passing ITS on to Barbara Messenger, secretarial assistant, till her departure for the altar, and thence to Ethel Burnham, who added the department to her duties as secretary to KBW. An increase in her secretarial work makes necessary its return to W4IE. Tinker to Evers to Chance.

Ethe]s thanks go to the thousands of amateurs who, during her management of the department, have submitted their war service records and to those amateur-minded individuals who, during the war, prospective brass pounders have compiled long lists of fellow hams in military and commercial radio work, swelling the AWR roster to over 12,000 names.

Your new manager is especially and selfishly interested in additional registrations. As a licensed ham, he has a stake in the future of amateur radio — together with some 100,000 postwar prospective brass pounders — and wants to return to 40 and 20 as rapidly and painlessly as possible. How can ITS help do the job? Listen.

Every month, month after month for three years, this column has chronicled the names of licensed amateurs in the armed services, in the merchant marine and Maritime Service, in Civil Service, and in industry devoted 100 per cent to the war effort: tangible evidence that radio knowledge and skill learned the hard way in peacetime is now paying our government big dividends in wartime — a powerful argument for the restoration and permanency of the institution of amateur radio.

Those in Washington who will determine the shape of postwar radio see and remember these lists, not as individual names but as thousands of amateurs in the war effort. These lists are impressive. Will you keep them so by sending in your AWSR? Fill in and mail the blank on page 18, or a post card copy thereof. It takes only a minute. Reach for your pen or mill now.

NAVY — SPECIAL DUTY

1KCI, Quarter, RT2e, North Beach, Md.
1KJ, Curtis, CR3, Bellevue, D. C.
1KNI, Schreiber, CRT, Portsmouth, Va.
2KY, Kirby, RT1e, Whittestone, N. Y.
2KSB, Hampton, RT1c, foreign duty
3JON, Ridgway, RT1e, Cumberland, Md.
3JUO, Latta, CRT, Chicago, Ill.
3JPC, Barr, RT1c, foreign duty
5KAB, Gillett, CRT, foreign duty
6HVF, Reid, Esq., Mare Island, Calif.
ex-4W6J, Estin, CRT, Chicago, Ill.
ex-4W6Q, Dill, CRT, foreign duty
6W9Q, Weidleton, L., foreign duty
6Y8P, Chilson, CRT, Chicago, Ill.
7FBO, Smaitt, CRT, foreign duty
7K2Z, Evans, RT1e, Gulfport, Miss.
8LX, Parrow, Lt., Comdr., foreign duty
8PMX, Haller, RT3e, Staten Island, N. Y.

SQC, Darmen, RT1e, address unknown
STOL, Pastor, RM1MC, foreign duty
8UP2, Jacoben, RT1c, Washington, D. C.
3J8ON, VanAlten, RT2e, Ft. Lauderdale, Fla.
9C1L, Hodge, Lt., Comdr., foreign duty
9JNO, Burneour, LCP, Washington, D. C.
9JDK, Blackard, RT1e, foreign duty
9L1T, McDonald, RT2e, Treasure Island, Calif.
9LZW, Gardner, RT2e, Treasure Island, Calif.
9LJG, Miller, RT1e, address unknown
9L2T, Being, RT1c, Washington, D. C.

Operator’s license only:
Tocarcio, RT1e, foreign duty

ARMY — SIGNAL CORPS

1AP, LaRue, 2nd Lt., foreign duty
1BK, Holt, 1/2, foreign duty
1LPK, Bent, 1/4, foreign duty
2AGL, Sawyer, Col., foreign duty
2Y38, Clark, S/Sgt., Atlantic City, N. J.
3GBW, Santucci, Plt., foreign duty
2BNV, Ritter, Major, Orlando, Fla.
2BTU, Rice, 2nd Lt., Fort Benning, N. J.
2BQF, Wardell, Camp McCoy, Wis.
2FAX, Barfor, 2nd Lt., Cambridge, Mass.
2J2S, Pfeifer, Pvt., Fort Leonard, Mo.
2JAF, Frey, 1/5, foreign duty
3GSM, Lee, Pvt., Baltimore, Md.
3H7P, Mullberg, W15, foreign duty
3JL1, Margolis, Sgt., foreign duty
3JRN, Peters, Major, Westport, Conn.
3LYH, Skowronski, Pvt., Fort Monmouth, N. J.
3PVN, Stone, Pvt., foreign duty
3RBS, Lobinger, foreign duty
ex-3H9Q, Apfelbaum, 7/5, Fort Monmouth, N. J.
3M6J, Hinkle, Sgt., foreign duty
3YUV, Delian, Pvt., Fort Monmouth, N. J.
3JLP, Forrest, L., foreign duty
3JLI0, Gorakowski, M/Sgt., Fort Meyer, Va.
3JLV, Ziegler, Pvt., Fort Monmouth, N. J.
3JLP, Deloach, 2nd Lt., Fort Monmouth, N. J.
4GNY, Gossey, Cpl., Fort Monmouth, N. J.
4KCL, Coal, Capt., foreign duty
4RFB, Coohey, Major, Fort Benning, Ga.
ex-4AXL, Penther, Capt., Long Branch, N. J.
4GQD, Andrews, 10, M/2, Anchorage, Alaska
4S2W, Anderson, Sgt., address unknown
6TON, Moore, Cpl., Robins Field, Ga.
7Y8L, Pin, Pvt., Fort Monroe, Va.
8SW, Davis, S/Sgt., foreign duty
8HA, Webster, Lt., Drew Field, Fla.
8K1L, Mulhern, L., foreign duty
8ZGZ, Nash, S/Sgt., foreign duty
8EXE, Beecher, 2nd Lt., Fort Monmouth, N. J.
ex-8SFP, Stadt, W/O (g), foreign duty
8SWY, Robinson, S/Sgt., foreign duty
8UNP, Alway, Plt., Fort Monroe, Va.
8UNU, Burner, Capt., foreign duty
8SWL, Choensik, T/4, foreign duty
8ATX, Behrends, Cpl., foreign duty
8GR5, Lavoock, Capt., foreign duty
ex-9CTP, Allen, T/3, Washington, D. C.
9DAK, Fainey, L., foreign duty
9K2M, Stambaugh, Pvt., foreign duty
9EJP, Aida, 2nd Lt., Arlington, Va.

NSS, the Navy’s high-power station at Annapolis, Md., is fortunate in having a representative group of eight amateurs among its personnel. Left to right, front row: M/2, W9NLL; RM1c Irving, W1BFR; RM1c Johnson, W6QIE, and RM1c Stoner, W8IMS. Rear row: RS Johnson, K8NSD; CRT Covella, W1L0B, and CRM Parten, W8BWC. Not appearing in the picture is the eighth ham, RM1c Schreiber, W2MGL.

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### ARMY — AIR FORCES

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<thead>
<tr>
<th>Name</th>
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<th>Location</th>
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<tr>
<td>1SQ</td>
<td>Hearts</td>
<td>Capt, foreign duty</td>
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<td>2SQ</td>
<td>Davis</td>
<td>Capt, foreign duty</td>
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<td>2ML</td>
<td>Barber</td>
<td>T/Sgt, Mitchel Field, N. Y.</td>
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<td>2NR</td>
<td>Riese</td>
<td>Pvt, McCook, Nebr.</td>
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<td>Leeman</td>
<td>2nd Lt, Scott Field, Ill.</td>
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<td>2OP</td>
<td>Mend</td>
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<td>3HQ</td>
<td>Lewis</td>
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<td>3SR</td>
<td>Reimen</td>
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<td>3FQ</td>
<td>Jozwik</td>
<td>Cpl., foreign duty</td>
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<td>4HFA</td>
<td>Larkin</td>
<td>S/Sgt., New Orleans, La.</td>
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<td>4LAA</td>
<td>Justus</td>
<td>T/5, Fort Monmouth, N. J.</td>
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<td>4PKT</td>
<td>Koeffier</td>
<td>Cpl., foreign duty</td>
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<td>4VHW</td>
<td>Maier</td>
<td>T/5, Alexandria, Va.</td>
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<td>4WMN</td>
<td>Twining</td>
<td>Cpl, Fort Monmouth, N. J.</td>
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<td>5JLE</td>
<td>O'Brien</td>
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<tr>
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<td>Preimack</td>
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### NAVY — AERONAUTICS

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<td>Taylor</td>
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<td>11K</td>
<td>Swift</td>
<td>Lt., Washington, D. C.</td>
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<tr>
<td>11L</td>
<td>Smith</td>
<td>Lt., Fort Worth, Texas</td>
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<tr>
<td>11M</td>
<td>Smith</td>
<td>Lt., foreign duty</td>
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<tr>
<td>11N</td>
<td>Smith</td>
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<tr>
<td>11O</td>
<td>Smith</td>
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<tr>
<td>11P</td>
<td>Smith</td>
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</tr>
<tr>
<td>11Q</td>
<td>Smith</td>
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### NAVY — GENERAL

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<td>11G</td>
<td>Canedy</td>
<td>Lt.(jg), foreign duty</td>
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<td>11H</td>
<td>Tower</td>
<td>Lt. (jg), Brunswick, Me.</td>
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<tr>
<td>11I</td>
<td>Swift</td>
<td>Lt., Washington, D. C.</td>
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<td>11J</td>
<td>Atwood</td>
<td>Lt., foreign duty</td>
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</tr>
<tr>
<td>11N</td>
<td>Atwood</td>
<td>Lt., foreign duty</td>
</tr>
</tbody>
</table>

### Army AACS

- Two ARRL Sweepstakes veterans and frequent QSOers in previous decades meet on the barren coast of Kiska.
- They traded the duty left for the duty right, enjoying their time in Hawaii.
- Some were stationed in foreign countries, while others were in the United States.
- Operator’s license only: Amber, Pfc., Camp Rucker, Ala.
- Operator’s license only: Verma, W9GZB, foreign duty

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**November 1944**
A good example of prompt Navy medical attention to sick personnel occurred when Howard M. Huckaba, WSHWS (what a callful of dots), RT6c on a mine sweeper in the Aleutians, was stricken with rheumatic fever and was immediately flown to a naval hospital in Coronado, Calif., for treatment. HSII missed being made chief by six days due to his illness.

CIVIL SERVICE

1AZL, Miglin, radio tech., Boston, Mass.
1BCG, Falconer, Dept. of Commerce, Gorham, N. H.
1D7P, Basset, War Dept., engineer, Syracuse, N. Y.
1DJF, Doerrach, FCC, monitoring officer, New York, N. Y.
1EOP, Bomberg, AAF, radio mechanic. Rome, N. Y.
1NAR, Chapman, AAF, radio mechanic, Beverly, Mass.
1NKH, Scott, AAF, Houlton, Maine
2AGL, Dracup, SC, engineer, Fort Montgomery, N. Y.
2BDH, Schwartz, engineer, Bronx, N. Y.
2BH1, Forman, Navy Dept., Brooklyn, N. Y.
2CTT, Turbak, FCC, radio inspector, New York, N. Y.
2STN, Michael, radio mechanic, New York, N. Y.
2EDJ, Closezy, radio mechanic, Belmar, N. J.
2EYT, Lucas, radio inspector, New York, N. Y.
2FWY, Hayman, FCC, monitoring officer, Brooklyn, N. Y.
2HNF, Kemp, AAF, Augusta, Maine
2LCO, Federico, Navy Dept., radio engineer, Brooklyn, N. Y.
2LFC, Smith, Navy Dept., radio inspector, New York, N. Y.
2M2X, Rolfe, Navy Dept., New York, N. Y.
2O0Y, Matthews, SC, insp., Clifton, N. J.
2JGR, Steinberg, SC, radio technician, Washington, D. C.
2DRL, Salm, radio mechanic, New York, N. Y.
2OLP, Mathews, SC, engineer, Norfolk, Va.
2S0U, Benes, radio technician, Columbus, Ohio
3LZ6, Storck, Navy Dept., radio mechanic, Wa.
3L18, Bremer, SC, radio engineer, Baltimore, Md.
4DBP, Truesdell, Navy Dept., Portsmouth, Va.
4EKO, Mclntosh, insr., Camp Stewart, Ga.
4EKY, Groves, engineer, Atlanta, Ga.
4LBD, Fitchett, SC, radio engineer, San Francisco, Calif.
4OEP, Schnell, radio mechanic. Los Angeles, Calif.
4ONM, Miller, CAA, aircraft communicator. Columbus, Ohio
4C8E, Probst, SC, inspector, Hamilton, Ohio
4GEB, Allen, SC, radio engineer, Patterson Field, Ohio
4L7L, Towl, Navy Dept., radio mechanic, Norfolk, Va.
ex-8KVM, Kearney, SC, radio technician, Bellevue, Iowa.
8LCO, Lawrence, radio engineer, Wright Field, Ohio.
8RKO, Cotton, FCC, Detroit, Mich.
8CNR, Gardner, AAF, Syracuse, N. Y.
8SPF, Beatie, SC, radio engineer, Ft. Montgomery, N. Y.
8TRN, Gilleo, Navy Dept., engineer, Washington, D. C.
8VDS, Eversly, SC, radio mechanic, Dayton, Ohio.
8VHR, Dimmick, SC, tech., Sampson, N. J.
8BAB, Strock, SC, radio engineer, Wright Field, Ohio
8CTT, Lincotta, inspector, Norfolk, Va.
8FYW, Ellington, CAA, aircraft communicator, foreign duty
8PGL, DePew, SC, radio engineer, Dayton, Ohio.
8QFO, Strasus, AAF, Sioux Falls, S. D.
8CJL, McKnight, CAA, radio engineer, Cheyenne, Wyo.
8EDJ, Murray, radio instructor, Colorado Springs, Colo.
8HSB, Ris, radio instructor, Chanute Field, Rantoul, Ill.
8JAR, BramaZiawicki, inspector, Milwaukee, Wis.
8NMT, Garrett, SC, mech., Salisbury, Md.
8NQF, Corral, SC, radio engineer, Seattle, Wash.
8LXR, Schmidt, CAA, aircraft communicator, St. Ignace, Mich.
8ZIK, Douglas, AAF, instructor, Scott Field, Ill.
8UBJ, Wagnier, CAA, radio electrician, North Platte, Nebr.
8JJC, Henneman, AAF, instructor, Trux Field, Wash.
8VET, Sulas, CAA, aircraft communicator, Columbus, Ohio
8Y0O, Hart, SC, radio engineer, foreign duty

Operator's license only:

Hart, S. J., Jackson Heights, N. Y.
Halsell, L. C., Annandale, Md.
Day, A. S., Lawrence, Kansas
Gold, E. A., New York, N. Y.
Halkock, S., Dallas, Texas
Marchese, A. S., Sunnion, N. Y.
Moore, J. D., Stillwater, Okla.
Roberts, A. S., Amex, Iowa
Robinson, RM2c, Norfolk, Va.
Sherf, A. B., Clarksville, Ark.
Siber, A. B., Rochester, N. Y.
Stone, S. E., foreign duty.

MERCHANT MARINE AND MARITIME SERVICE

1D6F, Viola, 1D6F, Reins, 1G0L, Cote; 1AN, Brown; 2CTL, Levine; 2KUL, Johnson; 2LDR, Stendover; 2JUN, Bursch; 2KGM, Heidt; 2LUN, Hayes; 2LUN, Myles; 2078, Staff; 2SKL, Frank; 2MM, Bidly; 2ZDX, Branch; 2KZ, Lamb; 2814, ZD, Finch; 2814, Stevens; 2238, Zlun, 268T, Zeller; 202D, Wren, and 27P2, Mahon, operators hold operator's license only.

Lt. Col. "Chuck" E. Grogan, W2RSZ, left, and Major Guy A. Stewart, W2JRG, are two amateurs who get around. The former was operations officer, the latter communications officer of the famous 79th Fighter Group with Montgomery and the RAF, which fought across North Africa from El Alamein to the final drive on Tunis, April, 1943. The plane is Col. Grogan's P-40 Warhawk; the insignia that of the 87th Fighter Squadron, which he formerly commanded. Major Stewart was last reported to be serving with General Chennault in China.

QST for
Do you know these men? Last June we received this photo of Canadian hams in the services, who attended a hamfest at the YMCA in Northcamp, Farnborough, Hants, England, early in 1940. Unfortunately, names, calls, ranks and branch of service were not given except for two of the group. We need more VE registrations and hope that men in the group or their friends will come forward with the missing data. How about it?
When the airship Italia crashed onto the icecap on her ill-fated cruise to the North Pole in 1928, the only equipment in working condition left to radioman Biagi for sending out an SOS was an emergency transmitter using a Philips B-405 oscillator, whose "B" supply was obtained from a 4-volt storage battery through a buzzer and a step-up transformer. Operating with only a few watts output and under sub-zero Arctic conditions, no answer was received for days, but Biagi continued sending out his distress call. To make sure he was getting out he moved the receiver as far as possible from the transmitter for testing. That meant long hours of dangerous crossing over the ice. The transmitter was working all right, yet there was no answer! What had happened? Simply this:

On board the base ship, Città di Milano, dials were turning and ears were straining in a frantic search, yet no one thought of that particular emergency transmitter and the frequency on which it operated (around 40 meters). The search was being made on different frequencies. Moreover, the signal of such an emergency transmitter as the one used by Biagi does not send out a real note at a distance, but sounds more like a scratch, or static.

Heard by Amateurs

But Biagi had been heard. U. S. hams heard him first. That fact is certified by an editorial written in those days by Luigi Barzini, one of the foremost Italian newspapermen, then owner of the Italian daily, Il Corriere d'America, edited in New York City. He flatly stated that no credit could be given to the claims of American hams of having heard distress calls from the airship Italia because it was materially impossible that radio signals originating from the North Pole could be heard as far as the United States!

Bedlam broke loose soon afterwards. Almost everyone was hearing SOS calls from the Italia. The whole world was tense and excited, stories and rumors of every description were running wild. Some fool sent out fake radio distress calls impersonating the airship, thus adding confusion. Fools can be found everywhere and, as with everything else, cannot be made foolproof.

Finally the Città di Milano heard Biagi's signals and the story ended with the rescue of the explorers.

One of the most astounding and appealing features in radio history had been accomplished and hams had a prominent part in it. Biagi was invited to the States where he was decorated.

Italian Hams Banned

But Mussolini, none too pleased with the outcome of the expedition, decided that hams deserved punishment and that Italy could get along without them. Consequently, all ham licenses were revoked overnight. No reason was given, no government statement was issued, and asking questions would have meant "undiscipline" under Fascist rule. Nor was the ban to be taken lightly, for it was known to have emanated from the boss. Italian hams were forced to abandon all activity and dared not do anything underhanded as their names, addresses, and station equipment were only too well known by the police.

Radio in Italy at this time also was struggling for an existence. It already had been subjected to a tremendous amount of red tape for revenue purposes at the hands of a special revenue corps, the much dreaded "Finanza," whose fines were so flat and irrevocable that the average dealer or store owner eventually was so hard hit as to be forced out of business. Not only radio sets but even parts such as condensers, headphones, etc., were taxed. A radio repairman needed a special license, another license was required for radio sets or parts manufacturing. Both were quite expensive and hard to get and capability or technical knowledge did not matter; anyone could obtain the licenses if he paid the fees. Then he was permitted to decorate his store with the special sign, "Radio Store Authorized by Government," even if he did not know the first thing about radio — which was usually the case.

To mention another instance: A fellow who had the brains, the money and a bulldog's grip as to will power wanted to open a laboratory with the purpose of manufacturing radio tubes. He had to fight a real battle, and even his vacuum pump
was under strict and constant control of the "Finanza"!

From the above it easily can be assumed that not only ham activity but radio as a whole was by no means encouraged by the Fascist government. Radio was considered an amusing toy somewhat useful for propaganda purposes. As long as these propaganda purposes were fulfilled, no further development was looked for, or encouraged.

**Hams Resurrected**

The ban on ham activity was never lifted, but nothing shall discourage a ham, so hams were resurrected in Italy, ban or no ban.

Leghorn's example is typical. There had been no pre-ban duly licensed hams in Leghorn, yet by the end of 1931 a gang of five new members had been established. It began with 11XX, a lawyer hard hit by the radio bug, and 111Y, a ham-in-the-making since his childhood. 11KW, just back from the States and helping along with English, joined in soon afterward, followed by 11KI, released from Navy service, and 11UL, a radio repairman. None of them was rich and radio parts were limited, but underhanded radio repairing practiced by the gang helped a lot to secure the necessary material. Ham spirit was running high, and the other fellow was always given a helping hand to enable him to get on the air.

Hartley oscillators using 45 tubes, with a respectable record of regular b.c. hours of service, and 47 modulators were the best equipment that could be hoped for. Crystals and other items were only to be seen in American catalogues or magazines, along with other wondrous things. -T.r.f. repairmen, nothing shall discourage a ham, so hams were resurrected in Italy, ban or no ban.

As for antennas, anything using feeders or separators had to be discarded as it looked too "queer" and attracted attention. Single-wire-fed Hertz antennas were adopted and gave full satisfaction, besides looking perfectly "innocent" to the layman.

Locations in town were not exceptional. A fellow owned the house where he was living and could erect a high mast on his roof, but 11Y and KW were at a loss as their "roof owners" did not want any pole or mast, fearing lightning. KW, to his despair, could not raise his antenna more than ten feet above the roof.

It was a different story with UL. The lucky dog was living in Montenero, a suburb of Leghorn, right on top of a hill facing the sea. At a certain distance to the rear of the house lay a rocky cliff, which must have played some part in his success.

The fact is that as soon as the 20-meter band opened up for DX, UL invariably was landing a solid signal in the U.S.A. His CQs were overcrowded with Ws calling him back. The thing was too appealing to UL not to make a "phone hound out of him, but he did not speak English and had to resort to a prearranged list of sentences "made to order" which at times did not exactly fit. The best fun the gang ever had was in listening in to UL's debates with the W boys who were gently kidding him or were baffled by the funny bird possessing such an objectionable modulation and such an astounding signal.

It must be added for the benefit of the fellows who remember having worked him, that a visit to UL's shack would have been highly surprising to them. A 45-47 extremely haywire rig, a carbon telephone unit and a power pack, sadly in need of better filtering, was about all it contained.

**"Questura" Interferes**

In the beginning the gang overestimated the ability of "Questura" (police) to detect unlawful radio transmitting and was accordingly extremely careful. However, when it became apparent that "Questura" could only rely upon eventual complaints of third parties or squealings of spies, members of the gang became a bit careless and the trouble began.

One day KL was working his first LU on 20 meters and, being anxious to get his QSL card as soon as possible, he dared to send out his name and address so that the other fellow could mail it direct instead of following the usual A.R.I. (Associazione Radiotecnica Italiana) route. KL was not aware that his single-wire-fed Hertz was at the

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Under the Fascist rule in Italy, radio as a whole was by no means encouraged and amateur radio specifically was prohibited. Ham spirit nevertheless ran high and, undaunted by the government ban, by the lack of equipment and various other handicaps, amateurs continued to operate their stations. This is their story — the history of amateur radio in Italy over the past fifteen years. Written by 11KW (whose home, incidentally, was bombed to the ground by planes of the American Air Force), it reached Headquarters via a W2 ham who met 11KW while serving in Italy with a U.S. Army signal battalion. The W2, himself, worked all five of the "Leghorn Gang" on 20 meters in the days before the war. Because of the circumstances under which they operated, it is imperative that none of the hams concerned be identified here.

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moment putting out a strong harmonic and that the harmonic was landing in Rome where a big shot in Italian official radio, Admiral P., chief of the department of communications, was doing some high-brow experimenting on 10 meters. Did the Admiral realize it was a harmonic? That was not known, but it became known afterward that he got awfully sore and ordered the police after the fellow.

Two days later there ensued a struggle at KI's door. KI defended his castle while his brother guided the transmitter in a nose dive from a rear window (third floor)! When the police finally entered the shack disappointment was easily seen on their faces. Orders in that particular case had come from Rome and something big was expected. Instead they saw only a lot of "junk" lying around. Where were the motors, the generators, the big panels and switchboards? KI was brought before the chief of police and given a thorough quizzing, but, of course, even the police had to admit that no motors were hidden in the house. Their report to Rome must have been disappointing to the Admiral. ... The case soon faded out and KI was back on the air shortly thereafter.

But the "Questura's" suspicions had been awakened and the gang often had additional trouble. To tell the truth, none of the gang was ever really arrested, nor fined, nor his equipment confiscated for keeps. But such hamperings were hard felt: no usual display of QSL cards on the wall, no permanent station arrangement — the different items were lined up just before operating and scattered again when closing down. Sometimes the closing down was hastened by an unexpected ringing of the doorbell. IY discovered that the best hiding place for the transmitter was to hang it out of a rear window like a bird cage and he passed the hint along with success.

But he was the first to experience another source of trouble which was developing — parent trouble. If the ham could stand the emotional effects of a domicile search by "Questura," it was a different story with fathers, mothers and other relatives. One day upon returning home, IY found that his enraged father had dumped all of the radio gear out of the third floor rear window, thereby hoping to cure his son of such a dangerous hobby.

It didn't work — IY was back on the air as soon as new material could be secured.

Later on crystals and other parts were available, but the 6L6 tube marked the limit. Too many reasons prevented the gang from getting high-power tubes and equipment. The results, though, were quite gratifying with low power.

Local work was started on five meters with good results. The gang got in touch with other hams located in Florence, Milan and other Italian cities.

**Duty Calls**

In 1935 the gang began to dissolve. KW and IY had new jobs on the sound staff of movie studios which had been opened in Tirrenia. In 1936 KI and KW, both reserve officers, were called to active service in the Navy and Army respectively. KI was soon released and had a job in Milan at Marelli Radio Transmitter Factory. KW was retained for four years in Rome.

KW and KI had a chance to probe the radio situation of the Italian Army and Navy and found it very queer. The higher-ups seemed to be anything but radio minded. Five meters was scoffed at as utterly unreliable for real war service. KI was recalled to the Navy. About 1940 he and KW were building 5-meter equipment privately and out of their own funds "just to show them."

But destiny decreed otherwise. When the war broke out, KW went to the bottom with the cruiser Fiume, and with him went his equipment. For all that has been known in Italy, the cruiser Fiume was sunk in a few minutes during the night by point blank 16-inch gun shelling. The ship was steaming to a high sea "rendezvous" — only the order it received by radio had originated from the British.

IY had been ordered to the anti-aircraft artillery of the "Milizia." At that time an Italian firm was manufacturing 5-meter equipment for the air-raid alarm networks, but of course the personnel lacked utterly. The firm asked the government to have the most intelligent men sent to the factory for training. IY was one of the number and never came back. He was retained by the firm as a research engineer.

Shortly before Mussolini's downfall a ham was in charge of the Italian Air Force radio communications. It is known that the "Consiglio di Stato," which is the supreme authority of the state, was asking technicians to produce 2½-meter equipment as soon as possible.

But it was, luckily, too darned late!
A Versatile WERS Mobile Station

District-Wide Communication By Means of Dual Installation

BY PHILIP S. RAND,* WIDBM

Real efficiency is possible when the district aide can break into local networks as need-be, from any location in the district. An approach to such an ideal operating arrangement has been made in Middletown, Conn., where the district aide’s automobile is equipped with the transmitter and transceiver units described in this article. The equipment was assembled from parts taken from a few prewar ham rigs and junk boxes.

Sometimes one well-designed transceiver is all that is required for communication at a WERS station. Sometimes that is not enough. Where a district aide needs to contact a local station for example, the job can be done well enough with a good transceiver, but if he needs to contact someone out in the district at more than local distance, he most likely is lost without an additional transmitter of higher power than the transceiver provides. After all, a transceiver must be operated part of the time as a receiver, which means that receiving-type tubes are required throughout. If more power is needed, the only practical solution to the problem is to separate the receiver and transmitter circuits. In this way, higher power may be available from the transmitter. However, a disadvantage of even this arrangement is that more power than is required will be on the air each time the transmitter is turned on, unless a means of reducing power is provided, and this adds just one more switch or knob to worry about. Another difficulty is that the transmitter must be reset rather carefully to the assigned district frequency for certain communications. This can be done, of course, but it is an added operating procedure and therefore more or less of a burden.

In the more ideal set-up, a transceiver is used for local contacts, plus a separate transmitter of somewhat higher power for district-wide work. In this way the transmitter may be set on the assigned district frequency and left there. It is not used for anything except district work, because the transceiver is sufficient for local communications.

On first reading, it may appear that a lot of equipment is required for this more ideal set-up. Actually, not as much is needed, nor is it as hard to get, as one might at first think. By looking at the photographs, we recognize at once that nearly everything that is used is familiar ham equipment. In Middletown, Conn., the equipment problem was solved by robbing some prewar ham rigs and, of course, the junk box. Where one rig and one junk box was not enough, more of them were plundered. Isn’t that kind of cooperation old stuff among hams anyway?

The finished units are mounted in a Chrysler Royal six-passenger coupe, meaning of course that any car of the same general design is satisfactory if this equipment is duplicated elsewhere. The transceiver is in the glove compartment near the operator. On its panel are switches which the operator can use to control operation of the main transmitter which is back in the trunk space at the rear. In order to make operation more foolproof, a separate storage battery is used with the radio equipment and it is charged by floating it across the car battery and generator. There is ample space for it near the main transmitter.

The use of a storage battery immediately suggests that some form of generator power supply is used. This is true — in fact both types are used — two generators for the main transmitter and the vibrator supply for the transceiver. A separate storage battery is used with the radio equipment and it is charged by floating it across the car battery and generator. There is ample space for it near the main transmitter.

Separate antennas are used with each unit. For the transceiver there is a rod-type vertical mounted on the right side of the hood. In the rear, projecting approximately six feet through The main transmitter unit is enclosed in the metal box on top of the chassis. The dual genemotor unit, with its smoothing and hash filters underneath, is to the left. Controls, indicator lights and connector sockets are arranged along the front edge of the chassis.

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the body of the car, is a "J" vertical for the main transmitter. This antenna is tuned and left at precisely 112.1 megacycles, the assigned frequency in the Middletown district. Tuning equipment for the two units is controlled from their front panels.

Circuit Details

If anything is mysterious in the photographs, perhaps a little circuit-study will clear it up. Those genemotors, for example, why are there two of them and for what are they used? The two are connected in series in order that approximately 350 volts may be obtained for plate supply for the main transmitter. Enough output voltage cannot be obtained from one, since each produces about 175 volts. The HY75 r.f. and the 6N7 modulator plate circuits operate at the full voltage output of the two genemotors. Adjustment of antenna coupling to the HY75 circuit permits the plate current to be held down to 65 ma., so that the legal maximum power input of 25 watts will not be exceeded.

Carter dual genemotors are used in the Middletown rig and they carry the load nicely. They pick up quickly as soon as they are turned on, which is important in quick-comeback WERS work. By breaking the motor circuits, we get away from the need for a high-voltage plate relay and for a heavy filter across its contacts to take care of inductive arc. Output filters for the two machines are built into the base on which both of them are mounted.

The main transmitter circuit shown in Fig. 1 consists of a conventional oscillator using an HY75 tube which is plate-modulated. Sufficient audio power for the purpose is obtained from the output of a 6N7 dual triode tube in a push-pull circuit. A single-button carbon microphone is coupled to a 6C5 to form the speech-input stage. Current for the mike comes from a "C" battery in one corner of the main transmitter cabinet.

The 6N7 and HY75 plate currents are separated from one another by the output transformer, T2, but each may be measured by the milliammeter shown on the face of the main transmitter.

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Circuit Diagram:

- Fig. 1 -- Circuit of the WERS main transmitter and control system.
- C1 - 35-µfd. variable.
- C9 - 100-µfd. mica.
- C10 - 0.001-µfd. paper.
- C11 - 6-µfd. 450-volt dry electrolytic.
- C12 - 25-µfd. 25-volt dry electrolytic.
- C13 - 0.5-µfd. paper.
- C14 - 0.015-µfd. 1600-volt paper.
- C15 - 0.01-µfd. paper.
- C16 - 100-µfd. paper.
- R1, R2 - 5,000 ohms.
- R3 - 25 ohms.
- R4 - 10,000 ohms.
- R5 - 1,000 ohms.
- R6 - 1-megohm potentiometer.
- L1 - 2 turns, 1/8-inch inside diameter, copper tubing or stiff wire.
- L2 - 1 turn, as above.
- L3 - 8-henry 150-ma. choke.
- RFC1, RFC2 - 2½-mh. r.f. choke.
- RFC3 - 50 turns of No. 12 enameled wire on 3/4-inch diameter form.
- T1 - Microphone transformer for s.b. mike.
- T2 - Driver transformer to match a 6C5 tube.
- T3 - Output transformer to match a 6N7 tube to speaker voice coil.
- T4 - Power transformer for vibrator power supply.
- S1, S2, and S3 - S.p.s.t. toggle.
- S4 - D.p.d.t. toggle.
- Tubes - First speech amplifier, 6GC or 6J5. Final speech amplifier and modulator, 6N7. Rectifier, 6X5.
- Meter - 0-100 milliamperes (flush mounting preferable).
- The upper outlet socket is for connections to the transceiver.
The meter may be switched into the 6N7 or HY75 plate circuits at points AA and BB. Across each set of points is a 25-ohm resistor, the purpose of which is to maintain a closed plate circuit for each tube whether or not the meter is plugged in. The meter readings are not appreciably affected, since the 25-ohm resistors represent relatively a much higher resistance than that of the meter itself. On the panel just under the instrument is a switch with which this change-over may be made. Neither plate circuit is broken when the meter is manipulated because the resistances at AA and BB are permanently connected.

The main transmitter cabinet contains more than the components for the HY75 circuit. The vibrator power supply circuit shown in Fig. 1 is strictly part of the transceiver layout. So is the vibrator control relay and both of the tube sockets which are used along with the power cables. This is not a bad idea, however, because there is relatively unlimited space in the rear of the car, compared to that in the glove compartment. Confinement of the vibrator, filter, and relays to the rear part of the car also helps to reduce stray contact and vibrator “hash” interference in the receiver. It is helpful also to have the battery in the rear so that the 6-volt leads to the relays and vibrator are short.

We cannot, however, depend upon location and shielding alone to take care of the “hash” problem, and so the vibrator and 6X5 rectifier circuits are thoroughly filtered. The heavy r.f. choke, RF'C4, is by-passed by C7 at the center-tap of the vibrator transformer primary for the purpose of killing a large portion of the hash immediately after it has been manufactured. Across the secondary is the series combination, C8 and R7, to keep vibrator sparking to a minimum. Now we start work on the output hash with RF'C6 by-passed by C9 at the rectifier cathode. Ordinary filtering of the rectified output voltage is done with the pi-section filter composed of L3, C19, and C11. No more hash is supposed to be in the output at the junction of L4 and C11 but some occasionally gets through via the heater of the 6X5, and so C12 is used as shown. With this circuit no hash interference has been noticed in the transceiver.

Comparison of Circuits

A few comparisons are in order at this point. It is seen that there is no basic difference between the circuit of the transceiver and that of the main transmitter. A self-excited oscillator is plate modulated, in each case, through a two-stage speech amplifier. The only noticeable difference in the r.f. circuits is that the transceiver plate is fed in series while that of the main transmitter is parallel-fed. There also are differences in details. The main transmitter and modulator plate circuits are transformer-coupled, while impedance coupling between modulator and r.f. oscillator plate circuits of the transceiver is achieved through the primary of the 6V6 output transformer.

There also is a difference in final speech amplifier tubes. A 6V6 for the transceiver provides plenty of "push" for its purpose, but a 6N7 is required in the main transmitter.

Also, T1, the speech input transformer in the transceiver, has a dual primary so that the speech amplifier circuit can be switched over to the receiver output to provide audio gain.

More switching circuits are required for the transceiver circuit than for the main transmitter. The reason is that the whole circuit of the transceiver must be converted quickly from that of a transmitter to that of a receiver, or vice versa. The main transmitter, however, only has to be turned on and off. Therefore, S4, a four-pole double-throw affair shown at several places in Fig. 1, transfers the plate connection to the HY615 at the lower end of RF'C6, to the modulator output for transmission, or to one of the primary windings of T1 for reception. The grid connection of the same tube, from the lower end of RFC8, is returned to ground through a series circuit composed of R9, one primary winding of T1 and a portion of R8 for reception, or more directly through R1 for transmission. The speaker or "phones also must be cut off during transmission, or on during reception, and this function is performed near the speaker jack, J1, by a part of S1. The microphone circuit must be cut in and out also, and this is done by S1 on the lower primary winding of T1. The other side of this same winding is changed over from transmission to reception by one part of S2, a d.p.s.t. switch. In this action, the shielded microphone connection which runs between the transceiver and main transmitter panels is switched off to an open circuit during reception and then the circuit is completed during transmission. The other part of S2 permits the main transmitter to be turned on through relay R2, or this relay is left off during reception. S8 on the trans-

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receiver operates the filament current through relay \( R_y1 \).

On the main transmitter, there are only three simple s.p.d.t. switches. \( S_1 \) opens or closes the winding of the filament relay, \( R_y1 \). \( S_2 \) does the same with the plate relay, \( R_y2 \). If it is desired to listen on the transceiver while the main transmitter is on, \( S_3 \) can be thrown on to short the two active contacts of \( R_y2 \) and thereby start the vibrator. The action of \( S_2 \) may raise the question, why can't the relay be made to do the job of turning on the vibrator, instead of the switch? The reason is that the relay \( R_y2 \) acts differently from the other relays. Its upper contacts open when it is operated. This happens when relay \( R_y2 \) goes on and puts the main transmitter in operation. In this way plate current for the receiver is cut off during operation of the main transmitter. However, when it is desired to listen to the main transmitter for testing purposes, \( S_3 \) may be thrown on to cause the vibrator to operate. By this method a separate monitor is not required in the circuit shown in Fig. 1. This happens when relay \( R_y2 \) goes on and puts the main transmitter in operation. In this way plate current for the receiver is cut off during operation of the main transmitter. However, it is desired to listen to the main transmitter for testing purposes, \( S_3 \) may be thrown on to cause the vibrator to operate. By this method a separate monitor is not required in the circuit shown in Fig. 1.

A green dial light on the main transmitter panel shows when the filaments are on. A red one indicates whether the plate relay is on or off. None is provided for the filament relay, but it would be easy to include one by simply connecting it between the bottom (now unused) contact of \( R_y2 \) and ground. Indication then would be of a magnetized \( R_y2 \) winding and of inaction of the vibrator, as far as its control by the relay is concerned. This light would come on with the red and green ones during normal operation. If indication of the action of \( S_2 \) were desired, then the light could be connected between ground and the upper contact of \( R_y2 \). No duplicate lights are located on the transceiver panel because extra lines would be required in the cables and furthermore, the operator has the use of a receiver at this position to tell him whether or not the equipment is functioning.

Bottom view of the transmitter chassis showing the placement of the vibrator-supply components. The relay near the top of the photograph is the plate relay, \( R_y2 \).

Construction

The photographs indicate the relative positions of the parts of the main transmitter on a 17 x 10 x 3 inch chassis. The tuning cabinet to the right of the two genemotors measures 10 x 9 x 7 inches. A uniform height thereby is provided across the entire top of the unit.

The controls which require manipulation for a quick test are located on the front edge of the chassis. For tuning adjustments, the main dial is located up where there is elbow room and there is a dial-lock provided for the purpose of setting the frequency of the transmitter at that assigned to the WERS district. The antenna coupling control knob is just above the main dial. The plate meter to the right is not as far from the same line of sight so that resonance and speech amplifier adjustments may be observed quickly during the tune-up job. The antenna comes in conveniently to the stand-off insulators at the upper left.

The top-view photograph shows two of the relays, those for the filament and vibrator, located in one corner of the cabinet on a common base. The relay which controls the genemotors is underneath the chassis. The HY75, with two top-caps, is placed next to the tank coil and condenser. Also, the 6X5 rectifier is placed close to the vibrator, shown in the cylindrical can, and the power transformer to which they connect is underneath the chassis at the same place. The plate meter and speech amplifier components are lined up vertically, in the photograph, at the left of the cabinet.

In the under-chassis view of the main transmitter, the volume control at the right has its shaft extended for the width of the chassis. Here, the idea is to put the volume control connections near the control grid of the 6C5 speech input tube. Thereby a long shielded lead from some other location is not required and the possibility of hum pick-up is greatly reduced. Otherwise, except for what has been mentioned above, the under side of this unit contains only the usual assortment of filter and by-pass condensers required in the circuit shown in Fig. 1.

The front view of the transceiver shows a cabinet with dimensions approximately 9 x 6 x 4 inches. This allows ample space on the panel for the gain and regeneration controls which are shown with pointer knobs, and for the adjacent send-receive switch with its circular knob. The two toggle switches at the left control the filament and main transmitter plate supplies through two relays, the circuits of which have been described. A speaker is plugged into one of the jacks at the left and the single-button mike goes into the other. Cables to the power supply from the panel of the main transmitter are shown in the rear. Several half-inch holes drilled in the top of the case provide ventilation for the tubes.
inside. Tubes are mounted horizontally. This arrangement places the terminals of the sockets right at the connections to component parts which are mounted within the front section of the unit. Exceptions are the microphone and inter-stage transformers, $T_1$ and $T_2$. They are mounted at the opposite ends of the top section and as far from one another as space will permit. All of the r.f. equipment is confined to the compartment at the right. Fairly close coupling between the antenna and tank coils is provided in the transceiver, although variable coupling is used in the main transmitter.

**Operation**

Suppose that we wish to test receiver operation of the transceiver. The first step is to throw on the filament switch. Relay $Ry_1$ then goes into action and simultaneously the vibrator starts, through the action of relay $Ry_2$. The familiar background hiss should then be heard and some stations might come in as the main dial is rotated. Sometimes, just manipulation of the regeneration control will cause the receiver to "come alive," if it seems dead at the start. As a simple test of operation, touch the antenna. The receiver noise should diminish instantly as an indication that the circuit is operating properly. In order to set the tuning so that the bandspread condenser can cover the band properly, condenser $C_1$ is fixed-tuned like a trimmer condenser. The adjustment screw may be reached from the top of the cabinet and is just to the left of the HY615. Since no receiver, other than perhaps an external one, is available when the transmitter section...

![Fig. 2 - Circuit of the transceiver and control switches.](image)
of the transceiver is being tested, the above adjustments for the receiver section should be made first. If the receiver is oscillating, then it is almost a sure thing that the transmitter also will work since it uses the same oscillating circuit with only the addition of modulation. Even proper performance of the audio section of the receiver circuit, which is easily determined by listening, makes it unnecessary to carry out more than a minor check or two on this part of the circuit in order to be almost certain that the transmitter section is okay. The adjustment of the main transmitter will be described later but when this transmitter is working right, there is then no further doubt about performance of the microphone itself. Since the speaker will have been proved to be all right when the receiver is tested, there is nothing left to give trouble in the transceiver except the usual run of bad contacts, faulty connections, etc. Therefore, a few actual contacts over the air at authorized periods, or of course listening on a near-by monitor, will reveal whether the transmitter section of the transceiver is working right.

Main Transmitter Tuning

Now to the main transmitter. To the left of the green panel light is the filament toggle switch. First, we turn this switch on, and then in due time the plate voltage toggle switch to the right of the red panel light is turned on. The plate-current meter will show some reading, unless there is a fault in the circuit, whether the meter switch is set to read plate current for the 6N7 modulator or the HY75 oscillator. In fact, the principle purpose of the meter is simply to show that current is flowing. The resonance dip does not occur for the self-excited oscillator of this transmitter, as it would with a crystal oscillator. However, some change in plate current usually will show up throughout the full range of the tuning dial, which is not the case with the 6N7 plate current. This is one way in which it may be known that the meter is in one of those circuits or the other. Antenna coupling next is made tight by turning the knob to the right just above the main dial. This should cause an increase in plate current. Now adjust the antenna length until a maximum increase in plate current occurs. This will be the adjustment for maximum power output at the particular frequency to which the transmitter is tuned. One practical point to consider is that the metallic lid of the rear car compartment will have some effect on the antenna capacity so that the lid should be left down, with the transmitter running, when the antenna length is adjusted. Another caution — for close frequency adjustment one should stay clear of the antenna when each change of its length is made so that body-capacity will not enter into the picture. In this case we can use the transceiver to listen to the signal, but a better check of modulation quality can be made with a receiver or monitor farther removed. Flickering of the meter will indicate something about modulation, since violent changes are anything but the best and a simple change of the gain control will set the speech volume to the right amount.

Results

Results with this mobile installation in the Middletown area are very pleasing. Except where buildings or similar large structures block transmission in a given direction, or except for occasional unexpected reflections of waves, contacts with local and district stations can be made at will. Where longer distances must be covered we drive to the top of one of the near-by hills, thus attaining an elevation of about 200 or 300 feet above sea level. From there we can work New Haven, 27 miles by air; lines; New London, 33 miles, and Hartford, 17 miles away. Weather, we find, does make some difference. A warm air mass between stations helps a lot in making a contact. Considering such results as these, and the convenience with which the mobile rig can be operated, we consider the job well worth our time and effort.

Somewhere in the jungles of New Guinea there is a small studio in a native-built grass hut. Radio programs emanating from it travel along two miles of landline through dense jungle growth to be transmitted by "RAAF Radio — the Voice of the Islands" to thousands of Australian and American servicemen stationed in that area. Chief technical engineer for the station is Flying Officer Ralph Turner, VK5RT, who had to overcome such problems as designing and hand-winding transformers and then redesigning them to overcome the effect of humidity. Today, eight months after its inception, RAAF Radio offers top-notch programs and boasts a transmitter output of 250 watts.
The push-pull audio amplifier is versatile. It can be readily adapted to varied operating requirements of signal input, power output, and electrode potentials. It is not necessary to restrict the push-pull amplifier to one mode of operation (Class-A linear) to obtain an output sufficiently free of distortion. This point was brought out in the construction of the composite characteristics in the previous installment. It was noted how linear (straight) the composite characteristics were at low plate-current values. This fact permits an increase in the input signal which swings the plate current to a very low value (extended Class A) and causes a corresponding increase in power output. A further increase in power output may be obtained by permitting the plate current to swing to zero and remain there for a portion of the grid input cycle (Classes AB1 and AB2). Thus the plate current of one tube may be cut off for a portion of the positive alternation of the input cycle while the other tube draws no current for a portion of the negative alternation. Still the composite load line remains reasonably linear since the mutual inductance between the two sections of primary winding of the output transformer tends to sustain the plate-voltage variations when one tube is conducting and the plate current of the other is cut off.

The four classes of operation employed in push-pull audio circuits are as follows:

1) Class A, where the plate current flows for the entire grid cycle and the grids are not driven positive.
2) Class AB1, where the plate current flows for less than the entire grid cycle but for more than half. Here again, the grid does not swing positive at any time.
3) Class AB2, where the plate current flows for less than the entire grid cycle but for more than half. The grid swings positive for a portion of the grid cycle.
4) Class B, where the plate current flows for only half, or slightly more than half, of the grid cycle. The grid may or may not swing positive.

The percentage of distortion gradually increases as the percentage of the grid cycle over which plate current flows decreases, particularly so when the grid is driven positive, but for any class of operation the push-pull amplifier, if properly designed, has less distortion than a single-ended stage which is being driven to its limit. The versatility of push-pull operation is demonstrated in the following chart showing the various operating conditions for push-pull 6L6s.

<table>
<thead>
<tr>
<th>Class</th>
<th>Input Peak Grid-to-Grid Voltage</th>
<th>Signal Power Output Watts</th>
<th>$E_{ab}$</th>
<th>$E_{ac}$</th>
<th>Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>32</td>
<td>14.5</td>
<td>250</td>
<td>250</td>
<td>Fixed</td>
</tr>
<tr>
<td>AB1</td>
<td>40</td>
<td>26.5</td>
<td>400</td>
<td>250</td>
<td>Fixed</td>
</tr>
<tr>
<td>AB2</td>
<td>50</td>
<td>34</td>
<td>400</td>
<td>300</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>32</td>
<td>400</td>
<td>300</td>
<td>Fixed</td>
</tr>
<tr>
<td>AB1</td>
<td>57</td>
<td>40</td>
<td>400</td>
<td>250</td>
<td>Fixed</td>
</tr>
<tr>
<td>AB2</td>
<td>80</td>
<td>60</td>
<td>400</td>
<td>300</td>
<td>Fixed</td>
</tr>
</tbody>
</table>

The following procedure is employed in the design of a push-pull Class-A amplifier using a pair of 6L6 tubes operated at a plate and screen voltage of 250.

1) Construction of load line. The construction of the push-pull load line is a simple operation, since we know that one point must lie on the plate-voltage coordinate at the applied-voltage point. This is point A in Fig. 1. Since maximum output is obtained when the grid signal swings to zero on the peak of its positive alternation, a second point is located on the zero-bias line. To obtain maximum output without distortion, this second point is located just ahead of the "knee" in the zero-bias line (point B). A line drawn between A and B represents the push-pull load line. As explained in the preceding installment, this load line represents the load presented to one tube when the other tube is not conducting. The actual load line for each tube is curved as shown in the last installment and curve ZW in Fig. 2. The plate-to-plate load is four times this value. Therefore, in Fig. 3,

$$R_{pre} = \left(\frac{HA}{HF}\right) = \left(\frac{250}{0.200}\right) = 5000 \text{ ohms}$$

2) Since we are employing Class-A operation, the plate current swings almost to zero during the negative alternation of the input signal applied to

*300 Fifth Ave., Asbury Park, N. J.*
each tube. With a plate voltage of 250 the minimum plate current occurs at a grid voltage of approximately -32 volts. Thus our d.c. bias point is at -16 volts and the peak grid signal is 32 volts.

3) The d.c. component of plate current per tube is located at the intersection of -16-volt Ee curve and the +250-volt plate-voltage ordinate, point P in Fig. 1. Point P represents a plate current of 60 ma. per tube or 120 ma. for both tubes.

4) The d.c. component of plate current, as found by using the above procedure, is the same with or without signal only when the plate-current variation is a perfect sine wave. This condition is approached only when the tube is operated Class A over the linear part of the characteristic curve. However, in the case of extended push-pull operation the plate-current variation per tube is not a perfect sine wave; in fact, the current alternation during the negative swing of the grid cycle is considerably compressed. Consequently, the average signal content on each side of the level set by the d.c. component of plate current is not the same. As a result, the d.c. component of plate current shifts so that the average plate current is not the same on each side of the zero-signal level. Since the average signal content is less on the negative alternation, because of compression of the plate-current characteristics at high grid-voltage points (gradual crowding of the high bias lines), the d.c. component of plate current increases. The larger the grid signal the greater will be the increase in the d.c. component because the signal is driven farther into the region of compressed plate current. It is well to note at this point that although the plate-current characteristic for each tube is compressed and therefore distorted, the actual plate-voltage variations (useful output) are not distorted because of the combined action of both tubes through the mutual coupling of the primary windings of the output transformer. The only ill effects resulting from the non-symmetrical plate current are the rise of the d.c. component of plate current and the consequent increase in plate dissipation. The plate dissipation (tube heating) of the push-pull amplifier at no signal is \( I_{p} (E_{b}) \), or in the case of the 6L6s,

\[
W_{pd} \text{ (zero signal)} = (0.06) (250) = 15 \text{ watts per tube.}
\]

However, when a signal is applied, the plate dissipation is increased by the addition of another d.c. component, called a rectified component, which is caused by the non-symmetrical plate current. The stronger the signal the greater the dissipation becomes. Thus the operating point must be set where excessive plate dissipation is prevented when maximum grid signal is applied. The plate current (as shown in Fig. 4) flowing from the power circuit into the center tap of the transformer (mid-branch current) consists of a steady d.c. component plus a pulsating component which varies with the signal voltage. Since the plate current is not symmetrical (less amplitude on negative side of \( I_{b} \)), the plate-current waveform consists of a steady d.c. component plus the resultant pulsating d.c. with a single tube (Fig. 4) receiving alternate pulses. The total current drain from the power supply per tube consists, therefore, of an additional current which increases from \( I_{b} \), with no signal to \( I_{de} \), with maximum signal. For practical calculations the total current is

\[
I_{de} = \frac{I_{bo} + \frac{I_{1} - I_{2}}{2}}{2},
\]

where \( I_{bo} \) is the no-signal plate current for a single tube, \( I_{1} \) the current at the peak of the positive grid alternation and \( I_{2} \) the current at the peak of the negative grid alternation for the second tube. The quantity \( I_{1} - I_{2} \) represents the approximate average current between the zero-signal point, \( I_{bo} \), and the peak of the plate-current pulsation. The d.c. component of each individual 6L6 tube is

\[
I_{de} = I_{bo} + \frac{I_{1} - I_{2}}{2} = \frac{60 + 160 - 10}{2} = 67.5 \text{ ma.}
\]

and the plate dissipation with maximum signal becomes

\[
W_{pd} = (0.0675) (250) = 16.9 \text{ watts}
\]

which is less than the maximum rated value of 19 watts for a 6L6 tube.

5) In using cathode bias for Class-A push-pull operation, it must be remembered that the increase in the d.c. component of plate current with applied signal also increases the bias from the no-signal point. Therefore, to reach the zero-bias line from a -16-volt bias requires more than a signal of 16-volts per tube. The value of the cathode-bias resistor is

40 QST for
The slope of the \( AB_1 \) and \( AB_2 \) load lines in Fig. 2 are respectively \( \frac{400}{0.24} = 1667 \text{ ohms} \) and \( \frac{300}{0.315} = 960 \text{ ohms} \), or the plate-to-plate impedance across the primary of the output transformer is 6670 ohms and 3800 ohms, respectively.

To design push-pull stages for Class-\( AB_1 \) or \( AB_2 \) operation, the procedure is much the same.

1) In constructing the \( AB_1 \) or \( AB_2 \) load lines the same method is used in locating the two points through which the load line is drawn. In general, when maximum output is desired the plate and screen potentials are set at the maximum permissible values. Thus, in Fig. 2 the plate voltage is 400 and the screen 300. In constructing load lines for pentodes it is important that use be made of the set of characteristic curves which correspond to the correct screen voltage. Fig. 2 is for a screen voltage of 300 while Fig. 1 is for a screen voltage of 250. The screen potential of 250 volts is used for less output and less grid drive. The plate voltage may or may not be reduced, depending upon output desired. In the interest of obtaining less distortion and less critical operating conditions it is best to choose a class of operation which will do the job satisfactorily with a little power to spare, and not to extend operation beyond this point.

In Fig. 2 one point on both the \( AB_1 \) load line \((XY)\) and the \( AB_2 \) load line \((XZ)\) is at point \( X \) at the intersection of the zero plate-current coordinate and the supply-voltage point. For the \( AB_1 \) curve the other point is just before the "knee" on the zero-bias line; for the \( AB_2 \) line, just before the "knee" on the most-positive bias line. If less output is desired, the \( AB_1 \) line, \( BC \), is drawn on Fig. 1 in the same manner. In the case of less output with \( AB_2 \) operation, the load line, \( CE \), is drawn on Fig. 1. Point \( E \) on this load line is approximately on the 8-volt bias line because of the lowered screen potential the effect of the positive grid on the electron stream is more noticeable and it is not advisable to permit the grid to swing too far positive.

2) The slope of the \( AB_1 \) and \( AB_2 \) load lines in Fig. 2 are respectively \( \frac{400}{0.24} = 1667 \text{ ohms} \) and \( \frac{300}{0.315} = 952 \text{ ohms} \), or the plate-to-plate impedance across the primary of the output transformer is 6670 ohms and 3800 ohms, respectively.

Fig. 4 — Curves showing individual-tube and resultant d.c. plate currents in a push-pull amplifier.

3) The operating point for \( AB_1 \) and \( AB_2 \) operation can be found by trying various operating points until one is found which does not exceed the plate dissipation limits set by the manufacturer. For minimum distortion it should be brought as close to this point as possible.

4) The remainder of the circuit values are found in the usual manner except for the case where the grids draw current. This point will be discussed in detail, in conjunction with Class-B operation in the installment which will follow in a subsequent issue.

As mentioned previously, although the composite push-pull load lines suffice to make all practical calculations for a push-pull circuit, the actual load line of each individual tube is a curved line. During the time when one tube is cut off, the load is \( R_{\text{m}} \) for the conducting tube. When both tubes are drawing the same current the load for each tube is an impedance of \( \frac{R_{\text{m}}}{2} \) because of the reflections between primary windings. This load gradually increases as the plate current falls toward zero until it reaches infinity at cut-off. The load line \( ZW \) in Fig. 2 will substantiate this fact. The method for drawing the curved load line was given in the previous installment; however a very simple method of accomplishing the same result is outlined below.

1) Since the slope of the load line at the operating point, \( O \), is \( R_{\text{m}} \), set a ruler at the operating point at an angle which has a slope of \( \frac{R_{\text{m}}}{2} \) with respect to the plate-voltage coordinate.

2) Slide the ruler upward from the operating point (always maintaining a slope which is \( \frac{R_{\text{m}}}{2} \) with respect to the plate-voltage ordinate) until a position is found on the -20- and -30-volt bias lines which sets off equal plate voltages on either side of the operating plate voltage. This position locates points 1 and 2.

3) Now slide the ruler up further until a position is found on the -15- and -35-volt bias.

(C)ontinued on page 20)

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**Fig. 3**— Push-pull circuit discussed in text.
Wright Field's Ham-Built Direction Finder

A Homemade Beam Antenna Guides Lost Planes to Safety

A ham can always be depended upon to come through in the pinches — usually with a simple but effective answer to any radio problem. This is the story of how standard amateur practice was put to use in developing a simple homing device for lost aircraft not equipped with the standard radio compass.

One morning last summer, an Army fighter plane was lost. The pilot, Lt. Cecil Albright, well aware of the nearly exhausted gasoline supply, called frantically for help in locating Wright Field. The Signal Corps radio laboratories on the field were called for aid. Although the signals from a dozen planes were picked up on receivers, there was no way in which they could be used to guide Lt. Albright's plane to safety. So he crashed, and, although the pilot escaped with only minor injuries, his plane didn't.

Over in the radio hangar on the flight line, Virgil Faught, W9POE, operator in charge of the Signal Corps radio station, O9V, and Ed Spears, a radio operator, had picked up Lt. Albright's transmissions directed to the control tower and had tried unsuccessfully to find some way of helping the flyer locate the field. When the news of the crash came, they determined to do something about this inability to be of assistance.

The Experimental Antenna

A homing device to guide lost planes, especially fighter planes which carry no radio compass, was the object of their determination. The two men, with the full cooperation of their division officers, set to work to develop a system by which the transmissions from flyers lost or unfamiliar with the area could be used to guide the plane to a spot over the field. Once there, the control tower could take over with landing instructions.

Beginning with a homemade antenna based on the loop principle used in the present radio compass, W9POE and Spears made many experiments and test flights. Fundamentally the model of the homing device, now in use successfully, involves the application of the three-element rotary beam antenna so familiar to hams. It is a combination array consisting of a half-wave dipole antenna with one director element and one reflector element. The construction of the antenna is shown in the accompanying detail photographs. The band of frequencies covered is that standard for AAF communications receivers.

The assembled v.h.f. array unit, showing the shorting straps at the centers of the director and reflector.

First consideration was the physical lengths of the director, antenna and reflector. The length of each was made somewhat shorter than that required for the highest frequency. Provision then was made to extend the element lengths by means of sliding sections so that the array might be tuned to any frequency down to the lowest in the band. The director, antenna and reflector elements are similar except as to length. Each consists of two equal lengths of aluminum tubing which are held together, end to end, with an insulator made from a piece of solid phenolic rod turned down to fit snugly inside the tubing. The two sections are held apart by a shoulder at the center of the phenolic rod, as shown in the photograph of the disassembled elements. The antenna elements are then secured to a piece of phenolic board by means of two metal cable clamps. The spacing between elements is based upon a frequency near the middle of the band covered. The two sections of the director and reflector are tied together with a jumper wire, as explained later. The outer ends of each element are split with a saw cut for a few inches and then compressed so that the tuning extensions which slide inside the ends will have a good friction clamp.
The phenolic board on which the antenna is mounted is bolted to a wooden bar which is mounted, by means of two pieces of angle stock, on top of a vertical pipe which may be rotated, as shown in the view of the completed installation. A weight which acts as a counterbalance is fastened to the end of the rotating bar opposite the antenna.

The Transmission Line

The antenna transmission line consists of two parallel lengths of coaxial cable. The center conductors of the two cables are connected to the inside ends of the two antenna sections, while the outer conductors are connected together at the antenna end and grounded at the other end. It will be noted that the antenna is “floating” with respect to ground. This arrangement has proved to be very satisfactory and does not affect the operation of the antenna.

When the antenna was first put into operation, it was mounted for horizontal polarization. Since this did not give the desired results, it was then mounted in a vertical position which gives better results for this particular location. A simple rotating mechanism with a scale on which the operator could read the direction in which the antenna pointed was designed. Since it was not desired to use sliding contacts for the transmission line, the shaft was blocked from turning continuously to keep from twisting and eventually breaking the transmission line. This simple rotating mechanism served satisfactorily until it was possible to obtain a regular antenna-rotating mechanism from a mobile direction-finding set. This equipment provides an excellent calibrated control for the array. The rotation control and bearing indicator are mounted immediately above the operator’s table in the station, with the rotating antenna support going through the roof of the hangar. This shaft was extended so that the antenna is 30 feet above the roof of the hangar. With this newer arrangement, inductive coupling between the transmission line and the antenna permits the antenna to be rotated continuously without the necessity for sliding contacts.

Tuning Procedure

The procedure in tuning the array follows standard practice and, with one exception, needs no explanation. When tuning the director the jumper between the two sections of the reflector is disconnected, and the director jumper is disconnected when tuning the reflector. This breaks up the element which is not being tuned so that critical adjustments can be made.

When the directive array was first installed, a standard v.h.f. radio set, the SCR-522, was used both for transmitting and receiving. This is the same set used in airplanes and was satisfactory except that it did not have the power output desired on transmitting. The transmitting equipment now in use is a 50-watt v.h.f. transmitter and the receiving equipment is a separate v.h.f. receiver. Maximum signal-strength reading is used for bearing indications in operating the system. This is done because the radio station is situated on the top floor of the hangar, which is a steel structure, and is surrounded by nearby steel buildings. In addition, a large amount of noise is picked up from trucks and other machinery. For these reasons, the use of a null reading, following normal practice, has proved to be unsatisfactory. The output-level meter of the receiver is used for the more accurate readings.

Results

Very satisfactory results have been obtained over distances up to 150 miles from the station, depending upon the altitude of the plane. In application, radio communication first is established with the lost plane. The antenna array is then swung for maximum received signal strength by which the compass bearing of the plane in relation to the field may be determined. When the airplane pilot has been given the first bearing and is headed in the direction of the field, bearings are repeated regularly until the plane arrives over the airport. As the plane comes

A set of antenna and director elements with their fittings. At the top is the phenolic insulating spacer which fits between the two quarter-wave sections of the antenna. The clamps at the bottom are for mounting the elements on a phenolic board.

(Continued on page 80)
The November, 1919, issue is the “liberty number,” the cover illustration showing an amateur triumphantly arising from what looks suspiciously like an oversized trash-can which has contained him, lifting “the lid” and proudly brandishing his new licenses. Since resumption was authorized only on October 1st, and this issue went to press in early October, there is almost no news of actual activity but there is a tremendous bustle of preparation. Everyone must get new licenses and we are not going to get our old calls back. There are instructions on how to proceed, and the first lists of new calls make their appearance. A new department is started in QST, “The Junior Operator,” to teach the fundamentals of amateur radio to newcomers. As amateur radio gets its feet under itself once more, we’re out to see that every ham becomes a member of the League. The lead article on “The Importance of our ARRL,” by Hiram Percy Maxim, points out the benefits of organization; and at the same time QST begins a subscription contest, with prizes in amateur apparatus for the winners.

On the technical side, that master of spark technique, M. B. West, prewar SAEZ, has a helpful article on “Transmitter Efficiency,” while Harold Tyszer describes the adjustment of the Amrad quenched gap. The editor inquires whether anybody is working c.w. on 200 meters and seeks a description of any successful rigs, saying, “We’re afraid we’re going to have lots of trouble with 200-meter undamped. The frequency is so high that an extremely precise adjustment of the heterodyne frequency must be made at the receiver.” In the ad section, the DeForest wireless telephone is offered, employing four hard receiving tubes in parallel, ‘phone range 10 to 20 miles, c.w. range 50 to 75 miles, price $200. Storage “B” batteries also make their appearance in the advertising pages of this issue. In response to the editor’s recent plea, The Old Man reports on “Rotten Impulse Excitation” and, as you can imagine, from the title, it’s a decidedly negative report. “Who’s Who in Amateur Wireless” resumes in this issue, the first victims being Mathews of 9ZN, Central Division Manager, and Schnell of Chicago City Manager. Herbert E. Metcalf has a very interesting article on “The Photo-Electric Cell and Its Possibilities in Radio Communication.” Commonly employed in the scientific world in the photometry of stars it has been tried as a detector in place of a crystal and very good results obtained, provided a strong light was allowed to fall on the tube: in direct sunlight the signals are fully as good as the best crystal detector. The author points out that the cell would make a wonderful detector for telephonic transmission over a beam of light and foresees many future possibilities for it in radio communication. . . . There are now two kinds of Marconi tubes for amateurs, Class I for use as a detector, gaseous and requiring critical adjustment of plate voltage; and Class II, a hard tube for use as an amplifier. The list is $7, plus an additional $1.50 for a socket. The prewar unmounted tubular audion has practically disappeared.

New Tubes

As certain of the “lighthouse” series of v.h.f. tubes have been declassified by the military services we are able to add the following characteristics to the general description published in October, QST, page 42.

The GL-599 is a high-vacuum diode for use as a transmission line switch or as a detector at very-high frequencies. Its filament is rated at 6.3 volts, 0.75 amperes. The cathode-plate capacitance is approximately 2.45 µfd. The base is a 6-pin octal.

In typical operation the plate voltage is 5, with a plate current of 24 ma., maximum 30 ma.

The GL-446-A and GL-446-B are triodes designed for use as oscillators, amplifiers or converters at the higher radio frequencies. The 446-B is the highest frequency oscillator. Their filament ratings are 6.3 volts, 0.75 amperes. The approximate direct interelectrode capacitances are: grid-cathode, 2.2 µfd.; grid-plate, 1.6 µfd.; plate-cathode, 0.02 µfd.; shell-cathode, 50 µfd. The grid-plate transconductance is 4500 µmhos, and the amplification factor is 45. The bases are 6-pin octal.

Typical operation of these tubes at 250 volts on the plate will show a plate current of 15 ma., when a bias resistor of 200 ohms is used. The plate dissipation will be 3.75 watts.

In oscillator service the maximum allowable plate voltage is 400, and the absolute maximum plate current, 20 ma. A grid-leak bias resistor of 10,000 to 20,000 ohms is recommended for oscillator service.

The GL-2C44 is a high-vacuum triode receiving tube for use as an amplifier or converter at the higher radio frequencies. Heater voltage and current are 6.3 volts and 0.75 amperes. The approximate interelectrode capacitances are: grid-plate, 2.0 µfd.; grid-cathode, 2.7 µfd.; plate-cathode, 0.1 µfd.; shell cathode, 50 µfd. The grid-plate transconductance is 7000 µmhos.

Under typical operating conditions the plate voltage is 250 (max. 500) and the plate current 25 ma. (max. 40 ma.). A cathode bias resistor of 100 ohms is recommended for a plate voltage of 250. The plate dissipation is 5 watts at 250 volts, 9 watts at 300 volts and 13 watts at 500 volts.

When the tube is operated at maximum ratings, a heat conducting connector which will keep anode temperature within maximum ratings of 150 to 175 degrees Centigrade should be used.
Although many people have known about the National Guard organization and its functions, not as many know about the organization which sprang up to take its place in 1941, when the entire National Guard personnel was inducted into the Army of the United States.

After the mass induction of National Guardsmen, the authorities in the various states deemed it wise to create some sort of a volunteer military group which would be on hand to assist the civilian defense authorities in protecting state borders and coast lines in the event of enemy attack. In many states this led to the formation of State Guard organizations, which were to consist of civilian personnel, trained and operating under Army supervision, to take over in all emergencies in which the National Guard normally would have been expected to participate.

Because of the particularly vulnerable coast line which characterizes Florida, the officials in this state were among the first to see the value of maintaining such an organization. Accordingly, the Florida State Legislature officially passed an act on April 22, 1941, which brought into being the Florida State Guard.

Plans for the new organization progressed rapidly after that, and these plans included the reactivation of the radio transmitters which had belonged to the National Guard, and which had been left to gather dust and mildew in armories throughout the state. Just prior to the completion of these plans, however, the Japs pulled their "fast one" at Pearl Harbor, and all such transmitters were silenced by the government.

The newly organized State Guard carried on without the benefit of the accustomed radio communications for about a year afterward, but it then became apparent that some form of radio contact was necessary within the group to enable it to reach its maximum preparedness and value in time of emergency or disaster. It was this situation which prompted the organization of the First Signal Company, Florida State Guard, whose primary objective was to secure permission to install radio equipment and, when installed, to operate it.

The First Signal Company was authorized to enlist one hundred and eleven men, who were to serve under five officers—a captain and four lieutenants. The company itself was divided into small detachments, each of which was commanded by a non-commissioned officer called the senior-in-charge, who also serves as deputy communications officer in his area. The detachments were assigned to serve with infantry units located strategically throughout the state, and with the communications division of the state civilian defense organization.

The captain of the company is responsible for the proper training of all enlisted men. Even though their final duties are concerned with the establishment and maintenance of radio communications, they must be schooled first as soldiers. They are uniformed, and then put through a training course which teaches them such things as how to handle a gun, a gas mask, etc. The captain prepares training schedules and issues training memorandums from time to time. He is assisted in this work by the lieutenants of the company, who remain in the field and visit units and detachments in their own areas at infrequent intervals. Since the detachments never know when to expect one of these "surprise" visits,
they keep eagerly on the job at all times to avoid being caught napping.

Following the organization of the company, many headaches were experienced in an effort to secure a station license from the FCC. It was found that application after application, and plan on top of plan, was returned from the FCC. Time after time this occurred, until it was doubtful that the First Signal Company ever would get radio communication. Finally, it was decided to appoint a full-time state communications officer, whose job would be to establish radio communications and work out plans for a state net. The man selected for this job was an amateur, WSUBN, and an ex-Army officer, into whose lap fell these immediate problems.

The original plan had been to operate two-way radio equipment on the special emergency police frequency of 2726 kc. When it was discovered that the possibility of operations on any low frequency such as this was prohibited, plans immediately went forward to work under the War Emergency Radio Service.

The procurement of radio equipment was the next worry. Many factory-built sets were bought outright, but many more were constructed by the ham members of the First Signal Company. The hams knew from their experience gained on the amateur bands that transceivers were the least desirable apparatus to be used on the very-highs, so plans went forward for construction of radio units of the transmitter-receiver type only. Frequency-measuring equipment and power supplies also were obtained in similar manner.

In addition to securing a station license for the Florida State Guard from the FCC, the state communications officer had other functions to perform, similar to those a radio aide has in connection with a CD-WERS license. It became his job to see that all FCC and State Guard rules and regulations governing operations were adhered to, that all apparatus was kept in shape for operation on a moment's notice, that all equipment was maintained on proper frequency, and that all the personnel were properly examined and licensed as WERS operators. At first glance this would seem to be a gigantic task, but fortunately the assistance given by the deputy communications officers with each of the detachments renders the task much less difficult.

**Net Operation**

After the Florida State Guard became licensed as WKRW on June 17, 1943, with fifty-six units authorized for operation among the detachments, the problem of net operation presented itself.

A special set of rules and regulations was drawn up for all the First Signal Company members. Nets were established within the areas covered by each detachment, and regular weekly drills were started. The routine was established and the men learned quickly.

Coded messages and cryptography are used in the net practice, with emphasis on the former because it is simpler to use and harder to decipher. State-wide drills are held periodically by relay from one area to another, on 112 Mc. when possible. Since each detachment operates as a separate organization or net within its immediate area, this form of drill is important in coordinating activities throughout the state.

Week-end maneuvers and periodic bivouacs, which are conducted as a part of the training for
infantry companies, are always participated in by the local First Signal Company detachment, which supplies radio communication from outposts and maneuvering groups to the command post or headquarters — wherever established.

Local detachment commanders, who are normally in charge of the control station within an area, also maintain contact and establish friendly relations with officials of civilian defense, fire, police, forestry, Red Cross and other emergency service organizations. In addition, the local signal company units coordinate activities and cooperate whenever possible with Army and Navy establishments within the area. This insures mutual aid and benefits in an emergency of any nature that might occur. Tie-ins, in many instances, have been established with these agencies by an exchange of receivers. In this way the radio facilities of each group are broadened and extended for use in an emergency, in spite of the fact that the two organizations are operating in different nets and on different frequencies. Mapping of the area normally served by a net, indicating the best points and locations for radio transmission and reception, constitutes a part of regular drill periods.

Additional training in radio operation for members of the First Signal Company is given during the monthly drill schedules by a participation in drills with the Florida Highway Patrol. This Patrol operates an f.m. police radio net, which covers the state. Key relaying stations, in constant radio communication with many roving patrol cars, offer the State Guard another outlet for state-wide emergency radio service during any disaster. All Highway Patrol men are deputy State Guardsmen, but have no power of arrest. In actual emergencies, the State Guard takes over. The training the signalmen receive in operating the Patrol radio stations fit them to be experienced Highway Patrol radio personnel in an emergency.

Experience has shown that communications on 112-Mc. amateur radio may be maintained generally throughout Florida. Working with a portable WERS transmitter-receiver set, equipped with a whip-type antenna attached to the set in walkie-talkie fashion, one can cover a distance of from two to five miles to another portable or portable-mobile rig. Working from a station with an antenna some thirty-five or forty feet in the air, one can cover about ten or twelve miles to a portable set operating in the field with a whip-type antenna. About fifteen to twenty-five miles can be covered, with good communication both ways, to another station having an antenna of about equal height. Two-way communication has been maintained at distances from thirty-five to fifty miles, without difficulty, between two stations with antennas one hundred feet or more in the air. Portable masts around forty feet high are part of the equipment of many of the First Signal Company detachments.

With but few exceptions, directional antennas are not used in the First Signal Company. It is generally desired to transmit or receive signals in all directions. The whip, "J," and vertical with counterpoise are the types found most satisfactory to use and the easiest and quickest to erect. (The latter is generally one-quarter to three-quarter wavelength long, and fed with open line spaced two inches, or with 72-ohm coaxial line when available.)

The First Signal Company also boasts of the use of two privately owned airplanes, belonging to members of the company, which are used in drills. Two-way communication on 112 Mc. has been held over a distance well in excess of one hundred miles. This generally is governed by the altitude attained by the planes.

It would not be fitting to close the story without a word of the work of W4FWZ, who is the commander of the First Signal Company and a major in the Florida State Guard. He has been designer, inventor, improvisor of parts and head mechanic since the beginning, when the initial procurement problems were toughest. The equipment which he constructed, some of which is illustrated, has proven to be very satisfactory and of good range.

While the members of the First Signal Company hope that low-frequency radio operation will be permitted in the State Guard in the near future, it is certain that a very definite place has been made for the 112-Mc. equipment now in use. Its use for emergency communications in time of disaster could easily become an important adjunct to all other types of operation which may be used in the future.


November 1944
His ship entered the harbor with Japanese dive bombers zooming in at mast-height level.

The K6s Come Through

BY WILFRED HO, K6THD

As early as the fall of 1941, even earlier perhaps, when the calamitous clouds of world conflict crossed the Pacific from the west and first cast their shadows on the Hawaiian Islands, months before those same ominous clouds burst into a downpour of unforgettable death over Pearl Harbor — most Islanders had become not only apprehensive of war on our side, but aware, also, of the strategic importance of our home as a defense bastion.

This was particularly true of four “salty” K6 hams — Herbert Chang, K6DSF-ex-KF6DSF; Alexander Wong, K6NVJ-ex-KG6NVJ; Wallace Choi, K6RYH, and Wilfred Ho, K6THD. Both Herb and Alex were hams of long standing. As KF6DSF and KG6NVJ, the two blazed a DX path from the Phoenix Island (Howland, Baker, Jarvis and Canton) across the Pacific during 1937 and 1939. Along about the same time Wallace Choi was “colonizing” Johnston Island, but was unable to obtain permission to operate from there. After returning to Honolulu he attended a radio school in Los Angeles before joining Herb and Alex. As K6THD, I completed the quartet while still in my teens and, after completing radio courses with RCA Institutes and CREI, obtained my telegraph first-class ticket. As sea-going ops we had the vantage point of a deck rail aboard merchant ships plowing the frequently white-crested channels between the Hawaiian Islands from which to sense the growing tension.

The Selective Service Act already had called many of our native sons to training camps, the territorial legislature passed mobilization bills to gear the government for any catastrophe, and the lights throughout the island group went out several times during blackout drills. Everywhere there were unmistakable signs that the slow pulse of life in the Islands was being quickened by one thought — preparedness for defense.

Despite the tenseness of life in the daytime, many Islanders found it easy to retire to their homes for an evening of quiet relaxation. For most of them a motion picture show and an automobile ride constituted all there was to Hawaiian “night life.” Thus, at the stroke of midnight which was to herald in that day of infamy, December 7, 1941, the greater part of Hawaii resembled its old self, tranquil in its sleep.

At that very moment a ship left port on her return trip to Honolulu. Aboard her in the radio room were Chief Radio Officer Kent and me, serving as his assistant. One might describe the chief as a strictly commercial man, genial in...
every respect — except for an apathy toward
lamps who somehow invited themselves into
the shack with the well-worn greetings, “I’m K6—— . . .” Little wonder that the chief was
apathetic.

Getting back to that fateful night, the chief
had decided to take the first radio watch, so I
lay in my bunk tossing around the tiresome
thought of awakening in the wee hours of the
morning. It seemed quite long before a prod
in the back made me grunt, and then groan, as I
got up to clamp on the headphones, in the mean-
time still retaining that state of somnambulism
which any old salt would insist is the one earmark
of any “Sparks” in the merchant marine. Natu-
rally, it would not be ethical for me to admit I
was half asleep on my watch, conducive as such
times are to slumber. In any case, the hellish
nightmare of the attack on Pearl Harbor a few
hours later was enough to keep me fully awake
for many months thereafter.

At daybreak on December 7th my ship was off
Pearl Harbor, but by 7:15 A.M. we were secured
to the pier in Honolulu harbor. The Japanese
had not yet unleashed the full fury of their trea-
chery, although by then the Island was under attack.

When I did see the dawn of war, I felt very
fortunate indeed that I was still alive, that the
Japanese had set the time of attack not a second
sooner, that there was not even another hour’s
delay in our arrival. Actually, our return to Hon-
olulu that Sunday was one day later than sched-
uled. Why our ship was not torpedoed that morn-
ing is hard to say. Perhaps it was because of the
unpredictable Japanese mind.

Wallace, K6RYR, also returned to Honolulu
that morning. His ship entered the harbor with
Japanese dive bombers zooming in at mast-
height level to blast near-by installations. At
the time, the customary docking place for
K6RYR’s ship was in the very shadows of the
city’s powerhouse, so throughout the morning
attack he found himself in an exceedingly hot
spot. Fortunately, the USCG cutter Taney
was moored on the other side of the same pier,
and her guns repulsed the aerial attack on the power-
house, only 75 yards away.

K6RYR was among the first to go on a war
footing as his ship was immediately chartered for
a war mission. Radio silence naturally became
the order of the day, but Wallace found himself
more than busy handling the blinker lights, as we
all had to during the first three months of war.
Eventually the four of us became quite adept at
reading semaphore and flag hoist signals, a big
task the deck officers passed on to us as a chal-
lenge which had to be met. Of course, we were
equal to the occasion, but to their dying days the
mates will never understand where we got the
capacity to store the letters in our heads.

Truth.” According to him, something jarred hell
out of the aft end of his ship, where the radio
room is located. Whatever happened, it laid up
his vessel in dry dock for repairs. The propeller
was in very bad shape, the blades having been
sheared off by some metallic object which, K6RYR
deduced, was a dud tin fish.

Anyway we look at it, the best story still
belongs to Alex, K6NVJ. To start from the very
beginning, let’s pull out our war maps and put
ourselves in the position of armchair admirals.
Someone focuses our attention on the strategic
importance of certain islands which form a
defense arc running from Midway, south through
Johnston, to Canton, and then northeast to
Christmas and Palmyra. These islands obviously
are outposts of our Hawaiian fortress, and they
undoubtedly proved extremely important in the
first phases of our defensive comeback, as the
battles of Midway and Guadalcanal testify.

When war with Japan seemed imminent, hur-
rried preparations were made to strengthen these
islands, and so it was that one week before Pearl
Harbor Alex and his ship were headed south with
a load of defense workers and their supplies. We
all envied Alex the break of a South Sea cruise,
but we wished him good fishing just the same.

Then came December 7th. Alex was more than
1000 miles from home and the nearest safe harbor
—if Honolulu could have been called safe at that
time! Our envy changed to hope for his return.
One week passed, and still no sight of Alex. Fif-
ten days later his vessel came steaming into
Honolulu, painted a somber gray throughout.

As could be expected of K6NVJ, he was right
on the job to pick up the shocking news that
morning. One would think that would have been
enough to worry hell out of any man, but Alex
found himself in for a hair-raiser. A submarine
was spotted surfacing not far from his ship,
which was anchored off one of the previously
mentioned atolls. As it was impossible to get
under way, the order to abandon ship was given.
Alex and the skipper remained aboard. Fortu-
nately, the sub turned out to be one of ours on
patrol, but I’m sure he’ll never forget that scare!

Herb, K6DSF, was caught at an undefended
port that tragic Sunday morning, and he also
pitched in with the painting, preparatory to mak-
ing a dash for Honolulu. He arrived two weeks
later feeling that he had missed a lot!

The task at hand for our four ships was tre-
mendous, as we constituted nearly all the ship-
ning available in the area immediately after
December 7th. There were troops, munitions and
A submarine was spotted surfacing not far from his
ship. . . .

November 1944
supplies to be moved all over the Central Pacific. For a while our time in port was limited to only that needed for loading and unloading.

In the ensuing months the four of us witnessed and took part in events which, while thrilling, could hardly be called spectacular, and ending in an anticlimax with the battle of Midway. We felt the threat to our freedom, we saw our homeland fade into something of the past under the impact of war, and we knew the task that was ours.

Then, too, we owe a lot to the Navy boys who gave us perfect protection. Herb reminded me of one of his escorts, the **USS Porter**. He has a lasting memory of that gallant fighting destroyer which went down in the battle of the Coral Sea.

The little that we have done, and still are doing today, seems even less to us after what others have done on Guadalcanal, Tarawa, the Marshall Islands, Saipan, and Guam. It is not for us to claim even an infinitesimal part of the glory which rightfully belongs to them.

**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.

In the heat of the Midway battle. Actually, we didn’t see a single Japanese plane, but, nevertheless, we couldn’t help realizing the significance of that struggle on the outcome of the entire war.

**Gold Stars**

**T/Sgt. William F. Hazelrigg, W9LVE, was killed in air action which occurred over Biak Island on August 30, 1944.**

W9LVE entered the Army Air Forces in February, 1943, at Scott Field, Ill., and received basic training at St. Petersburg, Fla. He returned to Scott Field to study radio and from there went to Kingman, Ariz., for gunnery training. He left for overseas duty in February, 1944, as a radioman-gunner on a B-29 bomber. T/Sgt. Hazelrigg was awarded the Air Medal after his plane, the “Little Thumper,” had destroyed two Japanese craft in Ambon Bay at Ambonai Island in August and then shot down two of six Zeros which attacked his plane.

While W9LVE had held his amateur license only since 1940, he possessed a code proficiency certificate for 25 w.p.m. and was well known as “Hank” on the 7-Mc. band. A member of the Passa Radio Club of Wood River, Ill., he also was active in WERTS until he entered military service.

**T/Sgt. Thomas J. Harrigan, W1JQQ, was killed on April 7, 1944, by the accidental discharge of a service revolver while he was on duty as a meteorologist with an AAF weather squadron stationed in North Africa.**

T/Sgt. Harrigan enlisted in the Army Air Forces in September, 1940, and received radio training at Selfridge Field, Mich., and Chanute Field, Ill. He then was transferred to Maxwell Field, Ala., and after graduating from the meteorology school was sent to McDill Field, Fla., where he had the honor of clearing Major General James Doolittle across the country to Texas. From there he was sent to England and later participated in the North African invasion, entering with the first units of General Doolittle’s 12th Air Force. He later received a Citation of Honor from Lt. General H. H. Arnold, commander of the U. S. Air Forces.

W1JQQ operated on the 1.7-, 3.5- and 7-Mc. bands, both ‘phone and c.w., and was a member of the South Shore Radio Club.
Historic Liberty Bell, which proclaimed the liberty of this country following the signing of the Declaration of Independence, will ring again for our entire nation and the world on V-E Day in Europe. The suggestion of recording and broadcasting the ringing of Liberty Bell was made by Dave Moore, W1BBL, to ARRL Hq. and it was then forwarded to Broadcasting. This magazine endorsed it editorially in their July 17, 1944, issue. The NAB now has made pressings of a recording of the Bell, which are being sent to all member stations for broadcasting when victory is achieved in Europe. The recording was made using a rubber mallet for striking the Bell in order to guard it from damage, and the volume was built up by amplification.

Radio amateurs in Belgium aided in the accomplishment of a notable feat in communications by the Belgian underground. Last December the Belgian government-in-exile sent into their homeland a three-man military commission whose assignment was to set up transmitters through the underground to maintain communications with London. Of the eight transmitters dropped by parachute, only one fell into German hands.

When fire destroyed the administration building and all telephone lines at the Douglas Aircraft Company at Chicago on July 17th, production in the plant continued without delay through the use of handie-talkies for emergency communications. Supplied by the Signal Corps, the handie-talkies were strategically located throughout the rambling plant and eight stations were placed in operation, ranging in distances from less than 100 feet to over a mile.

During the recent hurricane quite a few of the New Jersey towns were without lights for several days. However, I noticed a slight glow in the smaller-wattage lamps and, grabbing the voltmeter, I found the line voltage to measure 6.5 volts. The junk box being handy, a few bayonet-base sockets and some automobile lamps were employed to provide light while the power was off. Of course, when the line voltage came back to normal the automobile lamps behaved like photo-flash bulbs, but the convenience was worth the small cost. — W2DRA

The nose section of the B-29 Superfortress, America's newest air weapon, contains all facilities for the bombardier, pilot, co-pilot, flight engineer, navigator and radio operator. Included in the items of equipment are 14 different radio systems. The nose section also takes four of the eight miles of electrical wiring in each ship.

It is interesting to note that according to a report from Dr. W. Gleissberg of the Istanbul University Observatory, the next period of sunspot maximum probably will come early, the number of pockmarks on the sun for the present cycle being greatest sometime before May, 1948. The last sunspot maximum occurred in April, 1937, and while on the average 11.1 years elapse between successive periods of sunspot maximum, Dr. Gleissberg believes that the present interval will be shorter than usual.

A new family of synthetic resins, called silicones, now provides waterproofing flame-resisting service in radio sets, planes and other machines operating on our war fronts. The new substances, which are a cross between slippery organic compounds and the gritty components of sand and glass, promise a greatly extended useful existence of electrical equipment.

At Westinghouse Lamp Division, the steel piece previously used to support a wire tube coil while it was being welded has been replaced by a tiny piece of uncooked spaghetti which can be readily burned out later. This step has reduced by 75 per cent the time required to assemble filaments for certain tubes and also has reduced the need for critical steel.

As the new SCR-300 walkie-talkies become available for Army troops, soldiers at signal depots are salvaging virtually "everything but the squeal" from the older SCR-194 and 195 models. The squeal, caused by re-radiation from the old-model receivers, is missing in the new FM SCR-300. Parts from the old models are inspected and reconditioned and then used for other Signal Corps equipment.

One of the Australian-made transceivers now in use by American troops. The set weighs approximately 7½ pounds and operates excellently over a radius of 20 to 25 miles, with a possible range of 50 miles.

November 1944
FILTERING GENERATORS USED TO SUPPLY RECEIVERS

It is possible to install a generator and filter for use as a receiver power supply with a minimum of commutator ripple appearing in the receiver output, even though no method has been devised, thus far, to eliminate the "whine" from the background.

Methods employed in present day aircraft receivers in mounting the generator should be the amateur's guide. The support should be in the form of rubber mounting blocks, or their equivalent, to prevent the transmission of vibration mechanically. The frame of the generator should be grounded through the use of a heavy flexible connector.

The brushes on the high-voltage end of the shaft should be bypassed with 0.002-µfd. mica condensers to a common point on the generator frame, preferably to a point inside the end cover, close to the brush holders. Short leads are essential.

Sometimes it is necessary to shield the entire unit, or even to remove the unit to a distance of three or four feet from the receiver. Shielded leads seem to be of little or no help.

A filter for the generator should be designed in very much the same manner as filters for vibrator supplies, shown in The Radio Amateurs' Handbook.

A 0.01-µfd., 600-volt (d.c.) condenser should be shunted across the output of the generator, followed by a 2.5-mh. r.f. choke in the positive high-voltage lead. From this point the output should be run through a "brute force" smoothing filter using, say, 8-µfd. electrolytic condensers on each end of a 15- or 30-henry choke of having low d.c. resistance.

Such methods proved to furnish adequate filtering for superregenerative receivers used in units of the Dayton (Ohio) WERS network. — Harris C. Haines, W9IBQ.

MULTIBAND ANTENNA COUPLING UNITS

Any amateur who likes to jump bands the way I used to will find either of the two multiband antenna coupling units described here a handy piece of equipment. Only a small amount of material and but little labor in construction is needed. Convenient tables are provided as guides for quickly setting up the switch positions for a variety of applications, without the necessity of consulting a circuit diagram each time a change is made.

Fig. 1 shows the circuit of the simpler of the two units, which uses a minimum of parts. The circuit shown in Fig. 3 is more flexible, and is especially well adapted to the matching of 160-meter trans-

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**Fig. 1** — Diagram of simple circuit for a wide-range multiband antenna coupler. C1, C2 — 150- to 300-µfd. double-spaced variable. C3, C4 — 0.01-µfd. mica 5000-volt, not required when link coupling is used. L1, L2 — 33 turns No. 12, close-wound on 3-inch diameter rubber isolantite forms. S1, S2 — D.p.d.t. porcelain knife switches.

**Fig. 2** — Table of connections and switch settings for various applications of the simple multiband antenna coupler.
mitters with various antennas, as both coils may be placed in series across the line.

Both units are built around the ribbed isolatorite forms, 3 inches in diameter, used as supports for $L_1$ and $L_2$. The coil forms are mounted on stand-off insulators on the back of a masonite panel 7 by 15 inches. All switches are mounted on the ends of the coil forms by means of 1-inch angle supports.

Rectangular openings in the panel facilitate reaching the switches, although the back of the unit is left open when the assembly is placed in a cabinet so that switches can be thrown from the rear if desired. This arrangement also provides clearance for the leads from the transmitter tank and the antenna leads from the porcelain stand-offs provided for output connections.

Copies of the tables of switch settings are mounted on the fronts of their respective panels for ready reference. The keying of the various positions by numbers is a feature which makes it unnecessary to consult a schematic diagram in order to set up the coupler for each change.

These units have been tried in long service at W1CQR and have proved their worth.

Fig. 4 — Table of switch settings for various connections obtainable with the flexible multiband antenna coupler.

Strong feed-back gives good output but requires a large negative bias and a high excitation voltage. These conditions are necessary for fool-proof operation when the ratio of frequency division is as high as one to ten. — 2nd Lt. Herbert Brooks, ex-W9SDG.

L.C. ON YOUR SLIDE RULE

With slide rules available at very moderate prices and increasing in popularity among amateurs, it is believed that a method of computing $LC$ values would be welcome, since instruction books seldom if ever contain this information.

A method is described here whereby $LC$ products may be read directly against frequency, or vice versa. If your rule has $A$ and $B$ scales only one setting of the slide and one adjustment of the indicator are necessary.

Before going into the procedure, let’s go into the reasons back of it. Referring to the chapter in The Radio Amateur’s Handbook entitled, “Electrical and Radio Fundamentals,” we find the formula for resonant frequency:

$$f = \frac{1}{2\pi\sqrt{LC}} \times 10^6$$

where $f =$ frequency in kc., $L =$ inductance in $\mu h.$, $C =$ capacity in $\mu f.$ Since the product of $L$ and $C$ is constant for a given frequency, the frequency of a resonant circuit varies inversely as the square root of the inductance and capacitance. Let’s transpose the formula to give the $LC$ product for a given frequency,

$$LC = \frac{1}{(2\pi)^4} \times 10^{12}$$

(Continued on page 97)

November 1944 53
ACTIVE SUPPORT

Box 557, Kirksville, Mo.

Editor, QST:

Nations and individuals change their viewpoints as time goes by, especially in times like these. Our country learned at Pearl Harbor the disastrous results of a policy which leads us strictly along paths of self-interest and attempted isolationism. . . . The day of "rugged individualism" may be on the decline, but the day of cooperation between free individuals in order to secure advancement and happiness for each is dawning.

I have been a radio amateur for eleven years. Until the U.S. entered the war, my station hardly missed a day on the air . . . . During all of that time I never joined the ARRL. I thought I had a good reason for not joining. It seemed to me, then, that the main benefit of membership in the organization was the subscription to QST. Since I cannot see, I thought I would get little good out of the magazine.

Since that time I have changed my mind. I have learned that all of the privileges we enjoy carry with them the responsibility that we must actively support the organizations which maintain and protect those privileges. This responsibility is present during times of apparent quiet and safety as well as being urgent during times of stress and strain.

There are many thousands of hams, who, like myself, are looking forward with eagerness to the future, when they shall once more be able to turn on the rig. There are many thousands of new potential hams being trained by our armed forces. I hope they all will get and stay firmly behind the American Radio Relay League.

— W. R. Brannan, W2NPX

PROSPECTIVE MEMBERS

2 Mitchell Ave., Poughkeepsie, N. Y.

Editor, QST:

. . . I have a thought that I would like to pass along regarding new members for our organization in the future.

I know from experience in selling that we cannot live on the customers we have had for years, but that we must constantly get new customers. It also is true with our amateur organization. Therefore, if it could be mentioned in QST that we should remind the present members of ARRL when writing to their brothers, sisters, fathers or friends in the service who have become radio operators since Pearl Harbor, that there is an organization at home such as the ARRL and urging them to join now or to keep it in mind when they come home, it would bring our organization to the attention of many prospective members.

I wish that someone had done this when I was in service in World War I. It took this war to bring the ARRL to my attention and I lost better than twenty years of a wonderful association . . . .

— D. J. MacLean

QLSs FROM ITALY

799 Juana Ave., San Leandro, Calif.

Editor, QST:

Here is a letter which speaks for itself. Enclosed with it was a QSL card which, as far as I know, is the first QSL card to come out of Italy since the war started.

— Larry J. Barton, W6OCH

Rome, Italy

Dear Friend:

June 4, 1944, was the most beautiful day in my life, when I embraced the first American soldier in Rome. With his coming I finally have regained the liberty that I, and all the Italian people, lost twenty years ago.

Until now it has been impossible for me to answer you because all the Italian OMs worked without licenses and it was very hazardous for us to send our QSLs.

I very well remember our last QSO on 'phone on January 28, 1939, and I was very happy over it, because our QSO was a record for me, also.

I am enclosing my QSL card . . . . I have more than thirty cards to send to American OMs to confirm our 1938-1939 QSOs . . . .

My house in Rome was bombed and almost destroyed on July 19th, 1943, by American Liberators, but every sacrifice made for liberty is always too little.

———, 11NQ *

INTERNATIONAL LANGUAGE

1138 Hayward Ave., Bremerton, Wash.

Editor, QST:

In these days of planning for the future post-war world and the building of a permanent peace, we should not ignore a factor which we as amateurs could use to advantage for selfish reasons and at the same time contribute materially to international understanding and cooperation. This factor is an international auxiliary language.

Amateur literature is largely technical in nature, and is seldom translated into another language. If translated, the languages involved are

* Name withheld by request.
major languages — the minor language groups are ignored. Suppose, for instance, that QST and the Handbook, or all technical literature for that matter, were published in an auxiliary language. A wealth of valuable information would become available to amateurs throughout the world without delay. Through this medium the amateur could share his experiences with others without the barrier of language.

Social relationships among hams ordinarily are carried on through the medium of radio and ham-fests. Here again, the amateur can exchange technical information and become acquainted with other hams throughout the world merely by the process of using in conjunction with his radio contacts a simple and easily learned international medium of expression. Another aspect to consider is the possibility of some highly successful ham-fests unrestricted by language difficulties. With the inexpensive and rapid transit envisaged for the future, the possibilities are enormous!

So far, nothing has been said about which language to use, and I do not claim to be an expert on the subject since my only language is English. However, I recently have read an interesting book entitled "The Loom of Language," by Frederick Bodmer,¹ in which this subject is discussed at length.

Bodmer points out that previously constructed languages have been one-man affairs. In his opinion, he believes that an international committee of language experts should be delegated the job of constructing a language acceptable to all nations. Only in this way can the mistakes and prejudices of a single mind be avoided and a product be made acceptable to all the major powers. He argues, also, that acceptance of such a language must be a political affair and must be taught in all the schools of the world in order to be successful. Bodmer makes the logical observation that, while a common language would not eliminate war, it would aid the cause of peace.

The amateur is interested primarily in radio — not language (except perhaps, on occasion, profane) — but here is a valuable adjunct to the art of communication and a valuable tool as such. In order for the amateur to benefit, he should use what influence he has, both as an individual and as a member of an organization, to promote the construction and adoption of an international auxiliary language. Prominent and influential men and organizations should have their attention called to the desirability of such a language, and the fact that one should be demanded at the peace table and included in postwar plans. With all the world planning now going on, let us include some language planning!

— Maurice V. Gowdey, W7DZZ

LEARNING SPANISH

Editor, QST:
The letter from WSUPH, "Postwar Service to the Nation," published in the Correspondence section in the October issue of QST, p. 62, de-

¹ Published by W. W. Norton. Price, $3.75.

serves wide reading and thoughtful consideration by amateurs and responsible government officials. The future peace and welfare of all American nations surely depends upon creating and maintaining understanding and good will on a wide basis among the individual citizens of these neighbor nations. Neither State Department nor business agencies can accomplish this on the scale possible to amateur radio.

I was much interested in the comments made by WSUPH with respect to the relative ease of learning the Spanish language, and resolved to take the first opportunity offered for study and instruction, hoping for a fluent command of the language, and anticipating wide contacts and countless new friendships among our Central and South American neighbors. It is to be hoped that the government of our own and the neighbor nations will make ample provisions for citizen radio contacts at the earliest possible date.

— Hollis M. French, W1JLK

“DARNED GOOD HOBBY”

APO 534, c/o Postmaster, New York City

Editor, QST:
... Uncle Sam, through the Signal Corps, has "bounced" me around quite a bit of the world — from England down the U. S. Atlantic seaboard, the Caribbean area, northeast South America and parts of Central, West and North Africa. Sometimes a place was pleasant, sometimes rough. Sometimes the work was done in a leisurely manner, but more often we worked our "pants off."

I started in Signal Supply Service and am now in the Army Communications Service. The work of installing, radio communication systems is interesting indeed, even though it always does keep us dragging our "fannies" from pillar to post in getting the job done and on the air by the deadline date. ... Seems like everywhere I have been stationed I’ve run into enlisted men and officers who at one time have been hams in civilian life. If I had kept a list of the names of all those men, it would be as long and as impressive as the lists of calls heard that once upon a time were published in QST. ...

I came in contact with these men in the various branches of the Signal Corps and in the Army Airways Communications Service — all of them grand guys. They take care of getting signal supplies where they are needed, installing or operating radio communication systems and air navigation aids, maintaining equipment and stations, and doing a million and one other communications and supply jobs as they come up. I do not necessarily mean that the reason these men are doing such a good job is because of their amateur radio background, but they are the men who seem to show a keener interest and enthusiasm in their jobs and in what they do. Usually, too, these men are tops in their work and have top ratings in their units.

In the past two years and some months I have worked with so many different types of radio

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equipment and under so many different field and operating conditions that I almost became fed up with radio. In fact, in my mind I pictured a quiet lake, a boat, a fishing rod in my hand and odds and ends of ham radio-gear tied to a rope being used for a boat anchor. Hf! Several weeks ago in a Red Cross club I ran into an old battered copy of *QST*. After thumbing through the pages, and "goggling" at some of the advertising, I knew what would happen to the radio equipment back home. It's going to be the same old story — the OW will again be saying, "If you didn't fool with that radio all night, you'd be able to get up in the morning." Hf!

Here's hoping for an early end to this mess and a quick return home to a darned good hobby. — Lt. E. C. Hudowalski, SC., W2HGM

**ENCOURAGEMENT**

APO 650, c/o Postmaster, New York City Editor, *QST*:

... The purpose of this letter is to lend a little encouragement to the fine work hams have been and are doing.

During my five years of service I have supervised the training of several hundred operators and have seen them work under fire, both on the ground and over enemy territory. Without exception, the hams have shown that "key sense" which always squeezes the message through.

In the event of future wars, I feel that an ARRL program to make military procedure the standard in amateur work will help both the ham and national interests.

— Major Cyrus B. Stafford, AC., ex-W9KWP

**SIGNAL CORPS ARTICLES**

138 South Virginia Ave., Atlantic City, N. J. Editor, *QST*:

I just want to let you know that the articles on the U. S. Army Signal Corps appearing in the September issue were about the finest presentation I have yet read in *QST*. They show an earnest effort to furnish readers with significant and interesting information.

I believe your efforts are really being appreciated — I know they are here. . . .

— RM1c Robert L. Brewster, USCG, W8WDQ

2209 Summer St., Berkeley 7, Calif. Editor, *QST*:

... Congratulations on the fine work you are doing. . . . The Signal Corps articles are among the best of the sort I have ever seen. . . .

— Robert H. Weidrecht, W6NRM

**PANEL LETTERING**

1108 St. Viateur Ave., W., Outremont, Montreal 8, Que. Editor, *QST*:

I was very much interested in the article on instrument panel lettering which appeared in the August issue of *QST*, p. 38.

For the benefit of those amateurs interested in such work, may I suggest the use of the "Wrico" lettering guide and pen made by the Wood-Regan Instrument Co., Inc., of New York City. Any size and style of lettering stencil with the appropriate pen can be purchased at a small cost in any store selling drawing instruments. Different sizes of points can be used with the same pen. . . .

The only drawback in this method is that such lettering cannot be done on crackle-finish panels, as the surface must be smooth. However, name plates can be made on aluminum cut to the right size, dipped in flat black paint and baked in an oven. . . .

— G. Gosselin, VE8AO

**PRACTICAL MATH**

APO 948, c/o Postmaster, Seattle, Wash. Editor, *QST*:

Just a word concerning Mr. Noll's articles on practical math.

I passed up the first two articles of the series without too much interest, but after reading parts three and four I obtained a great deal of valuable information, so I pulled out my back issues and started a separate file. Now I hope that Mr. Noll is good for the duration and that he keeps up the good work.

— Sgt. K. Digre

**THE FINISHING TOUCH**

124 West St., Stillwater, Okla. Editor, *QST*:

. . . *QST* has been the finishing touch on all of the radio engineering courses I have taken here at Oklahoma A&M College. As you may know, courses in college neglect the many practical points which an engineer should have. *QST* shows how such theory may be applied, and for that reason I highly recommend *QST* to anyone.

— Robert C. Burns

**NORTH ATLANTIC RESCUE**

47 Tilley Ave., Newport, R. I. Editor, *QST*:

Now it can be told — how RM1c Ed MacCarthy, W2NAK; RM1c Herbert Schwartz, W2FAD; RM1c F. A. Munro, W8WRK, and several other Coast Guard operators came to the aid of HMS Empire Knight in February of this year when that 7000-ton British merchant ship went aground and broke up on Boon Island Ledge off Portsmouth, N. H., during a driving blizzard.

The boys at NMF were doing extra special listening on 500 kc., as the North Atlantic was raging with a howling gale. When the Empire Knight's SOS came in, we surely went to town on rescue work. It is customary when an SOS comes through to intercept it and forward it to the proper authority and open up only if ordered — which we were ordered to do later on. When we got the OK to send traffic we really delivered the goods FB.

(Continued on page 88)
WERS On the Job During the 1944 Hurricane. Early in the week of September 10th, the first warning of an approaching hurricane was sent out to the residents of the Atlantic seaboard. It struck fear and apprehension into the hearts of those who remembered the ravages of the 1938 hurricane, and preparations were begun almost immediately to alert all emergency disaster facilities. Included in these facilities were the units of the War Emergency Radio Service licensees in the coastal area. Amateurs and other radio operators in the War Emergency Radio Service responded nobly to the call, and it is with pride that we recount herein a few of the reports of activities of members of WERS networks during the hurricane.

Fortunately, the 1944 hurricane was of a different character and of less severe intensity than its forerunner of 1938. This time it progressed upwards along the Atlantic Coast more rapidly, and the force of the gale increased as it moved along. Beginning with an initial velocity of about 50 m.p.h., the “big wind” moved up past the Virginia Capes, and then on to Delaware, Maryland and Eastern Pennsylvania at 70 m.p.h. The peak of its destruction was wrought in the New Jersey coast area, on Long Island, and along Connecticut to Cape Cod, for it was here that the center of the storm struck before it veered eastward into the Atlantic Ocean. Fortunately, in each locale the hurricane seemed to end abruptly, but there were numerous commercial power failures, and knockouts of telephone communication where falling trees and flying debris caused line breaks and pole fellings.

It was in these instances that the personnel of the WERS were able to assist other relief organizations. For example, on the evening of September 14th, the WERS gang in Roselle, N. J., sprang into action with all the mobile units which were available. Using two fixed stations as “base units,” WKVR took over communications between the Borough Hall and the firehouse, as the telephone and power lines came down. The mobile units were used to report fallen-tree blocks, hot wires, etc., and to act as liaison agents between the various defense units in operation.

Further north, in Leonia, N. J., the units of WJWY also functioned creditably. Three hours before the alert given in New York City, the operators of WJWY were on hand at three points, working in conjunction with three police cars. Through the medium of WERS, information was relayed to police headquarters (where one of the WJWY units was located) concerning road conditions, dangerous blockings by fallen tree and debris, and other situations needing police help. The other two units of WJWY were used to cruise the town and relay messages to workers and to police headquarters. As a result, all county roads in the borough were cleared by the following morning. Close tie-in with police headquarters during previous test periods helped make this alliance a satisfactory and efficient one during the emergency.

Elsewhere in the state, the Hillsborough Township WERS, WKXQ, was placed on emergency alert on September 14th, and the entire personnel stood by for any necessary action for the duration of the storm. Since the hurricane missed that section, they were not required to go into actual operation.

Further north, in the state of Connecticut, all emergency services were alerted at noon on Sep-
tember 14th. By 4 P.M. New York City was experiencing high winds and heavy rain, and by 6 P.M., the rain, together with fairly strong winds, reached the New Haven area. All local radio aides were told to alert their operators for possible operation. These included the radio aides in New Haven, West Haven, Branford, East Haven and Guilford. At this time word was received from W1EAO, the state radio aide, that the center of the storm was expected to pass somewhere between New Haven and New London, accompanied by very high tides and strong winds.

Word was then received from Hamden, New Haven, and West Haven that all WERS units were prepared for the worst. WJLH-23 had been moved to a location on the Long Island shore, and was minus an emergency power supply. At about 7 P.M. two operators went out to this point, in the face of strong winds, heavy rains and high tides, and hooked up an emergency power supply so that this unit would be prepared. The WJLH units that were in operation that night included: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 16, 17, 18, 19, 20, 22, 23, 25, 26, 32, 35, 41, 44, 53, 54, 62 and 71. Special commendation goes to Elizabeth Doyle, operator at WJLH-6, who handled heavy traffic concerning live wires which had been blown down, uprooted trees on roads, etc. W1JQD, a blind operator of WJLH-8, made his way over to the station in the thick of the storm and handled many messages of importance. In West Haven, Peters and Collins covered control center units WJLH-16 and 17, and handled a great number of messages. When phone communication was disrupted at WJLH-20, Peters made his way over there to handle several important messages requesting dispatch of auxiliary police and doctors. W1LTZ, after quite a few accidents en route due to falling trees, etc., established contact with the control center in East Haven from WJLH-54 in the Momauguin shore area. This area had been hard hit, and power and phone communications were completely out during the entire evening. Families had been evacuated to the fire house there, and all available facilities of the local Red Cross had been utilized. About ten messages of importance were handled by WERS for assistance in this area.

Also in Connecticut, WKJA units in Torrington, WJQA units in Stamford and Norwalk, and WMH1 units in Hartford, were alerted, but their services were not needed. The WKNQ network in Middletown was on the air, and maintained communication with battery-powered apparatus until the early morning hours, when the possibility of danger had passed. The Bridgeport, Conn., WERS network, WKAO, really went to work on the night of the hurricane. Twenty-five of the units reported into the control station, and 75 per cent of these units were required to operate on d.c. current since the power lines were down in many sectors. Units 1, 20, 23, 42, 48, 55 and 75 stayed on the air from 9 P.M. to 3 A.M. until the worst of the storm had passed. Units 60, 61, 62, 64, 66 and 70, located in Milford, deserve a great deal of credit for the great job they did in their area. They were the only means of communication for that locality, and handled a volume of traffic. In addition, they assisted in the evacuation of 65 adults and 38 children from seaside homes to safer places.

In Massachusetts, all WERS stations were activated on September 14th by the Massachusetts Committee on Public Safety. Units were on in Cambridge, Boston, Winthrop, Weymouth, Needham, Newton, Belmont, Walpole and Wellesley. Traffic was not heavy for the most part, but the stations in Winthrop handled one fire alarm incident.

The Fall River WERS was on the job and ready to go when needed. At 7:30 P.M. on September 14th, the Massachusetts State Guard liaison officer to CD headquarters contacted the radio aide of WJSU and asked that a station be placed in operation at the State Armory, to be manned by one of his operators under the radio aide's direction. Since five operators with the local CD-WERS are also members of the State Guard, several of these operators were assigned to this station. Actual operation of all the Fall River...
units began at 8 p.m. Both portable and fixed stations remained on the alert until dismissed at 2:15 A.M. Although no actual breakdown of telephone communication occurred, a number of messages were routed by radio to State Guard officers who found that their own telephone lines were busy or overloaded at the time they had to dispatch a message. It was the first actual test of WJSU's efficiency, and though a great volume of traffic was not handled, it helped prove that the group could be mobilized and the equipment put into operation on a moment's notice. The units in Swansea and Somerset were the only ones of the group who had to operate on emergency supplies because of commercial a.c. power failure.

In Fitchburg, Mass., WLSO was put to the test, and the results were very satisfactory. Members of the group stayed on duty until 4 A.M. the morning of September 15th, and maintained communications with all sectors. The storm damage was not serious there, however, and railroad ties, power, lights and telephones were not completely put out of commission. Provisions had been made for additional power for a.c.-d.c. stations, in preparation for the long siege which, fortunately, did not become a reality. The two women operators of the group proved as capable and rugged as the men operators during this alert.

In general, WERS operation during this hurricane emergency has clearly demonstrated the following points: (1) That there is a necessity for having efficient and regular test periods within WERS nets, with emphasis in operation being placed on message handling; (2) that ties should be established with other emergency services, and combined operations be held from time to time, so that the actual procedure in an emergency is well defined in the mind of each operator within the WERS group; (3) that well-trained fleets of portable-mobile units are a valuable asset in any emergency, and (4) that all units should be equipped with a source of emergency power, and that storage batteries should always be kept charged.

How does your WERS unit rate in a score of these points?

Wanted! Code Instructors for CAP in N. Y.

At this time we are informed of the need for competent code instructors for the Greater New York Cadet Training Group of CAP. The Bronx squadron is particularly short, since there are nearly 700 cadets awaiting training at the present time. Those who qualify as instructors are entitled to wear Army officer uniforms, and are in line for rapid promotion to the rank of warrant officer. The work will involve sessions at high schools, two evenings a week, two hours per evening, using Army playbacks and code records for instruction equipment. It is not necessary to hold an amateur license. For those who are interested in additional information, we suggest addressing a card to Lt. M. J. Becker, W2NF8, Bronx Headquarters, Civil Air Patrol, 2 E. 45th St., Bronx, N. Y.

C. K. W.

WERS of the Month

Philadelphia, Pennsylvania

Each month under the above heading we shall publish the story of an outstanding WERS organization as an item of general interest to all WERS participants. Contributions are solicited from any radio aide or WERS participant, whether he be an amateur or a WERS permittee. Descriptions of organizations which have already been featured in QST articles will not be considered. The story may describe the organization in general, how it came into being, how it was set up and how it operates; or it may describe some particular phase of the organization which makes it unusual or unique. Contributions should be brief (two or three typed, double-spaced, pages, maximum) and may include photographs if desired, although only one photograph will be printed with each story. Each story must be released for publication by the radio aide of the licensee, in writing. Address your contribution to the Communications Department, ARRL, and mark it: "For WERS of the Month."

Amateurs and the other men and women of Philadelphia who have labored so hard to give their city an efficient means of communication during an emergency or disaster, can feel justifiably proud. The WERS organization of Philadelphia has been proven a definite success.

In the short space of slightly more than eighteen months, through the efforts of a small group of men and in cooperation with Police Inspector Thomas Burns, a simple and flexible system has been built around six control centers and a main control. In that time the system has been tried again and again, both in practice alerts and in actual instances such as the disastrous Broad Street station fire.

The tremendous job of organizing the amateurs of Philadelphia and setting up WERS was given to George Hautenschild, W3KD. He was selected as radio aide for the city because of his extensive knowledge of the problems confronting the operator on the very-high frequencies, and because of his contacts with the army of operators WERS would need. He immediately called a general assembly.

From this meeting stemmed the present set-up of zone control. For each zone or control center an assistant aide was appointed, upon whose shoulders rested the responsibility of complete mobilizing and the securing of equipment.

A seemingly impossible job loomed ahead. The armed forces had drawn heavily from the ranks, leaving at the most 250 men with whom to work. It developed that about fifty per cent of that number would not be available because of employment or other duties.

Finally the six aides, who also acted as advisors with the cooperation of WPDP, the city's police radio system, surmounted all obstacles and now have 111 units distributed among the six controls.

As the controls were equipped and manned, a constant monitor of main control was required. Portable-mobile units were then added and finally walkie-talkies were employed. Two portable-mobile units were kept at main control at all times.

The monitoring of main control required two receivers. In some cases, as at the fifth control, two regenerative receivers were kept side by side. Some of the other controls were more fortunate in having superhets.

In every control center there were zone headquarters where fixed units were situated, and from these zones portable-mobile units have been operated. Walkie-talkie transmitters, which have proved their worth on numerous occasions, and difficulty in getting their messages through on test drills because of the interference from the control center.

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This chart pictures the organization of Philadelphia's WERS network, WKIB.

For the benefit of the residents of the Greater Philadelphia area who would like to help in this vital work and who are interested in War Emergency Radio Service, the following list of assisting aides and their telephone numbers is given:

Radio Aide... Geo. Hautenschild, W3KD, 950 Marcella St., Phil., 778

Control #1... Fred Craven, W3ERV
Control #2... Jack Murphy, W3IMJ, 1045 Ashley St., Wav., 8114
Control #3... Horace Needhamer, W3FSM, 1631 E. Berks St. N., 2436
Control #4... Geo. Nicholson, W3IXU
Control #5... William F. Romen, W3ITZ, 5333 Pine St., Gra. 7358
Control #6... Jack Sterner, W3GQK, 6949 Rodney St., Han. 9214

Meet the SCMS

It seems that one good term deserves another, because this month we are introducing to you the newly reflected SC for Louisiana, Eugene H. Treadaway, W5DGR. Having served previously as SC for a three-year period beginning in 1937 and ending in 1940, Gene has been a popular and active amateur since he received his ticket in May, 1933.

He first saw the light of day in New Orleans, on October 21, 1905, and not long after, in 1920, he became interested in amateur radio.

In the meantime, the major portion of his attention was directed to his high school work, and after graduating he attended the Delgado Trades School. He then began work for the Southern Bell Telephone and Telegraph Company, where he is at present employed as a toll testboard man.

Always an active participant in operating contests, W5DGR also possesses an ARRL Public Service Certificate for assisting in communication work during the flood days in early 1937. He has held the appointments of OBS, OPS, RM, PAM, QSL manager for the fifth district and alternate director for the Delta Division of ARRL.

In addition to his regular work, W5DGR has found time to be president of the Short Wave Amateur Club of America, secretary-treasurer of the New Orleans Radio Club, and a member of the Laplace (La.) Chamber of Commerce, Telephone Pioneers of America and Perfect Union Lodge #1, F. and A. M. For recreation, he indulges in fishing, baseball, football and motion picture operaing.

Although all his radio equipment is at present doing a job for Uncle Sam, we'll bet that Gene won't lose any time in getting back on the air when it's all over. A salute to you, W5DGR, one of hamdom's real leaders!

BRIEF

W9FUZ suggests that hams in the services place their amateur calls after their names when signing Red Cross, Salvation Army, USR and other registers here and abroad. In this way it would be possible for ham clubs and groups to get in touch with visiting amateurs and for individual amateurs to locate other hams who may be in the same locality.
ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — 3DJD, operating WKB-5, said he has heard the following out-of-town calls; WJOR-1, Allenstown; WKRV-1, Reading; WJWE-1, Erie; WMDD, Baltimore; WMOJ-1, Oaklyn, N. J. The following could not be identified — GJT; 3DII; 3GQI; 3HJSJ; 3HJH, heard regularly, are suburban Phila. 3JBB (WKB-32) says his old sidekick, 3GHC (WKB-60) is now on the high seas as second operator on a new Liberty ship. We received letter from 3VH the other day, wanting to know how the gang is making out in the 5th control. Archie was one of the original gang to get that control center working. He says he might be home shortly on furlough. Pvt. SFHM, ex-assistant radio side of the 3rd control, writes us from Camp Crowder, Mo. Horace says he’s getting some new ideas for his postwar rig, I’m sure Horace would be glad to hear from his old gang of the 3rd control. 3AVG has taken over as 3rd assistant side of the 3rd control. The assistant side of the 4th control, is doing a swell job of reorganizing that center. How about some news, George? It is beginning to look like the 6th control has its neck of the woods pretty well covered. The assistant radio side of that district tells me they have 200 units and nearly 30 portable-mobiles. Most of these units are on Sun., Mon. and Wed. 3XX (WKB-60), operating portable-mobile in the 5th, did well the other Sun. In getting into main control, as control station, has taken a ticket with a “J” antenna. The foregoing is from a report on Phila. WERS submitted by 3ITZ, for which we are appreciative. 3IJN sends us a V-mail from the West Coast. He has just finished traveling 12,000 miles and has been on the move during the contest. 3JBB and Bob Stevens (LSFH) have just returned from the Persian Gulf, where the temperature gets up to 160. 3GYV, writing from Italy, tells us he has built himself a short-wave receiver for the gang. The N. J. state radio aide reports that the gang in that control is now and then. WJSO, Lower Merion, cooperated with the Red Cross in the recent hurricane disaster. HJCOC and 3QJF, for which we are appreciative. 3JNN sends us a V-mail from the Gulf, where the temperature gets up to 160. 3GHU, writing from Ohio, Illinois and Michigan, had PB chats with 3DDC and 9FD. 3SRY is taking treatments in a Detroit hospital for a brain tumor. He gets a 1000-kv. x-ray squirrel at him every now and then. WJSO, Lower Merion, cooperated with the Red Cross in the hurricane disaster. 3DOU and 3HFD took their portable-mobiles to Ocean City, N. J. 3IXN operated from the main control center. The Red Cross radio disaster unit went into action under the call WKB-198. 3IOT and 3LST have been working in the 4th control. 3IOT and 3LST has just returned from a trip to Silver Spring after an extended business trip. The WERS of Maryland is rebuilding equipment. 3JN and family have moved from Phila., Pa., to 728 East Biddle St., Baltimore 2, Md. 78.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCQ — Regional EC for So. N. J., Technical Radio Advisor for N. J., State Defense Council, State Radio Advisor for N. J., N. J. Defense Council, reports that Horizon Labs. JJX is also with the IBM New York branch. Chic is now among the old gang at home again. IOW was home from vacation. GEV, who has seen action in several theaters of war, including the Fiji Islands, Guadalcanal and Island of New Britain, is spending some more leisure moments on his farm somewhere near Waldoboro, Me., with several acres directly on the ocean front. Bet he will have a few to tell us about that storm up above. Bill is on the move in his new position as assistant to the director of the new School of Electronics at Peddie Institute at Hightstown. Steve Czorga is still at Boca Ratan, Fl., but is now doing some more teaching on the 5th control. Doc is chief instructor at civilian trainee school at Long Branch. Doc may be seen almost any evening riding his scooters around the area. Steve’s hobby is sailing, and he is planning on taking a sailboat cruise to the Bahamas this summer.

AMATEUR ACTIVITIES

AMATEUR ACTIVITIES
bicycle up and down the main stem. HWT has returned to duty after a 30-day leave. George Hule, formerly of American Radio, Trenton, was in active service in Africa, Italy, and the Middle East. When he says the girls are much prettier than in Italy. The regular Sept. meeting of the Delaware Valley Radio Assn. was held on Wed. evening in the Pine Room of the Bromley Inn, on Route 36. Several postwar plans were discussed, including the possibility of a 1-w. equipment in WIL. DX news is supplied to "DVRA News," which is being received by service personnel in all parts of the world as a free service by the DVRA to men in service. 73, Roy.

Yankee Station, New York—SCM, William Bellow, WSBC—Thanks to H8K, we have news of a lot of the gang about whom we have been asked. Hamilton recently returned from Hawaii, having spent 2½ years there working for the Western Electric. He tells us that he and 9TTP bunk together at radio servicemen in all parts of the world as a free service by the DVRA to men in service. 73, Roy.

Yankee Station, New York—SCM, William Bellow, WSBC—Thanks to H8K, we have news of a lot of the gang about whom we have been asked. Hamilton recently returned from Hawaii, having spent 2½ years there working for the Western Electric. He tells us that he and 9TTP bunk together at radio servicemen in all parts of the world as a free service by the DVRA to men in service. 73, Roy.

East Coast, New York—SCM, William Bellow, WSBC—Thanks to H8K, we have news of a lot of the gang about whom we have been asked. Hamilton recently returned from Hawaii, having spent 2½ years there working for the Western Electric. He tells us that he and 9TTP bunk together at radio servicemen in all parts of the world as a free service by the DVRA to men in service. 73, Roy.

Quack tells us that he and 9TTP bunk together at radio servicemen in all parts of the world as a free service by the DVRA to men in service. 73, Roy.

Quack tells us that he and 9TTP bunk together at radio servicemen in all parts of the world as a free service by the DVRA to men in service. 73, Roy.
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SOUTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — This SCM has often said that there's nothing so good as being back home again. In making a trip around the country recently, he was impressed with the fact that there are quite a few countries one would not care to live in, and home and the U.S. looks better than ever. It's fortunate that some of the fellows like BIY, who were never run around by amateurs, have made it and come alive. Sometime I shall try writing a bit about the hams one contacts while out. Several wish to be remembered to the Dakota Division gang, including K9DO, VK6JJ, VK6NE, G03S, 4ICQ and QTDQ. ARII wishes to have a record of the services of all amateurs in furtherance of the war effort. It should be obvious now that you cannot take too much time in getting this in to them as they wish to weld it all together into a solid band of conclusive reasons why we should have our full prewar privileges back again. SCM wishes to do everything to keep up interest, especially with the Pontiac gang.

DAKOTA DIVISION

SOUTH DAKOTA — SCM, P. H. Schults, W9QY — TXK, a cousin of our faithful correspondent, ZB1U, was wounded during the invasion of France after serving in the African and Italian campaigns. He is now in the hospital at Topelia, Kans. SBF says he is getting his QST in France and it is a very welcome piece of mail. He has constructed a "Duke's Mix" receiver and says it is OK except that the Jerry equipment just doesn't operate up to his standards. More news please.

NORTHERN MICHIGAN — SCM, Tom P. F. de Vries, W9YNI — This SCM has often said that there's nothing so good as being back home again. In making a trip around the country recently, he was impressed with the fact that there are quite a few countries one would not care to live in, and home and the U.S. looks better than ever. It's fortunate that some of the fellows like BIY, who were never run around by amateurs, have made it and come alive. Sometime I shall try writing a bit about the hams one contacts while out. Several wish to be remembered to the Dakota Division gang, including K9DO, VK6JJ, VK6NE, G03S, 4ICQ and QTDQ. ARII wishes to have a record of the services of all amateurs in furtherance of the war effort. It should be obvious now that you cannot take too much time in getting this in to them as they wish to weld it all together into a solid band of conclusive reasons why we should have our full prewar privileges back again. SCM wishes to do everything to keep up interest, especially with the Pontiac gang.

HUDDON DIVISION

NORTHERN NEW JERSEY — SCM, Winfield J. Beck, W2CDQ — Here's hopin' all you fellows will send me your report of WERS activities during the hurricane. The WERS gang of the Borough of Roselle, including W2UI, CS1L, Bill Alzenauer, CQY and CQ9D, really swung into action, putting two base stations and the mobile units into service about 7 P.M. as the telephone and power lines came down. WERS took over communications between Borough Hall and the firehouse where the base stations are located. The mobile units reported fallen-tree road blocks, "hot" wires and generally acted as liaison between the various units up the South River. SCM has often said that the weekly WERS drills have really been valuable. The gang took to this emergency like ducks to water — and did we take to water! And here's a big bunch of rosas to Bill Alzenauer who got out of a sick bed to put his mobile unit on the service. The SCM (ARRL) from the Roselle Radio & Television Service) are going full swing after 7 P.M. beside working a full shift at Eastern Aircraft. Haven't received a single letter from you guys so, gang, drop me a line and let me know how things are going.

MIDWEST DIVISION

KANSAS — SCM, Alvin B. Unruh, W9AQP — TVF writes from overseas, e/o Postmaster, San Francisco, reminding us of the overyone fires fought while in the Kans., National Guard encampment with LFB, chief at KG7PZ.
QST for

AWP, your humble SCM, and a flock of other hams "under 38" and now overseas. It was a nice tea party. JTN, BCU and ROA were right-checking radar on Boeing superforts. The ground radio check and trouble-shooting crew includes QQL, BCZ, AWP, 5HHF and others. Inspectors include FYD for Boeing and KNAQ for the AAF. DMP is attending "future radar" school for Boeing-Wichita Engineering Department in Kansas. EAO is taking a trip in Kansas and surrounding states for KFQZ, Wichita police. ICY, chief at KGZC in Topeka, reports the new e.w. rig is in service. Several of the Kansas gang are building v.h.f. receivers and they do some ground tests to note new, unusual frequencies and report distances that would make the old 3½-meter boys go into hysteric. Interest in wired wireless is also reviving. Note: If you are tired of reading about the Kansas gang, possibly you are not interested in v.h.f. serendipity. MISSOURI — SCM, Mrs. Letha A. Dangfield, WOUD — TTP of St. Louis sends a letter saying that he is attending radio school down in Clarksville, Ark. Wes says the course is really stiff. GHD says SKAD and 6OMO are with him up in the Aleutians now, and he has heard from 2DXL who has been shipped out. Dave says the fog lifts sufficiently about once a week for a mail plane to come in, and he appreciates some letters when that happens. TGN wrote again, but added nothing in the way of news to last month's report that he has been on leave. At the same time, the BMS has built a small trailer, dreaming of the time when he will have a boat again and gas to take it down to the lake. OUD still does some monitoring and listens to press schedules, though he really has to keep up the code speed. How about some news, or at least some letters? Best regards and lots of luck to you all.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — 9ANL, formerly from Wis., recently visited LIZH while in New London. TD reports a visit from 5BXX of Allentown, Pa., who spoke at Yale University. KKS sends 73 to the gang from Calif., where he is still with the FCC. Bill has been advanced to principal radio operator and says he is in the market for some No. 620 reels. He and WMF are putting together an all-wave receiver for use in the barracks. ZXX is attending the Navy radio school down in Clarksville, Ark. Wes says the course is really stiff. GHD says SKAD and 6OMO are with him up in the Aleutians now, and he has heard from 2DXL who has been shipped out. Dave says the fog lifts sufficiently about once a week for a mail plane to come in, and he appreciates some letters when that happens. TGN wrote again, but added nothing in the way of news to last month's report that he has been on leave. At the same time, the BMS has built a small trailer, dreaming of the time when he will have a boat again and gas to take it down to the lake. OUD still does some monitoring and listens to press schedules, though he really has to keep up the code speed. How about some news, or at least some letters? Best regards and lots of luck to you all.

MAINE — SCM, G. C. Brown, W1AQI — JSY writes in that he is the only ham left in Ft. Fairfield; he also states that he has an emergency rig under construction. ICMP reports that EAP at Camp Stangan, in the AAF, is interested in carrier-current. In October, the Customs Service at Coburn Gore after having been engaged in defense work in Burbank, Calif., and Bath, Me. AUC is still in the State of Washington. LYK says that only 5 of the gang are left in the L. Edmonson burn area. ALF, IJX and Don Mason are in the merchant marine. INW is still with the FCC, but has moved his family back to Lawis­ton. LOS is a lt. col. in Europe. HMS is with the CAP. ICW, HUT and IXY have been overseas, and ICW has just picked out a radio room for the postwar days. LEF is a Navy operator somewhere in the Pacific. LIZ is in the civil service at Colorado Springs. DEG is still at the Harvard Laboratory, and the Mrs. is expecting a call from the stock soon. Ex-BF is back, and the home is interested in carrier-current; he has one rig completed and is working on the second. Anyone interested should contact "Mac" at Dow Field. Your SCM has been appointed assist­ant director for the state, and will be directly to ARRL Director. Percy Noble. If any of the gang has any ideas or suggestions relative to frequency, power, etc., for a postwar set-up, your letters will be very welcome and your wishes will be sent along to the ARRL Director. Percy Noble.

EASTERN MASSACHUSETTS — SCM, Fred L. Baker, jr., and 8AX, is at the Mass Institute of Technology. On Oct. 16, a state test was called by GAG, director of radio communica­tions, to see the strength and effective coverage of the state by WERS on 3½ meters. A few heard here in Quincy were: HPC at WJQH-4; BVP, KAB and 8AY for him. WERS news: WKRG, Waterbury — EEM, district radio aide, writes that meetings are held the 1st and 3rd Thurs. of each month at the QTH of WKRG-70. A new coax. has been installed at WERG-43 and is operating very satisfactorily; the old line was quite a few of the operators meet every Tues. in the City Garage to work on new units. Several transmitters and re­ceivers were at the meeting. One rig was a 9R3E. The dis­trict radio aide, reports that 7 mobile units are now in operation, including one in Winsted with fixed "units" tape and one in the Battle Ground. With the latter WKJIA works the Hartford and Water­bury relay units consistently on the Mon. night inter-district test periods. All units stood by during the hurricane but their services were not required. BHH and BXB are contemplating the rebuilding of their amateur rigs for the future. WKNQ, Middletown — DBM, district radio aide, informs us that the WERS group were well represented during the 1950 Victory Garden Fair Sept. 9th. with a typical WERS display. Among those present were the City of Middletown's municipal officials, WJLH, New Haven — An outing of WERS operators and guests was held Sept. 17th in Mt. Carmel. Howard Dickerman, Hamden assistant radio aide, was chairman and did a very nice job with the arrangements. JOH, now stationed in California, sent word by cable, WJLH-11, after some difficulty, WJLH-35 and WERG-43 were next in order to locate it. Both sides of the conference were represented. Portable-mobiles and the hidden transmitter were picked up on the grounds and amplified over a p.a. system so all present could hear what was going on. EAO, state radio aide, and Martin Cattaneo, state communication officer, were present along with WMHC-33 from RKDE. At Middletown, CT, 1950 from Mount Vernon, Cheshire and WERG-43 from Southington. An indoor baseball game between the male and female operators was won by the former after some difficulty. EAO umpired the contest. Club news: Radio Alde Tuttle and Galor of Cheshire were at Sanders, Southington radio school, all of the WKRG district. EAO attended a recent meeting as GB in which postwar amateur activities were discussed at length. Al­though we have not a complete story on the activities of WERS units during the hurricanes, it is known that the WERG and WJQH-43 units were in operation. Field Day acquaintances were con­formed personally at GB on Sept. 22nd when 9BEY, a lt. in the AAC stationed at Yale, and a member of the St. Paul, Minn. flock, called WJQH-43. Several of the state relay sta­tions were in operation. FLY, state radio aide, and Martin Cattaneo, state communication officer, were present along with WMHC-33 from RKDE. At Middletown, CT, 1950 from Mount Vernon, Cheshire and WERG-43 from Southington. An indoor baseball game between the male and female operators was won by the former after some difficulty. EAO umpired the contest. Club news: Radio Alde Tuttle and Galor of Cheshire were at Sanders, Southington radio school, all of the WKRG district. EAO attended a recent meeting as GB in which postwar amateur activities were discussed at length. Al­though we have not a complete story on the activities of WERS units during the hurricanes, it is known that the WERG and WJQH-43 units were in operation. Field Day acquaintances were con­formed personally at GB on Sept. 22nd when 9BEY, a lt. in the AAC stationed at Yale, and a member of the St. Paul, Minn. flock, called WJQH-43. Several of the state relay sta­tions were in operation. FLY, state radio aide, and Martin Cattaneo, state communication officer, were present along with WMHC-33 from RKDE. At Middletown, CT, 1950 from Mount Vernon, Cheshire and WERG-43 from Southington. An indoor baseball game between the male and female operators was
secretary of the Waltham Amateur Radio Assn., says they held a meeting on Sept. 15th at her QTH with the following present: Sgt. E. U. S. Marine Corps, on leave, KLY, DMG, LHV, LWW and YXL, LUG, LSD, KXY, MLN and Don Berry. LSD has a new son. JCI met KQY in San Francisco. KQY is now in Pearl Harbor. JFS has a visit from LTR and LNS and says he gets many letters from MBG in the Navy, MBG in San Francisco, KCQ is now in Pearl Harbor. JFS had a bridge, KTG; Dedham, KCT; Easton, MTQ; Fairhaven, D. E. Sleeper; Fall River, AHP; Haverhill, KBQ; Lawrence, ACM; Lexington, KOR, Linscomb IJM; Lowell, MKX; Malden, GAG; Needham, L. Russell; Newton, W. W. Hartford; Norwood, HSB; Providence, LRO; Quincy, EAU; Salem, MF; Somerville, C. A. McElroy, Jr.; Waltham, MZV; Wakefield, WBW; Ware, WCW; Wayland, RNZ; Waltham, HUV. In a great many cases other cities are included under the license of the above cities under the regional plan of the Mass. Comm. on Public Safety. Anyone who is willing to help out in WERS in this section, please write me.

Here is a list of the cities and radio aides: Belmont, AJW; Boston, KDF; Brockton, 1WG; Brookline, LD; Cambridge, KTG; Dedham, RCT; Easton, MTQ; Fairhaven, D. E. Sleeper; Fall River, AHP; Haverhill, KBQ; Lawrence, ACM; Lexington, KOR, Linscomb IJM; Lowell, MKX; Malden, GAG; Needham, L. Russell; Newton, W. W. Hartford; Norwood, HSB; Providence, LRO; Quincy, EAU; Salem, MF; Somerville, C. A. McElroy, Jr.; Wakefield, WBW; Ware, WCW; Wareham, RNZ; Waltham, HUV. In a great many cases other cities are included under the license of the above cities under the regional plan of the Mass. Comm. on Public Safety. Anyone who is willing to help out in WERS in this section, please write me.

WESTERN MASSACHUSETTS - SCM, William J. Barrett, WJAH - will have to rely on the grapevine for news this month. JAB visited BVR recently, and while there heard WJK-YR-50 and heard a WERS drill, with a good percentage of the hundred or more units of WKKF in action. During the recent state-wide WERS test, WJPC-1 was stationed on Mt. Greylock, with WJKW-2 volunteer at W. M., to give two possible receivers easy to WKKK, Northfield, and WKKF, Springfield. It worked out fine, since WJPC-1 developed transmitter trouble, and the alternate route via Pittsfield and WKKF-16 was a lifesaver. From Mt. Greylock the WERS nets in Pittsfield, Springfield and Northampton, Mass., and Greene County, N. Y., are like locals. Pittsfield net drills on Mon. nights are a pleasure to listen in on; short, snappy and to the point. Had a nice visit from Walt Barrows of WKKW-2, and tried to work out best set-up for statewide tie-in. Clubs of WKHF and WJPG were out and rarin' to go the night of the hurricane, but fortunately the Berkshire were out of the path of the storm. No reports have been heard as yet from the towns along HW-17 and along HW-18, but we are trying to get a radio here. The hurricane was extremely strong and caused much damage.

NEW HAMPSHIRE - SCM, Mrs. Dorothy W. Evans, W1JFT - Mail from the boys has been among the missing. However, here's the little that I have been able to dig up: AFB, K8X and family have returned to New Hampshire for the annual prep school radio conference. JHA is the proud father of a baby daughter. MZV has been made chief, and has been transferred to Bloomingdale, N. Y. He has taken the 2nd-class commercial exam and is on his way to Bolivia to do communications work. He showed us his dress blues, etc., and some mighty fine pictures of the new volcano in Mexico. He has conquered Portuguese as well as Spanish. He is just about ready to go home. He is on his way to Bolivia to do communications work. He showed us his dress blues, etc., and some mighty fine pictures of the new volcano in Mexico. He has conquered Portuguese as well as Spanish. He is just about ready to go home. He is on his way to Bolivia to do communications work. 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now teaching about antennas at Treasure Island, was home recently on furlough. K6G is operating in the merchant marine. ENX is now a lat. It. and is stationed in Texas. HJH dropped in the other day from Rome. The major has had over two years overseas service, having served in the campaigns at Casablanca, Tunisia, Sicily, Anzio, and in the invasion in France on Rome. He says men cried when the Red Cross ladies at New York served them milk. EKW was on furlough after 18 months service in the Aleutians, but has now returned. He is stationed here in the West Coast and is glad to be back. Here is a list of who we heard from yesterday. It was the old gang. We hope you all are doing well.

PACIFIC DIVISION

NEVADA—SCM, N. Arthur Bowle, W6CWW—Ase t SCM, Carroll Shott, jr., W6BVZ—TNP is stationed in San Luis Obispo, Calif. TJE, recently in Reno on leave, is a lat "hokey" stationed at Camp Fickett, Va. It will be well represented, according to the latest information received. It is likely that the Army will make the return of our frequencies an actuality. It's the duty of each of us here at home to make the fight for those of our fraternity on the battlefront a success. The League memberships have unselfishly turned thousands of dollars back into making the return of our frequencies possible, and we hope to have many more dollars to send to them. The League is doing all it can, and we need active League membership to help the League keep fighting its old system. Radio Aide BQO held a WERS Jl).eeting Sept. 15th. After motion pictures a fine discussion followed. Don Wells, WERS-27, presented a new antenna system, which he is having tested on Treasure Island, where Art. is now teaching about antennas at Treasure Island.

San Francisco—SCM, William A. Ladley, W6RBQ—EC, 6DOT, PBM, a court reporting friend recently. ZM has completed a new radio room and is in readiness for the big day. NRP, of the San Bernardino school, has received notice to take a transport. Drop him on a line. A. B. Wilson, Room 717, RCA Bldg., New York 20, N. Y. YT has returned from a few days vacation in Los Angeles. Oakland WERS had its regular meeting here. YELLA is here. He is going to Radio Aide EE. How about you kids in the service? Are you dropping me a few lines so I can pass the dope along to the gang? EY is on his summer vacation in No. Calif. EZ is a proud pop with a brand-new girl in the family. GYP is with W. E. Co., New York. CBX is on duty in the Pacific. Another day closer to victory. TT.

SAN FRANCISCO—SCM, William A. Ladley, W6RBQ—EC, 6DOT, PBM, a court reporting friend recently. ZM has completed a new radio room and is in readiness for the big day. NRP, of the San Bernardino school, has received notice to take a transport. Drop him on a line. A. B. Wilson, Room 717, RCA Bldg., New York 20, N. Y. YT has returned from a few days vacation in Los Angeles. Oakland WERS had its regular meeting here. YELLA is here. He is going to Radio Aide EE. How about you kids in the service? Are you dropping me a few lines so I can pass the dope along to the gang? EY is on his summer vacation in No. Calif. EZ is a proud pop with a brand-new girl in the family. GYP is with W. E. Co., New York. CBX is on duty in the Pacific. Another day closer to victory. TT.

COLORADO—SCM, H. F. Hekel, W9VGC—Acting SCM, Howard R. Markwell, W9TFP—VGC is now home and doing fine, but will not be able to do much for a couple of months. He says he has been a host to "mud" this past of August, going on a radio overseas trip. He is now back at Hill Field. TLM (Denver's little man) is swapped with work. He is a traveling auditor with the state auditor's office, and because of the man power situation, they had to send him. He is doing a splendid job. EHC says hello to Jim and to the gang, and would be pleased to hear from you.

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ROCKY MOUNTAIN DIVISION

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A little over a year ago, we used this page to discuss the general awkwardness and confusion resulting from conflicting symbols in electrical wiring diagrams. The symbol for a fixed condenser in radio diagrams was the same as a contact in a power circuit diagram. A radio resistor was shown the same as a power coil.

There was a time when this conflict made very little difference because communications, power, control, and measurement were pretty much separate industries, and the fact that they did not all use the same written language was not very serious. Principally due to the expanding use of electronic tubes, these fields have begun to overlap and the confusion has become serious for the industries affected.

Since writing our page a year ago, real efforts have been made to coordinate symbols, and the work is still going on. We would like to think that our page helped bring matters to a head. That is something we will never know. At all events, revision of graphical symbols was begun in January of this year at a conference of interested parties held under the auspices of the American Standards Association. By March, agreement was reached on a series of coordinated symbols, and these were published as a War Standard. A complete booklet entitled “American Standards for Telephone, Telegraph and Radio Use” will be available about the time this issue of QST reaches your hands. It may be obtained at nominal cost from the American Standards Association, 33 West 39th Street, New York.

We are listing a few of the more important radio symbols below. However, we urge all those who make extensive use of wiring diagrams to obtain a copy of the standards.

We think the men who worked out the new symbols and won acceptance for them by industry and by the engineering societies, have accomplished a miracle of compromise. They deserve the thanks of the whole electrical industry. We, for one, think they have done a magnificent job.

Dana Bacon
TIME TRIED AND PROVEN” has real significance when applied to Mallory Jacks and Plugs. Almost a quarter of a century ago, wireless experimenters and apparatus makers used—and praised—these products. Through the years, from crystal detector to television, the applications of Mallory Jacks and Plugs reflect the history of radio and electronics.

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SOUTHEASTERN DIVISION

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — BHY comes through with a nice snap of the local WERS station. Longfield-Smith and Brusie are now on the out. 8RZ claims a total of 5 mobile rigs and 30 stations on the air at various times. They were all alerted and on their toes during the recent hurricane scare. 8RZ has left for Chicago and N.Y. EY comes through with the following report: "FLW has been transferred from 136 and has gone to N.Y. for reassignment. DWU was married and, according to a clipping, the bride is a real Geordie. Both, GAC and CSJ are doing nice jobs at W59. Atlantic Station has returned to Miami while on a business trip to Washington and N.Y. Dr. Kendricks and Anderson of P.U. Puerto Rico. ES and IP enjoyed their 30th and 43rd birthdays recently. 0X2EY is now chief radio with PAA, Miami. JH is last heard of in Bremerton but probably is now in the middle of it somewhere in the So. Pacific. Bill is a lt. commdr., USNR, radio material officer. The following PA and PX operators from Brownsville are attending a PAA radio school under the guiding hand of CNZ: MIP, WIP, 6KJN and SJRL. Bill Hazleton comes through with the following report: "FVJ is chief operator at WTAU and is supposed to go over to Job Corps in five days. He has been a very active member of the State Guard. McMasters and Brundage, of the state highway patrol, have resigned in favor of the Army Signal Corps appointments they have received as special service men. Barnett, a member of the Signal Co. State Guard, is training for a ham and is moving to California, where he will go into technicolor movies as a color expert." Bill is getting some new equipment from the Army. According to the State Guard "OWL" (apologies to Pop Jones), I see a lot of my old friends, including AC7, Hollister of Jax and Norton of Miami. Tony seems to be having a fine time catching up with his dancing. A nice letter from CFP says that he is a chief yeoman at Jax. HX1 (0GKX) is at work in the AAP at Coffeyville, Kans. and is a proud papa again. CCR has returned to the States for reassignment after three years in the Caribbean area. CU2, chief engineer with Sarasota Bel, obtained a new assignment to work with Westington’s CFP. He is moving to California, where he will go into technicolor movies as a color expert. Bill is getting some new equipment from the Army. According to the State Guard "OWL" (apologies to Pop Jones), I see a lot of my old friends, including AC7, Hollister of Jax and Norton of Miami. Tony seems to be having a fine time catching up with his dancing. A nice letter from CFP says that he is a chief yeoman at Jax. HX1 (0GKX) is at work in the AAP at Coffeyville, Kans. and is a proud papa again. CCR has returned to the States for reassignment after three years in the Caribbean area. CU2, chief engineer with Sarasota Bel, obtained a new assignment to work with Westington’s CFP. He is moving to California, where he will go into technicolor movies as a color expert. Bill is getting some new equipment from the Army. According to the State Guard "OWL" (apologies to Pop Jones), I see a lot of my old friends, including AC7, Hollister of Jax and Norton of Miami. Tony seems to be having a fine time catching up with his dancing. A nice letter from CFP says that he is a chief yeoman at Jax. HX1 (0GKX) is at work in the AAP at Coffeyville, Kans. and is a proud papa again. CCR has returned to the States for reassignment after three years in the Caribbean area. CU2, chief engineer with Sarasota Bel, obtained a new assignment to work with Westington’s CFP. He is moving to California, where he will go into technicolor movies as a color expert. Bill is getting some new equipment from the Army. According to the State Guard "OWL" (apologies to Pop Jones), I see a lot of my old friends, including AC7, Hollister of Jax and Norton of Miami. Tony seems to be having a fine time catching up with his dancing. A nice letter from CFP says that he is a chief yeoman at Jax. HX1 (0GKX) is at work in the AAP at Coffeyville, Kans. and is a proud papa again. CCR has returned to the States for reassignment after three years in the Caribbean area. CU2, chief engineer with Sarasota Bel, obtained a new assignment to work with Westington’s CFP. He is moving to California, where he will go into technicolor movies as a color expert. Bill is getting some new equipment from the Army. According to the State Guard "OWL" (apologies to Pop Jones), I see a lot of my old friends, including AC7, Hollister of Jax and Norton of Miami. Tony seems to be having a fine time catching up with his dancing.
Skilled hands seal-in the original precise characteristics of Hammarlund variable capacitors so that moisture and vibration can not change them—even after long periods of operation in all sorts of climates and under varied working conditions.

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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

SEALE
(Continued from page 68)

GEORGIA — SCM, Ernest L. Morgan, W4PFDJ — PAH, of Allentown and later Butler, passed away at Crawford W. Long Hospital in Atlanta. We shall all miss him," DIZ, now a 1stLt. in the Marines, took unto himself a wife. We are sorry to hear that ES at Statesboro has not been so well. GPF landed in the Navy. BBG is somewhere in the Pacific area. His XYL competently carries on at Columbus. FCW’s location is unknown. DDU attended a hamfest in Italy at which there were a hundred from all over the world in attendance. ERS and his XYL enjoyed seeing their “Junior,” who was on furlough after a long tour in the Pacific. Indirectly we heard that VX is still busy at Columbus. EGT has returned to duty and found on his return that he was a full-fledged It. Yo use guys please note — when you send me the dope it gets printed. 73, Pop.

SOUTHWESTERN DIVISION

LO S ANGELES — SCM, H. F. Wood, W6QVV — The lack of news from those on our fighting fronts is very understandable, but I still don’t know why we can’t get more news from those at home. I have waited ‘til the last bell, hoping that each day would bring some reports, but outside of “Old Faithful” AM and Inglewood’s MSO, there just ain’t nuttin’. Don Wallace writes that KGWE is now working up to 100 miles in their drill practice periods and that the crystal-controlled frequency meter at his place is working FB. Inglewood says that during the past two months or more the KGIC net has been quite active and that a portion of each of the regular weekly drills is devoted to handling simulated incidents and emergency reports. They are badly in need of additional operators. We hope that their recent examination for WERS operator licenses was a success and that a large percentage made the grade. Keep up the good work. Regular drills are held by the various KGLV units in their respective areas. Los Angeles City net and the whole network is operating quite efficiently. We still need operators who can spare the time so that each of the areas will be fully manned at each period. Regular monthly meetings are held by the aides and their assistants and plans are made for much more interesting drill periods than those necessarily held while rigs were being placed on frequency and antennas “pruned,” etc. Don’t let your interest lag for one minute in this most important job that we have been given an opportunity to do. We may be needed and needed badly, so deep up your equipment and your contacts. Be sure to notify us of any change of address or telephone number so the emergency lists can be kept up to date. SBU dropped in to town recently and reports that he is still “hopping around.” He has been flying over the ocean so much that now he has a “hankerin’” to pound some brass on it. UQL writes that he has landed and his AFO number has been changed to 980, Seattle. He is mighty anxious to get mail, even if he is a major. Still no word direct from KBG. His XYL reports that all’s well with him and he’s still going strong, though, so that will have to be enough ‘till he finds time to contact us. 73, Ted.

ARIZONA — SCM, Douglas Atiken, W6BWW — GG reports the continuing activities of the Tucson Short Wave Assn., with a new class under way. OZM and his XYL staged an enjoyable “foam” party with SFG, TXM, OZM, GS, KRC, OWX and their XYLs. Much discussion of future ham activities and future rigs, antennas, etc., held up very nicely and informative letter from OVK, who is still doing his bit for the war in Boston and vicinity. He says that SNT, RM1a, and SNU, ART1d, called on him and they had an FB rag-chew. He also says that KBG, former owner of KTCU, is in the same organisation as himself. He tells of Curt Huff being ART1d in South America. We lose another FB Arizona ham when BIX moved to Oahu. ROP is up and around again and we all hope it’s permanent. NGJ has been giving 3rd-class exams to WERS hopefuls. JFO, DCQ and OAS had to take out state tax licenses because of their activity in repairing BCL boxes of their friends, as the regular shops kicked. Ask MAE about blow-up tubes in his WERS outfit — he did a wholesale job. ANO is reported to have trod that path to holy matrimony. NRP writes that he’s all through with the fun at boot camp and is now at the personnel depot expecting a transfer to active duty. TCOQ is still raising cows down Willicox way, and is planning on a real rig when the shooting is done. He had a tough go with appendicitis, but is OK again. UKEB is still in the Pacific and saw some of the Saipan scrap. RJN has been transferred to the Miami, Fla. district of PAA and will be on new Caribbean and S. A. runs. OAS is to be congratulated on

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70
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2 MECHANICAL ENGINEERS
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Hammarlund offers you a permanent position in a well-equipped and modern engineering department. Here is an opportunity for a good-paying position with a future in an organization whose thirty-four years of manufacturing quality products have earned it top rating in the radio industry.

Write giving personal history and qualifications

THE HAMMARLUND MANUFACTURING CO., Inc.
460 West 34th Street, New York 1, N. Y.
(Continued from page 72)

the #1 job he did in getting new ARRL members. Hope this
finds the whole gang "tops" in every way. 73, Doug.

SAN DIEGO - SCM, Ralph H. Culbertson, W6CHV -
Asst. SCM, Gordon W. Brown, W6APG - W6B was home
for a short vacation. He is flight radio man for Convair.
W6B has just completed 32 round trips to Australia.
NDF is CRM USNR, CDQ is s/agt. at Williams Field.
Ariz. O1N has returned to San Diego after six months with
Raytheon and has joined Convair as a radio man in transport-
ing planes to the East Coast. QK1 is still a motion picture
operator and has just acquired a new QTE which will make
an FB radio location. O1N and QK1 are interested and try-
ing to start some activity in W2EFS. How about the rest of
the San Diego gang giving them a hand? CGG is now civilian
R.E. and is located at Crown Point. We have just received
the sad news that MQH passed away Sept. 10th. 73, Ralph.

WEST GULF DIVISION

OKLAHOMA - SCM, Ed Oldfield, W5AYL - Business
is picking up as a fewletters came in this month. G2K
assisted ESMW7 at Ads in his old profession as teacher.
HXB paid off with a telephone call recently giving an ac-
count of himself. He is a 1t. in the Signal Corps and attended
Harvard during training. ERF, formerly of Seminole, is a
refinery engineer at Odill, Calif., and is doing fine. GOC is
now in the Navy. GKG was last reported in the Pacific
theater helping to run out the Japs. ESB has obtained a
first-class tel. license, which he uses occasionally at KGFF.
The oil game is still his job, though. Thanks for the information.
Bill, FFK went north to Fredonia, Kans., to work for the
Mo. and Kan. Tel. Co. JMT, who monitored the bands at
Oklahoma City for the FCC, has moved to Portland, Ore.,
by way of Aberdeen, Wa., and Salt Lake City, Utah. He is
now principal radio operator. Lyle says he surely likes
Oklahoma people and hopes to get back some day. Regards.

NEW MEXICO - SCM, J. G. Hancock. W5HF-10A is back in Albuquerque after two years' service with
the RlD of FCC. JWA is working hard between watches and
battles on his RMI examination. HDN is still sailing the
high seas with the merchant marine, and would like to hear
from some of the old gang such as CSR, GXL, DYV, CGJ,
etc. Censorship will not permit publication of George's ad-
dress, but it is the glad to give it to any of you fellows who
care to write him. KCW was down to see the SCM recently,
but the SCM was warned in time to make a get-away. Sure
sorry, Coly. 73, Jake.

BRIEFS

Our data are off to Lt. Charles D. Houchin, W90UQ, who
has received the Purple Heart award for wounds in action
in the Mediterranean theater. He received his first commen-
dation from his commanding officer after receiving
wounds in the battle for Tunisia. Recently, while serving on
the Italian battle front, he was wounded, and received, in
addition to the Purple Heart, a commendation by the
commanding general of the Third Air Force. Lt. Houchin,
who has been in service for more than three years and over-
seas for eighteen months, has served in North Africa, Sicily
and now in Italy.

... ...

It sounds like Camp Crowder, Mo., is the place to head
for if you are an Army ham! We were recently notified that
in response to an announcement, 61 members of the amateur
fraternity registered to become members of the post ama-
teur radio club. They were: W1APA, BKO, BKB, MAI-N;
W2HUU, JFV, XXG, LOP, OEP, OLI; W3CGG, EUC,
GUM, RFW, MW; W4AKV, GNO, HED, ZE; W5FSY,
GCX; W6RAM, JQX, TPO; W7BW, JTN; W8APC, G,
DBL, FIF, LJS, OJR, OOT, PLZ, QIQ, RBR, RPS, RUE,
SRC, UMI, ULM, VWW, VEF, WIL; W9AR, CCE,
DNQ, DYV-1, EDO, EIR, FZ, MFY, RN, U1U, UQQ,
UXR, YDI, VPK, XD, YAW and KAFUB. At the first
meeting of the group, activities were planned for the future.
These include an "old fashioned hamfest" and a trip to
view the Signal Corps transmitting equipment on the post.

... ...

The amateurs of Tucson, Ariz., report that their club, the
Tucson Short Wave Association, has been a success in
the first month of code class instruction for cadets, men in the
services and civilians, since Pearl Harbor. An excellent
record, we agree.

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as a radio engineer is an important part of the training you enjoy as a CREI student ... and
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branches of radio-electronics.

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course, you learn not only how . . . but why!
Your ability to solve tough problems on paper,
and then follow up with the necessary mechanical
operation is a true indication that you have the
confidence born of knowledge confidence in
your ability to get and hold the new, better
jobs that are crying for good, well-trained
technical radiomen today . . . and offering secure
careers and happiness for the future!

"I have been helped by the course far beyond my expectation,
and the lessons have been particularly timely for me."
-- Lt. M. Hollingsworth, General Electric Co.

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qualify for a better radio job. To help us intelli-
gently answer your inquiry-please state briefly
your background of experience, education and
present position.

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72
There is Nothing to Do About A War Except Win It!

The purpose of this advertisement is NOT to brag about Thordarson's part in the war effort. While patriotism in a person or company may be something to be proud of, our own feeling is that it should not be exploited. Expressing patriotism in America is not even a duty; rather, it is a privilege... happily one that is understood and appreciated by the majority.

That is why, for nearly 3 years, Thordarson has talked little about the war and war production... except to make the bare statement that we were busy supplying materials for the armed forces.

Regardless of all this, we do think the time is now propitious to give a few more details as to what we are thinking and doing.

When war came, we were one of the first companies to be chosen for front-line production duty. The need was urgent... the demands were great. As Americans, we were glad wholeheartedly to tackle the job assigned to us.

Early and late... day and night... Sundays and holidays, we have continued to devote all of our efforts, 100% to winning the war. We have kept "eyes front" on this one task. We have had to forget, for the moment, personal considerations of "good business"... on occasion we have even had to turn down old and good friends who needed this or that which, under ordinary conditions, we would have been tickled to death to supply.

The time will come... it's coming shortly, we feel... when we again can think first and foremost of supplying civilian needs. That will be a far happier day for us than it could possibly be for you, no matter how much you have needed material you were unable to secure.

But meantime, the war goes on... and we, in our small way, must continue to stand guard at our appointed post until the "at ease" command is given. As we said in the beginning: THERE IS NOTHING TO DO ABOUT A WAR EXCEPT WIN IT!

Transformer Specialists Since 1845
. . . Originators of Tru-Fidelity Amplifiers
The Month in Canada

QUEBEC—VE2

From Lt. L. G. Morris, VE2CO:

We extend our deepest regret over the record of passing of R. M. T. Larocque, VE2P, of Montreal. A keen friendly amateur, Ralph stoically endured a lingering illness for many years. His fine spirit won the admiration of his many friends.

Stan Comash, VE2E, former SCM, and Jim Carlyle, ex-VE2H, both have been promoted to the rank of command, RCNVR. Others receiving Navy promotions are Bill Lore, 2NQ, and Bruce McKimmie, 2LU, who are now lieutenants. Albert Launsiiller, 2CG, is back in Canada, having been in England since December, 1932, but his wife and two sons are still over there at present. Lt. Gordon Yull, 2GE, has returned to foreign duty overseas, after several months stay on this side.

ALBERTA—VE4

From W. W. Butchart, VE4ALQ:

From Barons we get a report on ham activities from 4ZI, Elwood Irwin. He tells us that VE4RC, Aylmer Gloor, of Barons, is celebrating the birth of a 2nd son. 4AQF, Milon Hodgson, of Barons, is busy pouring concrete on the foundations of a new house, but will have to lay off holidays and the spot of grain-buying, as the new combined wheat is beginning to come in. 4ADY, LaVerne House, of Barons, has been kept busy on tractor repairs. 4WZ, John Row, of Barons, keeps out of sight pretty much these days — guess his work must be keeping him too busy. Had a QSO with 4VJ, Ken Angus, of Edmonton, a few days ago which lasted for all of an hour. Ken notes that our ham circle in Edmonton is growing smaller all the time, and that the departure of 4BT, Bob Lamb, and NT, Gordie Sadler, makes an appreciable difference. 4AH, Frank Makepeace, of Edmonton, attended the Convention of the Canadian Association of Broadcasters, held at Montreal recently, and had an enjoyable week of it. While in Calgary, Frank saw AKK, Bob Lamb, who is now studio technician at CFCN, Calgary. Frank notes that Bob has made several very necessary improvements already, and that VE4 is far behind Edmonton as far as up-to-date broadcasting equipment is concerned.

By the way, boys, I'm about three months late with this news item: 4VJ, Ken Angus, had to have several buttons sewn on his shirt and vest after becoming a proud uncle. 4EAY, Roy Usher, of Edmonton, ran into a bit of trouble out at CKUA's transmitter the other evening, when a fixed tank capacity 'gave up the ghost,' leaving CKUA dead. Luckily, a replacement was rounded up from the stock line, and Ken reports that work is progressing satisfactorily, and that they are keeping on their hands, as far as design is concerned. The rig, by the way, is a 250-watt job, with an 833-A final, modulated with a pair of 828s. 4EA, Roy Usher, of Edmonton, ran into a bit of trouble out at CKUA's transmitter the other evening, when a fixed tank capacity "gave up the ghost," leaving CKUA dead. Luckily, a replacement was rounded up from the stock line, and Ken reports that work is progressing satisfactorily, and that they are keeping on their hands, as far as design is concerned. 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the Science behind the science of electronics

The pattern of progress in the science of electronics is determined by the achievements in creating and developing new and more efficient electron vacuum tubes. Therefore, the whole complex task of vacuum tube development - involving the intelligent application of many sciences - comprises the real science behind the science of electronics.

To create and produce the modern vacuum tube requires experience and skill of the highest order in these many sciences in addition to complete facilities for their application. The list includes everything from chemistry and metallurgy - the technology of glass fabrication and vacuum pumping - to physics, optics, thermo-dynamics and most important of all - Electronics.

The resources and resourcefulness of Eimac laboratories have accounted for many outstanding contributions to the science of Electronics. A fact which is attested to by the leadership which Eimac tubes enjoy throughout the world. These comprehensive facilities are continuously being utilized to achieve better and better results for the users of Eimac tubes.

Eimac Engineering is devoted solely to the development and production of electron vacuum tubes. However, since the electron vacuum tube is the heart of all electronic devices it is advisable for users and prospective users of electronics to look first to the vacuum tubes required. A note outlining your problem will bring advice and assistance without cost or obligation.

Write for your copy of Electronic Telesis - a 164 page booklet fully illustrated - covering fundamentals of electronics and many of its important applications. Written in layman's language.

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Follow the leaders to Eimac TUBES
most hopeful individual in the 4th District, and his enthusi­asm must be catching, as there are rumors around that the odd new receiver is being planned, or is under construction! Seems like a good idea though to have a receiver ready, and speaking of receivers, boys, how's your copying these days — 10, 15, or 25 w.p.m.? And getting back to the weiner roast, again — credit for organizing the outing goes to WH and VI. 4HJ was heard to remark that a weiner never tastes very good until it's been dropped into the fire a couple times! A business meeting of NARC is being called in the near future with a view to plotting future development of the club. Postwar reorganization will be the main topic.

I have AES, Père McGraw, of Lec La Biche, in the C. N. station, Edmonton recently, still in the uniform of a Lt. in the Canadian Navy. As noted earlier this year, Père has been taking a very active part in training Sea Cadets at Lec La Biche, and it would possibly not be an over-state­ment that Lec La Biche is rapidly becoming a fertile field for prospective Navy recruits, thanks to the activities of AES.

Had the pleasure of a visit from 4IN, Bill Lawrie, of Kirkland, High River, and Vancouver, recently. Bill is an F/S in the RCAF and was on his way north to make anten­na installations at several of the RCAF stations in the north. I found out from Bill that 4LA, Bill Harwood, of Strathmore, is still farming in that locality, and is patiently waiting for the day he can crank up the old rig on 75 'phone and renew acquaintances. 4PB, Elmer Nelson, of Vulen, is still with the Dept. of Transport on radio installation work, and when last heard of was in Whitecourt, Alberta. His brother, 4NN, Lawrence Nelson, of Vulen, is operating for the D. of T. up in Whitehorse, in the Yukon. 4AEV, Nona Lockhart, is working in the RCAF canteen at Currie Field, Calgary, 4ACF, Colin Heseltine, sr., of High River, has gone in for photography, and was very fortunate in picking up a good 35 mm. camera up at Benfi. Colin, jr. (whose call has slipped my memory) is in the RCN.

We managed to get a rise out of 4AOZ, Slim Marenda, of Millo, via this column, and one of Slim's newsey letters came along right away. He has been very busy around his service station and shop, and as he is the only one there his radio service work has reached proportions such as to warrant a long waiting list! Slim has worked up enough enthusiasm to get on the road of his joint this winter, and we have no doubt, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty. Slim is still with the RCAF and was seen to be operating for the 4th District, and says that the Meissner Traffic Master that he has on the air is a real beauty.
This is the now-famous Electro-Voice "Lip Mike" which began a new era in transmission of voice and the cancellation of ambient noises.

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- Press-to-talk switch opens microphone and closes relay simultaneously, if desired
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If your present limited quantity needs can be filled by any of our Standard Model Microphones, with or without minor modifications, please contact your nearest Electro-Voice distributor.

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MANUFACTURERS OF PIEZOELECTRIC CRYSTALS AND ASSOCIATED EQUIPMENT

(Continued from page 70)
Here's what COLLINS RADIO CO., well-known transmitter manufacturer, says: "Within its power range . . . the most convenient to use, the most stable and the most accurate Dummy Antenna we have encountered . . . Used successfully for testing and measuring power output . . . Gives long life without detectable deterioration."

Proved by use before war came . . . Ohmite R.F. Units today are performing vital functions in the production and operation of vital war equipment. An interesting example is the use of Ohmite hermetically-sealed, glass-enclosed gas-filled dummy antenna resistors by Collins Radio Company, and other well-known manufacturers for testing and measuring power output.

Other Ohmite Units doing specialized jobs in radio frequency applications are Vitreous Enamed Non-Inductive Power-Size Resistors, Parasitic Suppressor and R.F. Plate Chokes.

Handy Ohm's Law Calculator
Set the slide once—read the answer! Solves any Ohm's Law problem—quickly, easily. Send only 10¢ in coin to cover handling and mailing. (Also available in quantities.)
WWV Schedules

Standard-frequency transmissions are made available as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following schedules and frequencies:

2.5 Mc. — 7:00 P.M. to 9:00 A.M. EWT (2300 to 1300 GMT).
5.0 Mc. — Continuously, day and night.
10.0 Mc. — Continuously, day and night.
15.0 Mc. — 7:00 A.M. to 7:00 P.M. EWT (1100 to 2300 GMT).

Each of these radio frequencies is modulated simultaneously at accurate audio frequencies of 440 cycles and 4000 cycles, excepting 2.5 Mc. which carries only the 440-cycle modulation. In addition, there is a 0.005-second pulse, heard as a faint tick, every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call (WWV) sent in code, except at the hour and half hour, when it is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.00001 second. The 1-minute, 5-minute, and 5-minute intervals, synchronized with the second pulses and marked by the beginning and ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000. The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

Of the frequencies mentioned above, the lowest provides service to short distances and the highest to great distances. In general, reliable reception is possible at all times throughout the United States and the North Atlantic Ocean, and fair reception over most of the world.

Information on how to receive and utilize the service is given in the Bureau’s Letter Circular, “Methods of Using Standard Frequencies Broadcast by Radio,” obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed to the Director, National Bureau of Standards, Washington, D. C.
In 1939, American Airlines adopted the Collins 17F Autotune* aircraft transmitter as standard equipment for its entire fleet. Previous experience on a lesser scale had indicated the wisdom of this step. Succeeding experience has confirmed it.

Compared with previous equipment, the 17F's doubled the power output (to 100 watts) with slight increase in weight, and the Autotune* provided thirteen quickly available operating frequencies instead of three.

Daily through the years, these rugged, uniquely efficient airborne 17F's and powerful Collins ground transmitters have given trustworthy support to a superb Operating Department in maintaining the great American Airlines tradition of safety and dependability.

After the war, Collins will again specialize in the development and production of advanced types of communication equipment for commercial aviation.

Its designs will bear the fruit of intense research and outstanding engineering achievement now engaged in meeting the hard demands of military service all over the world. Collins Radio Company, Cedar Rapids, Iowa.

*The Collins Autotune is a repositioning mechanism which quick-shifts all transmitter or receiver controls simultaneously and with extreme precision to any one of a number of pre-determined frequencies. U. S. Patents issued and pending.
Of the 20 survivors, 7 were rescued by a Coast Guard buoy tender, and the bodies of 12 other British seamen were recovered by the crew of a Coast Guard cutter of the 94-foot class.

Throughout the two days of rescue operations the boys at NMF kept 500 kc. open for traffic from the wrecked ship and used other frequencies to assist whenever and wherever possible. W2NAK talked with the Knight a great deal and the ship’s op sent all the boys at NMF and WSL a very nice letter of appreciation.

Ham training was the thing we relied upon. Wish we could have done even better... 

-- R1te F. A. Murol, USCGR, W8WRK

**Correspondence**

(Continued from page 68)

One of the Abbott communications units that has won acclaim is the Model TH-4... used in military services wherever there is a need for a standard, compact, and efficient 1 1/2-meter transmitting and receiving set.

Blood is still needed by the Red Cross... make an appointment for a donation today.

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**Better and Wiser**

APO 920, c/o Postmaster, San Francisco, Calif. Editor, QST:

My radio activities since joining the armed forces have been more or less varied, first as a radio operator on B-17s, then as a ground operator and maintenance man, and now in radar. To describe these activities as interesting and educational is putting it mildly, for they have meant a lot more to me. My only hope now is that all of us will return as better assets to ham radio and with the full realization of the freedom which no other ham in the world enjoys. It took a war to make us fully appreciate this, and the end of the war will see us back much the wiser.

Until the time the war started I had always maintained that my biggest thrill had been that first contact in ham radio, but as I look back I know now that my biggest thrill is still in store for me — that will be when I’ll be able to crank up the old rig again and sing out with that old familiar CQ. It won’t be an artificial thrill then as it was on my first contact, but of something preserved that we all came so close to losing forever...

-- T/Sgt. George Colafatt, W1CEM

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**As Others See Us**

952 East 19th St., Brooklyn 30, N. Y. Editor, QST:

I sometimes wonder if amateurs would enjoy knowing how they look to some of us folks on the outside who, through the exigencies of the war, got mixed up with amateur radio.

When the war broke out I had been away from actual land telegraphy for more than fifteen years, but recalling that during the first World War the Army rated me as a radio operator (which I wasn’t, except that I knew how to recite the dots and dashes of the Continental code), I thought I might be useful somewhere in teaching the horde of youngsters eager to learn the code. An offer to assist on an evening volunteer basis at the First Army Signal Corps School in the World Building, N. Y., met with no success; volunteers were not welcome. The New York Board of Education then offered me a teacher’s job
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All over the world Delco Radio products are in useful service. They prove daily that the name Delco Radio means dependability . . . dependable designs developed with care and imagination; dependable products built with craftsmanship and skill. In radio and electronic equipment, the name Delco Radio stands for engineering vision—manufacturing precision.

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On the one hand

We have anticipated one of your needs in the development of this type HAF precision adjustable air gap crystal. Its frequency is continuously variable over a range of 5 KC at 3 MC, available in the frequency range 1 MC to 6 MC. Temperature coefficient is 2 CY/MC/C° or less. The frequency can be accurately adjusted and locked. The holder has solid stainless steel pins and contact plates. Prices are in line with non-adjustable crystals. We are prepared to make immediate deliveries. Write for details.

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just what the code symbol for the dollar sign is. ARRL says it is SX (or VU) or BD.

Finally, the greatest marvel to a landline Morse operator is the loose way in which you toss around the word "ham." Among actors and on any land wire that word is a fighting word. A "ham" is a "lid," and a lid gets lifted from the wire because he's not "heavy enough" to hold it down. — Jos. B. Milgram

MAY THE GANG REMEMBER

Second Signal Service Bn., Washington, D. C.
Editor, QST:

The other evening while rummaging through a stack of magazines in the day-room, I came across a recent copy of a magazine which, prior to Pearl Harbor, was very well known to the amateur fraternity, although its editorial policy was anti-ARRL. Imagine my surprise when leafing through it failed to turn up even one article written for hams, or even remotely connected with ham radio. If ever I had a convincer this is it. Apparently, when the profit goes out of ham radio so do the good-time-Charleys. When this mess is over I hope the gang remembers who stuck around when the going got rough.


JUST WHAT HE WANTED

At Sea

Editor, QST:

Here is the story of just another "ham in the service" — but I am one soldier who actually got what he wanted in the Army!

From the very start my ham ticket served me well. Upon my entry into the Army in March, 1943, I was sent to Camp Crowder, Mo., for radio training. It kind of burned me up when they stuck me in basic radio on five words per with a stick, but it wasn't long before I was moved up to thirty-five on the mill.

I always had an ambition to be a sea-going radio operator, but I never expected it to come while I was in the Army! My lucky break came when I was sent to San Francisco, to be given special training in commercial procedure, operation, etc. Finally I was placed on an Army transport as second op. Then my adventures began! It would not do to mention our ports of call on my first voyage. I can say, however, that to date I have been to just about every group of islands of any size in the South and Southwest Pacific.

On this trip I am sailing as chief operator. I can thank nothing else but my amateur experience for being given this responsible job in such a short length of time. So far as I have been able to learn, I am, at the age of nineteen, the youngest chief operator sailing out of San Francisco. To me this is quite an honor.

— Al B. Hayes, W5JQU

(Continued on page 88)
MOISTURE
the enemy of radio insulators
CAN'T PENETRATE STEATITE

Moisture in hot steaming jungles and in cold foggy climates is a life-shortening enemy of radio equipment.

Steatite is absolutely impervious to moisture. The American Society of Testing Materials porosity test (Steatite placed in a chamber with fuchsine dye under five tons of pressure for six hours) has proved that General Ceramics and Steatite insulators are not porous and therefore do not absorb moisture.

The low loss factor, the high physical strength, the stability of shape of Steatite is not affected by age or climatic changes. For a long trouble-free life of your equipment specify Steatite Insulators made by General Ceramics & Steatite Corporation.

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QST 11-44

A WORD ABOUT THE ARMED GUARDS

EE & RM Class 6-44 Sec. A, College of the Ozarks, Clarksville, Ark.
Editor, QST:

There's some doubt in my mind as to how much our fellow hams and friends know about the U. S. Armed Guards.

I was formerly a proud member of this branch of the Navy. Most people have a misconception of the AGs. They never seem to realize that a Navy operator stands watch in the radio shack on our merchantmen. The number of ops on each ship depends upon the type of ship. These Naval operators are known as "Compool" men, derived from the term "communication pool." Most of these men have volunteered for duty on tankers, cargo ships and Liberty ships, in addition to troop ships. Their jobs take them to every corner of the globe and from New York to Russia and from Alaska to Africa. To name the places they visit and the battles they go through would fill many a volume.

Our work aboard ship was to man all radio gear, work in step with the ship's op, check radio equipment and the battery room, operate the d/f gear, and do about everything in connection with communications. These ops also have to be reliable signalmen, in that they must know how to communicate by international flag hoists, blinker lights, colored lights and semaphore.

It was my good fortune to meet many hams in this work. The commercial operator was usually a ham, and that was the start of a good rag-chew. Once in a while we came across a ham we worked in prewar days. Although slight friction existed between the ship's "Sparks" and the Navy op, the two ops got along pretty well. . . .

If any of you hams on the tankers and cargo ships read this, let's have a QSO by mail.

...A. Le Blanc, RM/8/c, W1NMB

IT IS HIS BIBLE

Johannesburg, S. Africa

Editor, QST:

I have yet to go into a radio section out here in the South African Air Force and not see a copy of the Radio Amateur's Handbook. Yes sir, for the man in the service it is his Bible these days, and the arguments it settles are legion.

I also would like to say how much we all look forward to receiving QST.

... J. M. Ross, ZS6BG

"COMING ALONG SWELL"

New Guinea

Editor, QST:

... QST has been coming along swell here; somewhat in a battered condition but, nevertheless, it surely is good reading. Every issue has a waiting line to read it. . . .

... Carl Bogart, W2DRM

* Address mail c/o ARRL Hq. for forwarding.
While electrical instruments are delicate by their very nature, the conditions under which they must serve are seldom ideal—these days especially. Before entrusting them with vital responsibilities, it frequently becomes necessary to learn just how much abuse they can withstand.

With Simpson Instruments performance can be proved beforehand right in the Simpson laboratories. Complete facilities are provided to simulate practically any operating conditions, and to make an instrument live many, many years in a day.

Important innovations in design and construction have resulted. Exhaustive breakdown tests show that the Simpson Instruments of today are far more rugged than would have been thought possible just a few years ago.

To users of electrical instruments and testing equipment, this fact points out the value of Simpson's long experience. While constant research and testing can isolate specific problems of design or construction, it's the practical know-how Simpson has stored up through more than 35 years that supplies the answers.

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STANDARD RADIO & ELECTRONIC PRODUCTS CO.
DAYTON, OHIO

Practical Math
(Continued from page 41)

lines which sets off equal plate voltages on either side of the operating plate voltage. This position locates points 3 and 4.

4) Continue to take equal increments of grid voltage until the curve is completed.

The installment to follow on Class-B amplifiers and modulators will cover the design of the push-pull input circuit when the grids draw current, exact method of calculating the plate dissipation, and the distortion present in push-pull circuits.

Wright Field's Ham-Built Direction Finder
(Continued from page 45)

nearer, more accurate bearings are possible and the pilot instructed to correct his heading. Tests have shown that it is possible to bring an airplane in directly over the radio station. Actually, all that is necessary is to bring the plane over the airport.

The value of this simple homing device was proved dramatically in early May of this year when out of the heavy rain one dark day came a call for help. The pilot of a P-38, with only 60 gallons of gas left, had become lost and was trying to locate Wright Field. If he were forced to land in a pasture it would mean thousands of dollars in damage to his plane and possible injury to himself.

The operators picked up the call and at once set their bearing indicator into operation. Within twenty minutes the lost plane was over the field and receiving landing instructions from the control tower. Authorities realized that the saving of that one plane alone amply paid for the cost of developing the antenna.

Refinements and different designs of antennas now are being worked on in an attempt to produce a device which will be even more directional and accurate.

— D. H. M.

Strays

One million “Type X” crystals, for installation in Army Signal Corps equipment, have been completed in record time by RCA Victor’s crystal manufacturing department. The millionth crystal, in a gold-plated container, was presented to Col. E. V. Elder, commanding officer of the Philadelphia Signal Corps Procurement District.

Electronic tube production at the Westinghouse Lamp Division has expanded to 30 times the dollar value of tube production in 1939, according to a recent announcement. Ninety-eight per cent of these tubes go to war use.
Why all eyes in the Electronics Industry are on this little city in Illinois

Beauty — and Accuracy! Top-grade personnel, brought up in a community where electronics skill has become a heritage, give Meissner products their far-famed quality. There are hundreds doing similar work.

Close Co-operation! This is a factory conference at Meissner's Mt. Carmel plant. Here production plans are worked out for maximum harmony, top efficiency.

Trouble for the Axis! Youthful vision here combines with mature judgment to keep Meissner in the forefront of electronics progress. These men are testing.

Precision-ed — that's the name earned by Meissner personnel because of their skill at all types of precision work. Here is one of many Meissner veterans.

Just Out!
Special 1944 Bulletin!
— showing radio parts in Meissner's 1944 line. Contains complete descriptive matter, with pictures. Now, more than ever, you need to know what the market offers. Send for your copy today. The supply is limited. It's free. Write to address below.

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Western Electric Co.
100 CENTRAL AV., KEARNY, N. J.

Applicants must comply with WMC regulations.

Hints and Kinks
(Continued from page 65)

and solve this equation for frequencies of 1000 and 10,000 kilocycles:

\[ LC \quad (1 \text{ Mc.}) = \frac{1}{39.5 \times 10^{6}} \times 10^{12} = 0.0253 \times 10^{6} \]
\[ = 25300 \]

\[ LC \quad (10 \text{ Mc.}) = \frac{1}{39.5 \times 10^{6}} \times 10^{12} = 0.0253 \times 10^{4} \]
\[ = 253 \]

Notice that as the frequency was multiplied by 10 the LC product varied inversely as the square of 10. This provides us with a definite ratio on which to base the method. Just to further fix this ratio in mind some quick figuring will show that halving the frequency will quadruple the LC value or dividing the frequency by three will multiply the LC value by nine.

Now we have all the necessary workings of the method, so let's apply it to the slide rule. Let the C scale represent frequencies from 1000 to 10,000 kilocycles. The LC product for 10,000 kilocycles is 253, so all we have to do is determine the ratio between the frequency for which we are going to find the LC product and 10,000 kilocycles, square the ratio and multiply it by 253 (using only frequencies between 1000 and 10,000 kilocycles). For an example take 7300 kilocycles. Set 7.3 on C scale over the right index on scale D. Under the left index of scale C is the ratio of 7300 to 10,000 or 1.37 on the scale D. Also the left-hand index should indicate the square of this ratio on scale A, which should read 1.88. Now, if your rule has a B scale, adjust the indicator to 2.53 and read 4.75 under the indicator on A. By inspection we find the actual LC product to be 475 since we were multiplying by 253. Our LC product then is 475 for 7300 kcs.

To find the frequency for a given LC product just reverse the outlined procedure. Keeping the decimal point in the proper place and selecting the correct section of the A and B scales can be performed mentally with a little practice.

To extend the range below 1000 kilocycles and above 10,000 kilocycles it is necessary only to make scale C represent 100 to 10,000 kilocycles and use 25,300 for a multiplier in lieu of 253 or if scale C is to represent 10 Mc. to 100 Mc. our multiplier becomes 2.53.

With a fine-point pen and India ink it should be quite easy to put an LC scale right on the rule as most rules have an unused edge.

— S. C. Hoeper, W3CCU.

Strays

Ham: "I saw a Spitfire shoot down two doodle-bugs this morning."

Spam: "Good. That reduces V-1 by another 2 db."

— G6LJ in R.S.G.B. Bulletin
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AMERICAN RADIO RELAY LEAGUE, INC., West Hartford 7, Conn., U.S.A.
Compact Gear for 224-M.C. WERS

(Continued from page 11)

success are given in Fig. 3. A coaxial antenna is shown at A. Flexible coaxial line is fed up through the 12-inch length of ½-inch copper tube which forms the lower half of the antenna. The upper half of the doublet is a 12-inch piece of ⅜-inch copper tubing. Beaded polystyrene concentric cable is recommended for the line. A special insulator is provided at the joint between the two copper tubes. It is made of polystyrene turned down at one end to fit into the half-inch tube and bored with a ¼-inch hole at the other end to take the smaller-diameter upper antenna section, as shown in Fig. 3-A. This hole extends the entire length of the insulator to provide a means of connecting the center conductor of the line to the bottom of the upper antenna section. Brackets are then strapped around the ¼-inch tube and fastened to a wood base to form a complete unit.

The antenna shown at B in Fig. 3 is essentially a "J" type. Proper matching to the feed line, however, is made by connecting directly to the bottom of both the main radiator and quarter-wave stub, instead of shorting the stub and radiator at this point, as is the case of a higher-impedance line. Quarter-inch copper tubing is used throughout this unit, except for the flexible 72-ohm coaxial line from the base. Both sections are made of quarter-inch copper tubing, are light in weight, and therefore do not place undue mechanical strain on the stand-off insulators on which they are mounted.

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Any convenient type of power supply which will provide approximately 80 ma. at 300 volts d.c. for the plate circuit of the WE 316-A tube is satisfactory. Since approximately four amperes are required for the filament, an a.c.-operated power supply is desirable if fairly long periods of operation are contemplated. However, two volts from a storage battery can be used for filament supply, along with a vibrator or generator pack for the plate. The use of "B" batteries is not recommended because of the heavy plate current required for the WE 316-A tube.

Results and Acknowledgment

Preliminary results have shown that 224 Mc. can be used to good advantage in many spots. Work on this band has taken the "drag" off the regular channel, and inspiration already is provided for some interesting experimental tests in connection with WERS. These should be all the more interesting because of the rather cut-and-dried pattern into which work on 112 Mc. has settled.

The author expresses appreciation to Robert Cobbaugh of Bayside, N. Y., for the photographs of this gear and to Athan Cosmas of Forest Hills, L. I., N. Y., for the valuable assistance in connection with the design and building of the rig.
Plan to pep up your rig with a famous Turner Mike—the choice of discriminating amateurs the world over. Precision-built TURNERS are engineered to stand up and deliver clear, sharp communications under all acoustic and climatic conditions. And they are priced within the reach of every ham.

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GARDNER & COMPANY
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Splatter

(Continued from page 8)

marine. His "have done" sketch is brief and to the point: "The age has recently changed to 23. Have a neat YF and a five-month-old future ham op. Interest in shipping out dates back to November, 1942, when I decided to attend Gallups Island (thanks to QST) to learn the code and shipboard operating procedure. After graduating, the General Electric repair shop in Pittsburgh, Pa., was home for a couple of months as they needed an electric balancing machine for aircraft generator armatures. This worked out nicely as I was on the tail end of a long beach list of ops. Came the day to ship and I signed on the S.S. Hadnot (vintage 1919, but did not improve with age as does most other vintage), as chief radio operator. At present am chief radio operator on the S.S. Formerly graduated from Bliss Electrical School and Capitol Radio Engineering Institute, after which I spent three months in the radar test section of Westinghouse in Baltimore. Hold Class A amateur, first-class 'phone and second-class telegraph licenses.'"

Our in-the-services roster of authors this month also includes a member of the Army Air Forces — none other than ARRL'S former acting communications manager, Cpl. George Hart, W1NJM. George, of course, is no newcomer to QST's pages and we are glad to welcome him back. His article appearing on p. 12 was written before he left AACS Hq. in Asheville, N. C., to attend officer candidate school in Texas to prepare for more responsible work in the Army Airways Communications System.

Completing our list of guest authors this month are two "repeaters" who, while not in uniform, are contributing to the war effort on the home front, both through their work and their hobby of ham radio. On p. 39 we present Edward M. Noll, ex-W3FQJ (Splatter, October, 1943, p. 8), and on p. 33, Philip Rand, WIDBM (Splatter, November, 1942, p. 12).

Strays

On a recent trip home a buddy of mine, Sgt. Floyd O. Duell, and a ham of about one year's standing, happened into the Chicago Service Center and noticed the start of remodeling in the wash room. Stopping again ten days later, he found the ceiling and walls clad in a nice shiny new coat of paint, with the exception of one corner, which held the added decoration of 23 neatly printed ham calls: W9NIL, W8JMC, W1CNP, W4FHC, W9NUG, W8RFP, W6QQL, W9BWJ, W9QPT, W6TEV, W9XJD, W4QTX, W4RT, W5TWX, W7DCV, W2CMH, W3GYS, K7GN, W9BBQ, W2EMH, W31ZD, W8GO and W2KXX. He was quite amazed that his first ham contact should be made in such a manner and place. It just goes to show you, like 10-meter DX, you never know when or where. — W3EVH
D'Arsonval Moving Coil D.C. Instruments
Double Iron Repulsion A. C. Instruments
Electrodynamometer A.C.-D.C.
R.F. and Rectifier Types; Sizes 2" through 7"

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And we hope that amateurs will remember Browning products, when they are again available for peacetime uses.

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SOLD: Mica crystal, 500 ohm to crystal transformer. Best made, including new mica crystal. Astic LP-32 pick-up, $75.00 each. WOE, 4108 4th Ave., Brooklyn 24, N. Y.

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- 1T4—R-F amplifier pentode
- 1S5—diode-pentode
- 1S6—pentagrid converter
- 2A4—power amplifier pentode
- 2A5—H-F twin triode
- 3A5—H-F power triode
- 5A4—U-H-F amplifier triode
- 616—twin triode
- 9001—Sharp cut-off U-H-F pentode
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