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Here is a totally new concept in microphones for amateur phone communication.

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**Forward gain is that compared to a pressure mike; actual front-to-back hemispherie pick-up ratio is 30 db.

*Patent Pending

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

"Of, by and for the amateur," it numbers within its ranks practically every worthy amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs. Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

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"It Seems to Us..."

Amateur Museum

Always popular with visitors is the Museum of Amateur Radio maintained at League Hq. Featuring several hundred exhibits, it runs the gamut of antique paraphernalia. Its interest is not confined to the old-timer either (though a faraway look has been noticed in many an eye) for it gives newcomers the opportunity to view for themselves an array of historic equipment that they would otherwise never see. One of the oldest pieces of gear on display is a Marconi Magnetic Detector, used commercially about 1901, while the oldest complete station that we know of, dating from 1907, occupies a prominent place on the second floor landing.

The historic achievements of our hobby literally jump forth when you read some of the important documents preserved here. Among them are the originals of a scratch log recorded by Paul Godley while at Androssan, Scotland, for the League in 1921, indicating the first U. S. stations ever heard in Europe; the crumpled piece of paper on which was copied a message of greeting to American amateurs from the Radio Society of Great Britain in 1922, the first received here; and last, but not least by any means, a photostatic copy of the true log of 1MO, operated by the League’s Traffic Manager, Fred Schnell, on the night of November 27, 1923, when he was the first station to accomplish the “impossible” and work two-way across the Atlantic on short waves. There is more to be sure, but it would take many pages. The only way you can see all of it is to be sure to stop in at Hq. yourself.
Hamfest Calendar

Arizona — The 1956 Southern Arizona Labor Day Hamfest at the Army Electronics Proving Ground, sponsored by the Fort Huachuca Amateur Radio Club, features a "chuck wagon" dinner and a reenactment of events historic to the "Wild West" days of Cochise County.

The various activities starting at 0800, Saturday, and ending at 1100 Monday. The Tombstone "Vigilantes" of Helldorado fame will stage the Wild West Day Entertainment, and prepare the chuck wagon dinner. An early start at the Army Electronics Proving Ground and a display of the latest Signal Corps equipment will highlight the first day's activities. Group "soufests" around a camp fire will complete each evening's activities.

The mid-day activities in scenic Garden Canyon located in the heart of the Huachuca Mountains; Nursery service for children, and a women's program organized and sponsored by the Fort Huachuca Women's Club;

Tickets for OMs, Novices, XYLs and Junior Ops.

Prior to August 27, ticket prices including the chuck wagon dinner will be $2.00 with half price for children under 12. After this date, the price of tickets will be $2.50 for adults and $1.25 for children. Advance reservations can be made by writing to the Fort Huachuca Amateur Radio Club, P.O. Box 903, Fort Huachuca, Arizona. Tourist accommodations are limited and persons planning to attend should contact local ham groups to camp if prior commercial reservations are not confirmed.

California — Second Annual Pomona Valley Hamfest—Picnic to be held Sunday, August 26, at Westmont Community Center & Golden West Streets, Pomona, Calif., to bring the family and a picnic lunch. Advance reservations can be made by writing to the Fort Huachuca Amateur Radio Club, P.O. Box 903, Fort Huachuca, Arizona. Tourist accommodations are limited and persons planning to attend should contact local ham groups to camp if prior commercial reservations are not confirmed.

Illinois — The Fourth Annual Sideband Dinner of the Chicago Area will be held Saturday evening at 6:00 p.m., August 11, at the Midwest Hotel, Hamlin Ave. and Madison, Chicago. Advance reservations and hotel accommodations may be made with E. L. Hanna, WA9NWK, 640 New Start Avenue, Glen Ellyn. The dinner tickets are $5.00 per person.

Indiana — August 5, 1000 EST to 1600 EST, at the Highland Park Big Bull Pei. Games and fun for all. Bring your family and the lunch baskets. Plenty of tables and, in case of rain, we have a shelter house. Rides and playground for the Jr. Ops. Donations, $1.50 per person. We will be glad to take reservations in advance — address all queries to Jerry Smrek, WA9LBR, P.O. Box 207, Kokomo, Indiana.

Kansas — The Kansas-Nebraska Radio Club Hamfest will be held on August 19, at the Armory in Concordia, Kansas.

Maine — Maine's only hamfest this year—Steve's Hamfest at Dexter, Maine, August 19. Reservations may be made by contacting WIBOK or WIVYA. Turkey dinner with all the fixings. Transmitter hunt and other activities. Tickets $2.50 each, payable in advance.

Massachusetts — The Minuteman Net will hold its annual outing this coming August 12, starting at 11:00 A.M., at Point Breeze on Webster Lake, Webster, Mass. All interested in attending contact W1JED, 440 Main St., Oxford, Mass. Reservations close August 6.

Michigan — The annual West Michigan V.H.F. Picnic will be held August 12 at Algonac County Park on the shores of Lake Michigan. Free admission, and all are invited. Many games and a V.H.F. demonstration.

Minnesota — The Saint Cloud, Minnesota, Arike and Key Radio Club is holding their annual family picnic on August 5 at Wilson Park, located in East Saint Cloud on the bank of the Mississippi, across the river from the hospital. All modern facilities, shelter house, picnic tables, playground equipment, swimming beach, and free coffee will be served. Signs will be posted on all highways.

Missouri — A "chuck wagon" transmitter hunt, mobile field-strength contest, oldest ham present, ham from the furthest distance and games for the XYL and harmonies; so bring the family.

Registrations start at 10:00 a.m. — $1.00 per call included the family. For further information, please contact Bob Mollitor, W6RO, 3185 — 7th Avenue North, St. Cloud.

Mississippi — The Jackson Amateur Radio Club will sponsor the annual hamfest at Legion Reservation, Hwy East, Jackson, on August 5. Lunch on the ground, swimming, refreshes, and a playground supervisor for the children are a few of the activities scheduled. Donations $1.00; 50c for the ladies. Plenty of refreshments. For reservations or further info, write JARA, Box 8871, Jackson, Miss.

Ohio — The Findlay Hamfest, sponsored by the Fort Huachuca Amateur Radio Club will hold its annual hamfest on Saturday, September 9 at Riverside Park in Findlay. Advance registration, $1.00; $1.50 at the gate. Mobiles listen for W5FT on 3812 kc. and 144.1 Mc. A swap-shop and a mobile-transmitter hunt will be features. Bring your family and enjoy a nice picnic outing. Concessions will be open. For advanced registration, or any other information, write or call Phil Predmore, 1200 Country Club Drive, Findlay, Ohio.

Ohio — Buckeye Shortwave Radio Association, Inc., is sponsoring its 10th annual Ham Outing on August 26. The location will be the Happy Days Camp of Virginia Kendall Park in Akron, Ohio, as in past years.

Pennsylvania — A picnic and swap-sho will be held by the Pennsylvania Fone Net, the Anthracite, and Eastern Pennsylvania Traffic Nets at Hershey Park on Sunday, August 12. Pavilions $2 and $3 near the band shell have been reserved for this purpose. Please remit $1.00 per ham call to Jack Todd, W3JUP, Maple Crest Manor, Rt. 88, Harriosburg, Pa. All Pennsylvania amateurs are invited; bring the XYL, kiddies, and your own lunch.

Virginia — Shenandoah Valley Amateur Radio Club will be held Sunday, August 5, at Dickey Ridge on the beautiful Skyline Drive near Front Royal, Virginia.

There will be a ham-and-chicken dinner and very little speaking. So come and meet the operators of those stations with whom you've talked. Plenty of room for the whole family. Prices are just $1.25 for the dinner, and $1.00 for registration.

There will be lots of stations on the air to guide you in.

For further information, or maps, write to: Holmes Bayless, K4GYH, Secretary, Shenandoah Valley Amateur Radio Club, P.O. Box 139, Winchester, Virginia.

COMING A.R.R.L. CONVENTIONS

Sept. 1—2 — New Brunswick Province, Bathurst, N. B.
Sept. 15—16 — Dakota Division, Watertown, South Dakota
Sept. 30 — New Hampshire State, Concord
Oct. 2 — New England Division, Providence, Rhode Island

The members of the Disabled American Veterans are invited to join a new national chapter of DAV devoted to amateur radio. Mr. Louis M. Caron, W1TFP, prime mover in the group, and Commander of Chapter 97, Boston, states that the objectives are to provide a source of rehabilitation, furnish valuable training for employment, and further increase the number of trained radio- men for Civil Defense, at the same time giving disabled vets an interesting and important hobby.

Those interested can write Mr. Caron at the Mass. Hq. of DAV, Room 517, State House, Boston, Mass.
Notes on the Development of Yagi Arrays

Part I — Multielement Beams

BY CARL GREENBLUM

A development program at Telrex, Inc. has been concerned with the effects of the various parameters upon the performance characteristics of Yagi antennas. The objective was to try to establish a formal design procedure which would result in a minimum of experimental or breadboarding efforts to convert a specified set of characteristics into a final production model. Some of the data which resulted from this study are presented here and may be of use to those interested in this subject.

Of specific concern here is the treatment of arrays up to approximately four to eight wavelengths long. Short arrays of two and three elements are usually treated elsewhere and are included here only for completeness. The mathematical treatment of Yagi arrays depends upon the solution of a number of equations involving the feed voltage, the currents in each element and the self and mutual impedances of all elements. These equations may be exactly solved if all the self and mutual impedances are known. Unfortunately, the mutual impedances for arrays of more than three elements are not known, so that a paper calculation for arrays of more than three elements is not possible at this time. Exact solutions will have to wait until accurate experimental data for the self and mutual impedances are compiled. In the meantime, a combination of mathematical and experimental methods will have to serve as the major means of designing long, multielement Yagis.

In general, the major requirement in the design of long Yagis is to obtain maximum gain for a specified overall length and number of elements. The forward field is a function of the current amplitude and phase in each element and the interelement spacing. This field is directly on the array axis. Its mathematical description involves a phase-lead factor with λ (wavelength) in the denominator, which indicates its direct dependence upon frequency. It is partially for this reason that the forward field or gain of Yagis varies with frequency. If the objective is to maximize the forward field, it would be a straightforward matter to do so if all the currents and their phases were known. Since this depends upon the solution of the equations mentioned earlier, our remarks pertinent to exact solutions made above are equally of import in connection with forward gain.

In the Uda book, voluminous data are presented which show the effect of element tuning and spacing for two- and three-element arrays, the net result of which indicates that as far as gain is concerned, a wide variation of different spacing combinations may be utilized to yield gains whose optimum values are of the order of 10 per cent (1 db, approximately) of each other. The impedance bandwidth for these different spacing conditions varies somewhat, and the choice of interelement spacing for 2- and 3-element Yagis would normally be made to satisfy either this requirement or other requirements such as front-to-back ratio.

Gain

The data presented here applicable to the design of long Yagis were obtained over a considerable span of time in connection with a Yagi development program for TV, amateur radio, and commercial communication arrays at Telrex, Inc. The data represent a compilation of results taken at a test site free from QRM, stray reflections, etc. They have been rechecked at various frequencies ranging from 7 to 500 Mc, and are presented in the form of curves which will enable a rapid preliminary design or an evaluation of a proposed design. An initial step in the design of a Yagi is to determine the number of elements and the overall array length required in order to satisfy some particular requirement of gain. Fig. 1 is a curve showing the variation in gain over a

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*Telrex, Inc., 354 Park Ave., N. J.
† Uda and Mushikane, Yagi-Uda Antenna, Maruzen Co., Tokyo, Japan.
‡ For brevity, the mathematical foundation supporting some of the material in this article was deleted. — Ed.
§ Frequency range over which the antenna impedance falls within stated limits. — Ed.
tuned dipole as a function of the number of elements in the array.

Fig. 2 shows the length of the array in wavelengths vs. the number of elements. Figs. 1 and 2 used together enable both the length of the array and the number of elements to be picked directly from the curves for a specific gain requirement. For example, suppose we desire an array with a 10.5-db. gain. From Fig. 1 we get 6 elements required (1 reflector, 1 fed element and 4 directors) and from Fig. 2 we obtain an array length of 1.15 wavelength. Figs. 1 and 2 are readily reduced to an easily-remembered approximate formula:

\[ G = 10 \log 10L - 1 \]

where \( G \) = gain in db. over a \( \lambda/2 \) dipole
\( L \) = length of array in wavelengths

This formula is only a fair approximation to Fig. 2 up to 1\( \lambda \) and is more accurate for longer arrays. This formula indicates that it takes doubling the over-all length to produce gains of 3 db. which is interestingly in accord with the fact that two arrays vertically stacked will produce a gain of 3 db. Thus, the same gains may be achieved with the same overall array length by either vertically stacking two unit arrays or using one array of twice the unit length. The choice becomes one of structural simplicity or a choice of which polar patterns are more desirable. (We shall show the relationship between the number of elements and the polar patterns subsequently.) The net result for gain when ratios are used rather than decibels comes to an extremely, almost intuitively, simple result; namely, that for a given length of array its gain is doubled when doubling its length. We believe that so long as the losses remain very small, which is certainly the case for larger-diameter, high-conductivity elements, this will hold true. As a practical matter, Yagis up to 16 wavelengths long or longer may be built with a gain of 21 db. or more at frequencies which will not make the array structurally unwieldy or impractical.

The "E" plane is the plane of polarization of the signal; it corresponds to the plane of the elements in this case. The "H" plane is at right angles to it. In a horizontal Yagi, the E-plane beamwidth is the so-called horizontal pattern in free space. — Eo.

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**Beam Directivity**

Frequently, the requirement in an antenna design is the polar energy distribution where patterns in the "E" and/or "H" planes are specified. Figs. 3 and 4 are curves which relate the variation of beamwidth at the half-power points to the number of elements employed. Obviously, Figs. 3 and 4 may be used with Fig. 2 to relate the variation of beamwidth in both planes to the length of array. These figures 1 through 4 make possible a very rapid preliminary design based upon a single requirement. For example, an "E" plane beamwidth of 25 degrees from Fig. 3 indicates the use of a Yagi with 13 elements. From Fig. 2 we obtain an array length of 3.6\( \lambda \). From Fig. 4 we see that the "H" plane beamwidth is 26 degrees.

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**Element Spacing**

After determining the length of the array and the number of elements required to satisfy a specified gain requirement, we require the spacing between elements. The equations show that the forward field for even a moderate number of ele-

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\( ^{4} \text{The "E" plane is the plane of polarization of the signal; it corresponds to the plane of the elements in this case. The "H" plane is at right angles to it. In a horizontal Yagi, the E-plane beamwidth is the so-called horizontal pattern in free space. — Eo.} \)
ments, such as 6, will depend on 5 spacing distances, and 6 element currents in both amplitude and phase. It is not surprising that there are large discrepancies in spacing arrangements in the literature on this subject. We have previously noted that for 2- and 3-element arrays there is a rather wide latitude in spacing arrangements. The following chart gives the range in which the spacing yields optimum gain from our data.

<table>
<thead>
<tr>
<th>No. Elements</th>
<th>R-D1</th>
<th>D1-D2</th>
<th>D2-D3</th>
<th>D3-D4</th>
<th>D4-D5</th>
<th>D5-D6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
<tr>
<td>3</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
<tr>
<td>4</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
<tr>
<td>5</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
<tr>
<td>6</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
<tr>
<td>8 to N</td>
<td>0.15 - 0.22</td>
<td>0.18 - 0.25</td>
<td>0.21 - 0.28</td>
<td>0.24 - 0.32</td>
<td>0.30 - 0.35</td>
<td>0.35 - 0.42</td>
</tr>
</tbody>
</table>

This chart shows the range for interelement spacing for which a variation in gain of less than 1 db, may be obtained. The elements, of course, must be optimum tuned for any value throughout the spacing range chosen. In a general way, the conclusion is drawn that the optimum inter-director spacings are close near the driven element and increase with the director number.

**Element Tuning**

The final step in Yagi design is establishing the current phase and amplitude in each element, which is done usually either by changing the length of the elements or by using tuning stubs or coil inductors to tune the elements. Fig. 5 is a plot of the length of a director required vs. its position in the array for optimum gain. Six curves are shown for six different element thicknesses in \( \lambda \). It will be seen that there is an oscillatory condition in which the element lengths vary depending upon their position in the array. The perturbations become smaller as the position of the element goes farther out and gradually settles to a fixed value in the same way as the spacing. It will be noted that the largest perturbations occur in the first five directors. The overall difference in length of directors is approximately 0.017A.

It will be re-emphasized that the thickness of the directors is enormously important in the tuning of the directors. These curves show that while a properly-tuned director with a thickness of \( \lambda/150 \) is equivalent electrically to one with a thickness of \( \lambda/25 \), the difference in length between these directors is 0.033, which may be a very large dimensional difference depending upon the frequency of operation. The curves in Fig. 5 may be used for intermediate element thicknesses by interpolation between the curves. In estimating the length of a Yagi director, we first determine the thickness factor (diameter of element in wavelengths) then the suitable curve from Fig. 5 is chosen (or an interpolated one therefrom) and the element length picked off, depending upon its position in the array. This procedure will result in a first approximation of length which will be quite close. These curves are based upon the elements piercing a boom approximately 2 to 3 times the diameter of the element. It is almost impossible to use these curves with any accuracy for elements of special shapes, such as tapered section, square cross sections, etc. The curves in Fig. 5 are based upon low-loss elements of cylindrical cross section.

**Losses in a Beam**

The efficiency of an antenna is determined by the power radiated divided by the power input.

\[
\text{Efficiency} = \frac{\text{Power input} - \text{Power lost}}{\text{Power input}} = \frac{\text{Power radiated}}{\text{Power input}}
\]

Now the power radiated is equal to the power input minus the power lost. The power is lost in various ways among which a major item is that due to the loss resistance. This loss is the sum total of the losses in every element in the system.

The loss resistance is inversely proportional to the diameter (decreases with increased diameter), directly proportional to the square root of the frequency (doubles when frequency is quadrupled), and inversely proportional to the square root of the conductivity of the element. The only control we have in the design for a fixed frequency of operation is the radius and conductivity of the element. The relative re-

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**Figure 5** — Length of director vs. its position in the array, for various element thicknesses.
The conductivity of the various metals varies widely with silver being the best and copper, gold and aluminum following closely behind. Such metals as nickel and steel have comparatively high losses and would be inefficient if used as radiating elements. Thus, aluminum is almost universally accepted because of its weight, strength and excellent electrical efficiency.

The loss resistance is inversely proportional to the conductor radius which indicates that from a loss point of view, the larger the radius, the lower the losses. The self-impedance of a radiating element is approximately given in the region of \( \lambda/2 \) by:

\[
Z = 73 \pm j \left[ 48.5 - 18 \frac{\Delta L}{L} \ln \frac{\lambda}{\rho} \right]
\]

where \( L = \) length of element
\( \Delta L = \lambda/2 - L \)
\( \rho = \) element radius

The reactive part of this impedance is shown in Fig. 6, where three different curves are shown for three different element radii. It is obvious that the rate of change of reactance is smallest for the thickest elements, which means that the bandwidth for the thicker elements will be larger. This comes about due to the fact that as the frequency changes, this will correspond to a change in length (in wavelengths) of the element. For a given change in electrical length, the reactance change will be smaller for thicker elements. This point will be taken up again when we consider the bandwidth factor of Yagis. It is sufficient to say here that to minimize losses in long Yagis, we desire thick, high-conductivity elements.

**Minimum Rear Radiation**

Maximum gain designs are not always the only requirement for Yagi arrays. Frequently, a requirement exists for minimizing the response in some particular direction; for example, the rear.

Both the rearward and forward field depend upon exactly the same factors (element tuning and spacing). Minimization of the rearward response and maximization of the forward field are almost never compatible, so that the tuning procedures which are normally recommended (see ARRL Handbook, for example) are compromises between best gain and \( F/B \) ratio. In theory, it is certainly possible to obtain very high \( F/B \) ratios by making the proper current amplitude and phase adjustments combined with proper spacings to minimize the rearward response. Indeed, the relationship between forward gain and \( F/B \) ratios for 2- and 3-element Yagis has been described in detail and need not be repeated here.

A requirement for minimizing the rearward response for long, high-gain Yagis is of some importance in some communication links. A theoretical solution of this problem is of the same order of complexity as the maximum gain (forward field) Yagi. There is, however, a straightforward experimental method of adjustment which yields a very satisfactory solution to obtaining minimum rearward field for long Yagis.

Suppose we first design a long Yagi without any attention to the rearward response; namely, to produce a maximum-gain Yagi. This will result in a particular distribution of currents in both amplitude and phase and element spacings. A proper mathematical addition of these currents yields the rearward response. If now another element is added to the array, suitably spaced from the driven element and tuned so that its field, in amplitude and phase, will be equal and opposite to the net rearward field resultant without this element, a minimum rearward field will result.

In practice, cancellation of the order of 25-40 db, can be achieved by the utilization of 1 or 2 elements whose primary purpose is rearward field cancellation. These excess elements may be employed with negligible effect on the gain characteristic. The procedure depends upon a well-instrumented site free of reflections and where the forward and back field are simultaneously monitored. An element of length equal to the shortest element used is attached to an insulator and run along the boom of an array. It will be found that the position for minimum rearward response is quite critical.

Since the addition of an excess element to minimize the rearward response affects the forward response, we generally choose that position for the excess element which causes no decrease in gain. After the position of this element has been established, further tuning and slight repositioning of the element will be found to bring to an absolute minimum the value of the rearward response.

**Bandwidth**

The bandwidth of an antenna is generally defined as that frequency range over which the...
gain will not vary by some specified limit; e.g., 1 db. Antenna bandwidth requirements differ widely, being extremely broad for TV use and narrow for single-frequency communication links. The bandwidth of a Yagi antenna is determined by the following factors:

1) The loss in power transfer to the antenna due to mismatch as the frequency varies.
2) The variation of forward field due to the currents (amplitude and phase) changing with frequency. It is also apparent that the rearward field is influenced by the same factors as the forward field and that the F/B ratio will also vary with frequency.

The variation of the s.w.r. with frequency in a Yagi depends upon the following factors:

1) The tuning of the elements.
2) The spacing of the elements.
3) The diameter of the elements.
4) The nature of the driven element (simple dipole, folded dipole, multiple driven elements, etc.)

The above characteristics determine the self and mutual impedances in the antenna, and they also determine the gain or forward field of the Yagi. There is a basic difference, however, in the action of these effects. The forward field is expressed by a distribution of element currents in space for which there is an optimum relationship. This results in an impedance at the antenna terminals which is some function of frequency. Now we can treat the antenna terminals as any other two-terminal circuit and furnish impedance compensation so as to improve the match. This matching technique in no way alters the phase relationship of the current distribution in the elements. It changes the current amplitudes by the amount of increased power furnished to the antenna terminals due to the increased power transfer resulting from the impedance compensation. The form of impedance compensation employed depends upon the impedance characteristics of the antenna and a technique for employing wide-band impedance compensation may be found. The point we are making here is that, at least in theory, the additional line losses introduced by an increase in s.w.r. caused by mismatch between line and antenna can be made very small compared to the gain loss occasioned by changes in current and phase distribution in the Yagi elements. The theoretical limiting factors for the gain over a wide bandwidth are due only to the variation of the forward field with frequency.

The impedance bandwidth may be conveniently chosen as that frequency range over which the s.w.r. does not exceed 2.0 to 1. As an example, the bandwidth of a 3-element array with a spacing from reflector to driven element and from director to driven element of 0.125, element thickness of \( \lambda/800 \), stub-tuned, fed element is shown in Fig. 7. The solid curve shows the array tuned for optimum gain (maximum forward field) and shows a bandwidth of 100 kc. or 1.12 per cent of the operating frequency. The dotted line shows the same array with the director detuned 1.5 per cent shorter than optimum. The shorter director increases the impedance bandwidth to 200 kc. or 1.40 per cent of the operating frequency. The loss in gain due to the shorter director was 0.35 db.

The use of a fed element of the folded, "T" or "H" type increases the impedance bandwidth from the simple half-wave dipole type. For example, a 3-element array employing a folded dipole as the driven element with an element thickness of \( \lambda/300 \) covered a range of 8 per cent of the operating frequency with the s.w.r. less than 2.0 to 1. The "T" matched and "H" type dipole had impedances bandwidths of approximately 3 to 5 per cent.

We have previously discussed the change of self-impedance of parasitic elements in the \( \lambda/2 \) region and pointed out that the thickness of the elements determines the rate at which the reactance changes with length or equivalently with frequency (see Fig. 6). Naturally, the mutual impedances changes also with different thicknesses but here we can only guess that it will change with frequency in some similar fashion to the self-impedance. It is obvious from Fig. 6 that the use of thin elements with a \( \rho = \lambda/1000 \) or less will result in extremely rapid changes in self-impedance with frequency. We should, of course, like to use elements as thick as possible, but practical limitations generally restrict the maximum diameter to 1 1/2 inches which is equal to a \( \rho = \lambda/1100 \) at 20 meters and \( \lambda/2200 \) at 40 meters, which indicates the narrow impedance bandwidth characteristics to be expected at low frequencies with practical elements.

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8 King, Mimno and Wing, Transmission Lines, Antennas and Wave Guides, McGraw-Hill.
Since folded dipoles are relatively impractical at such low frequencies, we are forced to the use of impedance-compensating devices to improve the impedance bandwidth for low-frequency Yagis. Ordinarily, the bandwidth required is usually small at these low frequencies; nevertheless, the 40-meter band is 300 kc. wide, representing a 4.2 per cent frequency excursion and, since we may obtain only about 1 per cent bandwidth with ordinary construction, we must be content with covering approximately 80 kc. without exceeding a s.w.r. of 2.0 to 1.

At 2 meters a 1\(\frac{1}{2}\) -inch diameter element is equal to a \(r = \lambda/320\), which enables us to obtain readily a bandwidth of approximately 2 per cent with no other change in the design of the array (same type of fed element, same electrical spacing and tuning).

In considering the impedance bandwidth of long Yagis we might surmise that the larger the number of elements, the smaller the impedance bandwidth. This, however, does not appear to be the case from a study of our data on long Yagis. A case in point is shown in Fig. 8, which is a plot of s.w.r. vs. frequency for one of our 15-element 2-meter arrays with an over-all length of almost 28 feet.

![Fig. 8 — Standing-wave ratio vs. frequency; 15-element Yagi.](image)

It will be observed that this array maintains a s.w.r. of 2.0 to 1 for over 3.5 Mc., or almost 2.5 per cent of operating frequency. This impedance bandwidth is about the same as our 6-element 2-meter array which is approximately a third the length of the 15-element unit. There does not appear to be a law of diminishing impedance bandwidth as the number of elements increases.

A possible explanation for the lack of diminishing impedance bandwidth as the number of elements increases is that the farther away we get from the fed element, the less coupling effect there is on the driven element. As an example, at 144 Mc. a parasitic element a mile from a driven dipole will have an insignificant reaction upon the dipole. The radiation field from the dipole will cause currents to flow in the parasitic, which in turn will set up a radiation field due to the current flowing in it. The field at any point surrounding the parasitic element will be the (vectorial) sum of the original field from the dipole in addition to the reradiated field from the parasitic element which will result in reinforcement in some directions and cancellation in other directions, resulting in increased directivity or gain in the reinforced direction. The reaction of the parasitic element on the driven dipole will be extremely minute, for the electromagnetic coupling exists solely in terms of the radiated and re-radiated fields. In the immediate region of a current element, we must, in addition, consider the effect of the induction fields sometimes called "near fields" or "Fraunhofer fields." These fields are rapidly damped out with distance since they are inversely proportional to the square and the cube of the distance. The near field, nevertheless, is greater than the radiation field at distances less than \(\lambda/2\pi\) or 0.16\(\lambda\), approximately. Since the coupling between elements depends upon the total field interaction, it is not very surprising that the spacing in the region of the fed element for long Yagis is different from those elements far away from the fed element.

In the same way, it is found that the tuning and spacing of those elements closest to the fed element have the greatest effect on the bandwidth. Since the first director has the greatest effect, our recommended spacing for this element is of the order of 0.2, due to bandwidth considerations in addition to that for maximum gain. We conclude that the effect on bandwidth of the number of elements is minor due to other factors such as nature of fed element, diameter, tuning and spacing of elements.

**Dual-Fed Driven Elements**

An example of a broad-band Yagi which employs a dual-fed driven element is of great practical interest for TV and other applications where impedance bandwidths of the order of 12 per cent are required. Fig. 9 is a sketch of such a unit (a broadband Channel 5, 76-82 Mc. TV antenna) of six elements, reflector, two fed elements and three directors. The fed elements are cross-fed somewhat less than 180 degrees out of phase. The two driven elements resemble a dual-driven, end-fire array. The rear fed element is tuned to the bottom end of the band and the forward fed element is tuned to the upper edge of the band.

![Fig. 9 — Broad-band dual driven element Yagi array.](image)
The hairpins at the centers of the fed elements are used for tuning. The reflector is tuned for peak response slightly above the low-frequency edge of the band and the directors are tuned so that their gain is peaked somewhat below the upper frequency limit of the band. A capacitive stub consisting of an open section of transmission line is then placed on the connecting harness, its length and position selected so as to compensate for impedance variations with frequency. Fig. 10 is a plot of the S.W.R. vs. frequency for this array from 76 to 82 Mc. This plot indicates band may be achieved without a major increase in complexity. The complexity, of course, depends upon the frequency: the higher the frequency, the simpler the construction.

**Gain vs. Spacing**

The basic factor to be considered with regard to the effect of frequency on the gain bandwidth is the effect of change in current phase and amplitude, and the change in spacing in wavelengths as the frequency is varied. Fig. 11 is a plot of the change in gain vs. length for a director whose spacing was 0.2λ from the fed element. The reflector was also spaced 0.2λ from the fed element. Fig. 12 is a plot of the change in gain vs. director spacing from the fed element. From these figures we can see that the element tuning has a much greater effect on the gain than the element spacing. Although not included herein, the gain vs. relative spacing of the reflector where the director spacing is maintained at 0.2λ will remain constant to within 0.75 db. over a spacing variation of from 0.1-0.3λ.

From Fig. 12 we observe that the variation in gain with change of spacing is not rapid, and in a region over approximately 0.1λ (0.15λ to 0.25λ) the variation in gain due to spacing is negligible. For long Yagis we have previously observed that for each element there is an optimum position.

We have also observed that this position is actually a region in which the element adds gain to the array. Outside of this region, the element may yield no gain or actually decrease the gain of the array. The region over which we can get some gain from the director will be approximately 0.15λ. The actual position of the element was covered in the prior discussions of optimum spacing.

The fact that we can derive gain from a director over a fairly wide spacing region enables us to use paired sets of parasitic elements which are set within the range over which the spacing of the director will yield gain. As the frequency shifts, the optimum spacing point for the director will move so as to engage either one director or the other, depending upon which direction the frequency is moved. This device might be called "stagger spacing" in analogy to "stagger tuning" as used in broadband amplifier design. It makes possible minimizing the gain variations with frequency due to changes in spacing.

(Continued on page 114)
"Tattoo"—Automatic C.W. Transmitter Control

A Simple Device for Semibreak-In Operation

BY E. LAIRD CAMPBELL, W1CU

O

ne of the features contributing to the popularity of single-side-band phone is the convenience of voice-controlled operation, which permits a semibreak-in type of operation. The gadget to be described permits a similar type of operation on c.w. With simple connections to the transmitter and receiver, "Tattoo" (The Automatic Transmitter Turner Onner Offer) will turn the transmitter and antenna relay on automatically when the key is closed and, if desired, at the same time silence the receiver. This condition holds true as long as the key is closed and for a short period after the key is lifted. The period of "hold in" is adjustable by the operator. Thus the use of Tattoo offers a type of "poor man's break-in" without the need for a separate receiving antenna and sometimes-difficult transmitter and receiver changes. The adjustable time delay can be set to drop out between characters, words or complete transmissions, within limitations set by the normal sending speed of the operator. Since Tattoo is a complete station control unit, it can also be used with phone by substituting a push-to-talk switch for the key. Completely self-contained with its own power supply, it can be installed in the station by making a few simple connections to receiver and transmitter.

The Circuit

The principle of this automatic device was first described by Hiehle. In its latest version we have included a few refinements: one side of the key is grounded as a safety measure, keying-relay techniques described by Stein have been incorporated to permit relay keying that can follow any bug perfectly, and modified circuit constants allow the transmitter to turn on slightly faster than it did with the original model.

![Schematic Diagram of Tattoo](image)

Fig. 1 — Schematic diagram of Tattoo. All resistors 1 watt unless specified otherwise; all capacitances in μF.

- R1 = 0.05-μF, 600-volt paper capacitor, good quality.
- K1 = 2000-ohm s.p.d.t. keying relay (Sigma 41F-2000FK-TUN).
- K2 = 10,000-ohm sensitive relay (Potter & Brumfield LB-5 or LM111, See text).
- SR = Low-current selenium rectifier (Federal 1002).
- T1 = Small power transformer (Thordarson 26R32).

Referring to the schematic diagram in Fig. 1, a simple power supply using a selenium rectifier furnishes about 120 volts. The keying relay, K1, operates from this supply through dropping resistor R2, which has a value that gives both current and voltage overdrive3 of the relay and makes it follow a bug perfectly. The relay contacts (not shown) are connected to the keyed circuit in the transmitter.

Tattoo does for the c.w. station what voice control does for phone. It turns on the transmitter with the first dot or dash, and holds in for a period of time determined by the setting of the panel control.

QST for
Resistors and the selenium rectifier are mounted under the chassis on tie points or tube-socket pins.

When the key is closed on the first dot or dash, C1 is charged through the diode-connected section of the 12AU7. This voltage overcomes the bias on the triode section of the 12AU7, plate current flows, and relay K2 pulls in. The contacts (not shown) on K2 are used to turn on the transmitter power, close the antenna relay, and turn off or mute the receiver. If the key is opened, C1 starts to discharge through the two resistors shunting it. If the key is not closed again, C1 will eventually discharge, but before this time relay K2 will have opened, depending upon the setting of R1. The higher the arm is set on R1, the longer K2 will hold in. The values in the cathode circuit of the diode are such that you can go from a condition where K2 will open between words at about 12 w.p.m. to where it won't open between sentences at 15 w.p.m.

**Construction and Wiring**

Although there are obviously a number of ways in which Tattoo can be incorporated in the station, we elected to build it in a 4 × 5 × 6-inch cabinet. A U-shaped chassis was bent from a piece of scrap aluminum; the chassis is 1 1/4 inches high at the rear but has only a 1/2-inch lip at the front to clear the cabinet. The chassis is 3 1/2 inches deep and 4 1/2 inches wide. The 6-terminal Millen strip (37306) mounts on the rear lip, and the a.c. line cord is brought out through a grommet in the lip. By cutting a 1 1/4-inch strip off the back cover, an opening is provided for the terminal strip and the line cord.

A little juggling of the parts on the chassis should bring you a reasonable facsimile of the arrangement shown in the photographs. The two relays were mounted with screws and small rubber grommets, to minimize any noise that might otherwise have been transmitted to the chassis and cabinet. A couple of tie points were required under the chassis, but otherwise practically all of the wiring is point-to-point on components. The selenium rectifier is supported by soldering one of its terminals to a tie point. The paralleled resistors evident in the photograph are the 2-watt resistors mentioned in Fig. 1; we used suitable 1-watt resistors in parallel rather than wait for the local dealer to replenish his supply of 2-watters.

**Operation**

You may have noticed in Fig. 1 that there is no switch for turning on the a.c.; this was considered unnecessary because we plan to get the a.c. from the transmitter, so that when the transformer filaments are turned on a.c. is applied to Tattoo.

To check Tattoo, connect the a.c. and plug in your key at the key jack. The keying relay K1 should follow your bug nicely. If you're a purist and want to check the keying relay, turn off Tattoo and remove the key plug from the jack. Connect an ohmmeter across your bug and send a few strings of dots. The ohmmeter should hover around half scale; its exact setting will depend upon how you have the bug adjusted. Now disconnect the ohmmeter from the key and (Continued on page 116)

The two relays, the power transformer and the tube are mounted above the chassis. Capacitor C1 and a 1.5-megohm resistor are mounted directly on R1.

**August 1956**
Quist Quiz

To add an international flavor to this "stump-the-experts" department, Mr. Jacques Vernet, F9TV, submits this teaser for the circuit masters who found the earlier quizzes too simple.

In an unnamed town in France a coal-and-wood dealer has an electric sign in his shop window. When there is wood for sale four lamps light in the sign and the word WOOD is illuminated. When the wood has gone six lamps are lit and the words NO WOOD are illuminated. The power line is 220 volts (no neutral) and 110-volt lamps are used. The dealer controls the lamps through a two-pole three-position switch: for safety reasons the center position is "off" and, in this position, no voltage appears past the switch. The basic problem is shown in the sketch; all you have to do is draw the connections. Hint: There are several possible solutions, but look for the simplest, with a minimum of extra components, if any.

ABOUT JULY'S QUIZ

Did you figure out what was in the box? You were right if you decided it had to be some kind of rapid interrupter device (possibly clockwork driven) that provided a short circuit half the time and an open circuit the other half of the time. When it was closed the voltage would be zero and the current would be limited by $R_1$. When it was open the current would be zero and the voltage would be that of the battery. Since the interrupter works at a rapid rate, the voltmeter and the ammeter would indicate half the peak readings. However, no power would be consumed past the wattmeter, because $W = IR$, and $E$ or $I$ is zero at any instant. The wattmeter would indicate only the small amount of power used by the voltmeter and ammeter.

For the meters to read half these peak values when the switch is at $I$, $R_2 = R_1$.

25 Years Ago

August 1931

In QST 25 years ago, Ross Hull described equipment for Duplex Phone on 50 Mc., with the editor pointing out that it would be much more sensible for the local ragchewers to use the 5-meter band than 75 meters. (Sound familiar, gang?) At that time, amateur mobile operation was not permitted, but Hull’s experiments showed that mobile operation could be quite practical.

Robert Brooke, W0CH, delineated a portable receiver completely self-contained in a box 5 by 9 by 9 inches and using type ‘30 tubes. Battery-powered, it was used both at home and portable locations, and also came in handy for tracing interference.

Paul Hendricks, W1AXV/W1XP, explained the standard frequency transmitter at W1XP.

George Grammer, assistant technical editor, describes the addition of an amplifier to any low-power transmitter.

Boyd Phelps, W2BE, points out the advantages of frequency-tripling over doubling, while James McLaughlin and James Lamb discuss the mystifying decibel.

Ev Battey reports on the very successful Fourth International Relay Competition. The big news was that six of the U. S. stations participating managed to work all six continents!

Clinton B. DeSoto reported on the formation of a new society entitled the Wives and Mothers of Radio Amateurs.

We thought you’d be interested in seeing this view of a stacked ceramic receiving tube recently announced by Elmac. The tubes feature long life (they will be wired directly into circuits, thus eliminating the need for tube sockets) and a type of construction which will enable them to withstand shock, vibration, and high temperatures. At the present time the price is rather high for ordinary amateur use, but extended use will undoubtedly lower the cost. The photograph at the left shows the size of the tube as compared with a paper clip, and also an exploded version indicating the construction.
Changing the 6146 Oscillator into an Amplifier

80 Watts Input on 80 Through 10

BY LEWIS G. McCOY, W1CP

As evidenced by the mail to Headquarters, the two-band 6146 crystal oscillator described a year ago was built by many amateurs. Several of the letters asked for information on converting the unit to an amplifier. This article describes how the change can be made from the original oscillator to an 80-watt band-switching amplifier capable of operation in the ham bands 80 through 10 meters.

The changes consist of rebuilding the grid circuit to a link-coupled band-switching circuit, and the tank circuit to a pi network designed to operate into a 50- to 75-ohm load. As a convenience during tune-up periods, a 25-µa meter and a switch have been added to permit reading either grid or cathode current.

If the reader has built the oscillator and wishes to make the changes to be outlined, it is suggested that he study Fig. 1 here and the circuit diagram of the original oscillator, to familiarize himself with both circuits. Most of the components used in the original unit are incorporated into the amplifier. If the reader has not built the oscillator and wishes to construct the amplifier, the details given in this article are complete enough so that no previous reference should be necessary.

Circuit Details

The inductances in the grid circuit are made up from two lengths of B & W Miniductor stock. By shorting out sections of $L_2$ and $L_3$ with $S_1$, it is possible to resonate the circuit to the desired band.

The tank circuit of the 6146 employs a pi network that is designed to work into a 50- to 75-ohm load. A 400-µuf. variable capacitor is used as a loading control in the output of the pi. When the pi-network circuit is switched to 80 meters, a fixed capacitor, $C_6$, is switched in parallel with the variable. This furnishes enough capacitance in the output circuit for matching to 50- to 75-ohm loads. A similar system is used for 40 meters. By using the bandswitch to connect the fixed capacitors in parallel with the variable, the customary "coarse" loading control is eliminated.

The original power supply is used, one of the "economy" type that utilizes a replacement type transformer in a bridge circuit. The supply can be switched from high to low voltage to facilitate tune-up without danger to the tube.

The 6146 oscillator is now an amplifier. Comparing this photograph and the one on page 26 of August 1955 QST will show the panel and chassis changes. As mentioned in the text, the crystal holder becomes the r.f. input jack. The dial light that was below the crystal socket has been removed and the key jack installed in its place.
Fig. 1 — Circuit diagram of the 6146 amplifier.

$C_1$ — 100-mA.f. variable (Hammarlund MC100S).
$C_2$ — 500-mA.f. mica.
$C_3$ — See text.
$C_4$ — 250-mA.f. variable (Hammarlund MC250S).
$C_5$ — 400-mA.f. tubular (Centralab D6-401).
$C_6$ — 800-mA.f. tubular (Centralab D6-821).
$C_7$ — 400-mA.f. variable, broadcast replacement type.
$L_1$ — L7 — See coil table.
$L_2$ — 10.5 henrys, 110 ma., 225 ohms (Stanco C100).
$S_1$, $S_2$ — 2-pole, 6-position wafer switch (Centralab PA2003).
$S_3$ — 1-pole, 6-position (2 used) wafer switch (Centralab 1401).
$S_4$ — 2 pole, 2-position rotary switch (Centralab 1464).
$T_1$ — Power transformer: 360-0-360 volts 120 ma; 6.3 volts 3.5 amp; 5 volts 3 amp. (Stanco PC8410).
$T_2$ — Filament transformer: 6.3 volts, 1.2 amp. (Stanco 81890).
$J_1$ — Crystal socket.
$J_2$ — SO-239 socket.
$J_3$ — Closed circuit jack.
Metering of the amplifier is accomplished by a 25-ma. meter that can be switched to read either grid or cathode current. In the grid position the full scale reading is 25 ma. and in the cathode position, 250 ma.

Construction

An 11 X 7 X 3-inch chassis is more than large enough to take care of the power supply and r.f. section. TVI shielding is provided by using a 6 X 6 X 6-inch aluminum box as an enclosure for the r.f. components. To provide ventilation, a row of 3/4-inch holes is made along the bottom sides of the box and in the lid over the tube. The face of the box serves as a panel for the meter and tank-circuit controls.

The power transformer and rectifier tubes are mounted on the chassis top at one end. All of the other power-supply components are mounted below the chassis. In the original oscillator unit, the 6146 socket was mounted 1 1/2 inches in from the front of the chassis. This is sufficient to permit the use of the Shurite meter shown in the photographs. However, if the builder is starting from scratch, the 6146 socket should be mounted at least 2 inches from the chassis front to permit greater clearance behind the panel. One other suggested change from the original model is to mount an RCA phono jack on the back of the chassis. This will accommodate coax input from the driver stage. In the unit shown here the crystal socket was used as the r.f. input connector.

The variable capacitor, C2, is mounted on a bracket positioned approximately 2 inches in from the back of the chassis. A panel bearing and shaft coupler is connected to the rotor of C2 to allow for panel control of the capacitor. The tank capacitor, C4, is mounted on the panel to the right of C2. The meter switch, S8, is mounted to the left of C2.

As can be seen in the top view, the inductance L3 is mounted on two isolator stand-offs which are mounted on the side of the box. The plate coil L6 is mounted at right angles to L3. A standard two-terminal tie-point is used for a mounting point for the neutralizing capacitor C3. The coax output receptacle is mounted on the rear side of the box.

COIL TABLE

The coils L1L2 are made from a single length of B & W Miniductor stock. Unwind 8 turns from the support bars and use side cutters, snip off the projecting bars. Snip the unwound piece of wire off about one inch from the coil stock. Next count off 13 turns and bend the 13th turn in toward the axis of the coil and cut the wire at this point. At the cut, unwind 1/4 turn from each coil. This leaves two coils on the same support bars. Unwind 1/4 turn at the end of the large coil. The 13-turn coil is L1 and the 42-turn coil is L2. Similar procedure is followed in making L6L7.

L1 — 12 turns of No. 24, 1-inch diam., 32 turns per inch (B & W 3016).
L2 — 42 turns of No. 24, 1-inch diam., 32 turns per inch (B & W 3016).
40-meter tap is made at 25th turn counting from junction of L6L7.
L4 — 4 turns of No. 29, 1/4-inch diam., 16 turns per inch (B & W 3007).
L5 — 13 turns of No. 20, 1/4-inch diam., 16 turns per inch (B & W 3007).
15-meter tap is made at junction of L6L7.
20-meter tap is made 7 1/2 turns from junction of L6L7.
10-meter tap is made 4 1/4 turns from junction of L6L7.
L6 — 4 turns of No. 14, 1/4-inch diam., spaced wire diam.
L7 — 5 1/2 turns of No. 12, 1-inch diam., turns spaced so that coil is 1-inch long.
10-meter tap is made 1 1/4 turns from junction of L6L7.
15-meter tap is made 2 turns from junction of L6L7.
20-meter tap is made 5 turns from junction of L6L7.
40-meter tap is made 9 turns from junction of L6L7.

The grid tuning capacitor C1 and the grid bandswitch S1 are mounted on the chassis front, below the 6-inch box. Two four-terminal standard tie-points are used to mount the coils L1L2 and L6L7. The bottom-view photograph shows the placement of the two coil assemblies. The turns on the coil that are on either side of the tap points should

August 1956
Looking down into the amplifier box before the output coils and bandswitch are mounted in place. The meter switch is between the 6J6 and the feed line. The output capacitor is mounted on a bracket and is turned by the extension shaft. Twisted wires to the right of the loading capacitor form the neutralizing capacitor.

For test purposes, a 60-watt lamp bulb was used as a dummy load for the amplifier. The amplifier was tuned up on 80 meters first and all initial tests were made on low power. The output stage of the driver and the grid circuit of the amplifier should be adjusted to give a grid current of 2 to 4 milliamperes. With the rated grid current, the output circuit can be adjusted for resonance and loading to a plate current of about 75 ma. To check for neutralization, turn off the excitation and hit the key for a couple of short dots. No grid current should be indicated, although the plate current will kick up quite high. (That's why the dots should be short, to avoid overheating the tube.) If grid current is indicated, it shows that the stage is not neutralized. Turn off the power and untwist a turn from the neutralizing capacitor. Repeat the test for neutralization. It may be necessary to make several adjustments of the neutralizing capacitor before the correct amount of capacitance is found. Usually it will be found that the neutralization will hold on all bands but it is a good idea to check it. If you find that the neutralization doesn't hold on the higher frequency bands, then the amplifier should be neutralized on the highest band used.

With the amplifier fully loaded to draw 150 ma, the plate voltage on the high-voltage switch position will be approximately 540 volts. Screen voltage should be about 130.

If this is your first use of a pi-network tank circuit there are a few things you should know about the use of one. It is recommended that an antenna coupler be used to couple the output to the antenna feedline. Preferably, the coupler should be a tuned job and link coupled. This will greatly assist in reducing harmonic radiation. Several suitable couplers and methods for using them are described in The Radio Amateur's Handbook. Though your best friend may tell you to connect a long wire ("long" being anything from 20 feet on up) to the output terminal of a pi tank, avoid like the plague such a system. It will produce contacts but is also likely to produce from the FCC a QSL card for harmonic radiation... and who wants such cards?

This view shows the completed output circuit. The tubular capacitors on top of the bandswitch are the output capacitors C3 and C4. The output coax fitting is mounted on the outside of the box.
Simple LC Filters for Amateur Use

A Wide-Band Filter for Receiver R.F. and Exciter-Multiplier Stages

BY HENRY RICE, JR., W1PMT, EX-W4FWW, EX-W9YZH

While band-pass r.f. filter circuits can admittedly be built by the "by-guess-and-by-gosh" method, there is another way. Here is an account by a man not in the electrical engineering field who did a little digging into the other way and found that it wasn't too tough and that it was actually interesting once he got into it. We think you will have the same reaction.

Noah Webster's hobby, like ours, was concerned with communication. He was deeply interested in the correct usage of words. It has been told that one day his wife caught him kissing his secretary and exclaimed, "Why, Noah — I'm surprised!" As might be expected of a technical man, he considered the matter quite carefully before answering. Then he said, "No, dear. You mean you are surprised. I am the one who is surprised." Here there were two thrills, the original euhoe and the perfect answer. This article is concerned with just one of the many thrills in amateur radio: the thrill that a person without a technical background experiences in learning to design on paper a simple circuit that will do a specific job.

The basic wide-band filter circuit we elected to use is not new to ham radio. It has been used in several exciters described in QST and will be familiar to all constant readers. It is shown schematically in Fig. 1 and will be recognized as two parallel-tuned circuits coupled to give the desired bandwidth. The quantity M is merely the effective coupling between primary and secondary. This statement does not imply carelessness in the choice of a coupling method, but in this case only one type of coupling will be considered. (A combination of inductive and capacitive coupling is sometimes used.) The secondary response curve of a band-pass filter of this type depends solely on k (coupling coefficient) and the actual Q of the loaded resonant circuits. It makes no difference how the coupling or Q of the coils was obtained. This is important to a clear understanding of the following procedure.

It should be pointed out that the primary circuit in Fig. 1 does not necessarily have to be the plate load for a vacuum tube — it can, and will, be used as an antenna load, as will be shown later. But from this point let's work with specific examples that can be built and tested and used. Things are more constructive that way.

A Receiver R.F. Amplifier

Let's get to work on an r.f. amplifier stage for a 14-Mc. receiver. Of course, the input and output LC circuits could be tuned separately, ganged together or ganged with the high-frequency oscillator but (you've guessed it!) we have just decided to make them bandpass. This means that the completed amplifier will have a response curve of the general shape of Fig. 2. Here f0 is the center frequency in the passband, and also the frequency to which the two circuits are tuned. Further, Delta f is the deviation frequency (peak to peak) and f0 is the bandwidth measured at the -3 db points. The double-bumped characteristic disappears at a value of coupling = k, (critical coupling), but we have decided on a double-peaked curve (coupling coefficient > k) because we want good amplitude near the edges of the band and reasonably good attenuation of strong adjacent-channel signals. Obviously we are shooting for a curve that is roughly symmetrical about f0, both in the location and relative amplitude of the peaks, and this is all that the curve shows or implies. Further, we assume that L0 = L, and Q0 = Q, and that k < 1. We are sure our technical friends will bear with us long enough to establish that > means "greater.

Fig. 2 — A typical response curve of a double-tuned circuit. This one is centered on 14,175 kc.

the center frequency in the passband, and also the frequency to which the two circuits are tuned. Further, \Delta f is the deviation frequency (peak to peak) and \( f_0 \) is the bandwidth measured at the -3 db points. The double-bumped characteristic disappears at a value of coupling = \( k_c \) (critical coupling), but we have decided on a double-peaked curve (coupling coefficient > \( k_c \)) because we want good amplitude near the edges of the band and reasonably good attenuation of strong adjacent-channel signals. Obviously we are shooting for a curve that is roughly symmetrical about \( f_0 \), both in the location and relative amplitude of the peaks, and this is all that the curve shows or implies. Further, we assume that \( L_0 = L \), and \( Q_0 = Q \), and that \( k < 1 \). We are sure our technical friends will bear with us long enough to establish that > means "greater.
than", \( \ll \) "a lot less than", and "unity" means "one." And now we have just completed Step 1: establishing \( f_0 \) and \( f_{\text{peak}} \) and the fact that we plan to use the customary \(-3\) \( \text{dB} \) band-edge response. And perhaps we have learned a fact or two — I’m sure I have.

**Step 2:** If we had a chart of universal response curves (Fig. 3), it would show that \( f_0 \) down 2 \( \text{dB} \) from the peak response results from \( kQ = 2 \), an easy relation to remember.

**Fig. 3 — Universal response curves for a pair of tuned circuits for various products of \( Q \) and coupling coefficient, \( k \).**

**Step 3:** Because we have decided on 2-db. peaks and assumed \( k \) small compared with unity, the equation to use in figuring the approximate coefficient of coupling is

\[
\frac{f_{\text{peak}}}{f_0} = 1 \pm \frac{k}{2}
\]

Thus \( 14.299 = 1.0087, \frac{k}{2} = 0.0087, k = 0.0174 \)

\( (k = 0.02 \) is close enough and will move the peaks out a little more and bring up the weak signals near the band edges just a whisper.)

Somewhere I read a rule of thumb that states a "reasonably flat response" will result if the bandwidth is not much greater than \( 1.2 f_0 \). Well, \( 1.2 \times 0.02 \times 14.2 \approx 340.8 \text{ kc} \). I’m sure Mr. Webster would agree that a "reasonably flat response" defines what we are after, and that \( 340.8 \) is near enough to 350.

**Step 4:** We made \( kQ = 2 \) (Step 2), so \( Q = \frac{2}{k} = 2/0.02 = 100 \).

**Step 5:** Decide the value of capacitance to use. If we use 3- to 30-\( \mu \text{F} \), mica trimmers, and take average input and output capacitances of tubes into account, we can cut 19 turns off a length of \( 1/2 \)-inch diameter 32 turns-per-inch Miniductor and get neat little coils of about 3.4 \( \mu \text{H} \) with \( Qs \) of about 200. There is no black magic involved in arriving at this — the ARRL Type A Lightning Calculator gives a close approx, or you can arrive at it with a grid-dip oscillator and a little patience, by removing turns from a coil until it resonates at 14.2 \( \text{Mc} \) with the assumed capacitance shunted across it.

**Step 6:** Find the equivalent parallel resistance of one unloaded \( LC \) circuit where the coil \( Q = 200 \). We can ignore the effects of the plate resistance of the tube (the plate resistance of pentodes is very high) and choose \( R_p \) and \( R_e \) as follows:

\[ Q = \frac{R}{2\pi fQ} \text{ (the reciprocal of the usual equation involving the resistance in series with the inductance).} \]

\[ R = \frac{2\pi fQL}{2 \times 3.14 \times 14.2 \times 3.4 \times 200} = 60,800 \text{ ohms.} \]

When \( Q = 100 \) the corresponding equivalent parallel resistance is half as much, or 30,400 ohms. To find the resistor needed in shunt with 60,800 ohms to bring the resultant down to 30,400 ohms, \( R_{R1} / (R_1 - R) = (30.4 \times 60.8)/(60.8 - 30.4) = 60.8 = 60,800 \text{ ohms, and we can use 62,000 or 56,000 ohm 1/2-watt resistors.} \]

(The answer was obvious in this case, but we wanted to record the formula for resistors in parallel.)

**Step 7:** Make two coils as described in Step 5 or, better yet, make four at once if you have an inclination to build a complete stage. It is wise to look them over carefully to be sure there are no shorted turns or any lousy crud between turns. The little 32 t.p.i. coils are usually high \( Q \), but once in a while something gets on them and knocks their \( Q \) way down. Assuming that you do not have ready access to a \( Q \) meter, a simple check is to use a grid-dip meter and find the self-resonance point of the coil alone. This will be up around 100 \( \text{Mc} \) and, if the \( Q \) is up where it should be, you will get a clean indication and a sharp dip even with the coil several inches from the grid-dip meter. Naturally, if a \( Q \) meter is available you would check the \( Q \) and use the value in figuring the shunt resistors (Step 6).

Couple two of the coils closely by sliding them over a dowel or cardboard tube. The objective now is to determine the separation between coils that will give the value of \( k \) determined in Step 3.

There are methods for this with a \( Q \) meter or inductance bridge, but it can also be done with a grid-dip meter and calibrated capacitor. The coils are connected in parallel and brought to resonance at a convenient frequency by the capacitor. Call this capacitance value \( C_1 \). The leads from one coil are then reversed and the circuit brought back to resonance with the capacitor, and call this value \( C_2 \). From these two values,

\[ k = \frac{\Delta C}{C_1 + C_2} \]

where \( \Delta C \) is the difference between \( C_1 \) and \( C_2 \).

Continue this reading and reversing process for different spacings between the coils until a value of \( k = 0.02 \) is obtained. Record the final spacing.

\footnote{Langford-Smith, Radio
designer’s Handbook, p. 1034.}
to the nearest 1/32 of an inch and use that dimension when the coils are mounted in an actual circuit.

That's the whole story for this particular band. Stage gain has not been considered because it seemed advisable not to confuse the issue by including it. For the same reason, perhaps we should let well enough alone and stick by our guns with the $kQ = 2$ (Step 2). However, for those who would like to choose their own curve, we can perhaps help a little by noting that $kQ = 1 = k$, or the flattest top we can get without double peaks (0 db. down at $f_0$). Also, $kQ = 2.3$ gives 3 db. down at $f_0$ and $kQ = 2.75$ gives 4 db. down at $f_0$. As these $kQ$ figures increase, the peaks move out and become sharper and the skirt slope becomes steeper at the top. Fig. 3 shows the start of this effect.

Another Example

We have all been sitting for quite a spell now and I, for one, have a slight case of weaver's bottom. But let's see what we have learned, by applying the procedure to the 40-meter band. We certainly don't need to draw any pictures, and we will number the steps as we did previously.

1) $f_0 = 7.15$ Mc. $f_p = 300$ kc., and $\Delta f = 300/1.414 = 2.2 f/2 = 106$ kc., so one peak will fall at $7.15 + 0.106 = 7.256$ Mc.

2) Set $f_a$ at -2 db. again.

3) $7256/7150 = 1 + (k/2)$, $1.0148 = 1 + (k/2)$, $k/2 = 0.0148$, $k = 0.0296 = 0.03$. But the rule-of-thumb check shows that $1.2 \times 0.03 \times 7.15 = 257$ kc., so we will increase the coupling to $k = .094$, which (working backwards) puts one $f_{peak}$ at 7.272 Mc., brings $\Delta f$ to 0.244 Mc., and makes $f_a = 0.345$ Mc.

4) $Q = 2/k = 2/0.034 = 50$.

5) We can use 3-30-μuf. mica trimmers for this band, too. Make any kind of small coils of about 12 μh. inductance. The 5/8-inch by 32 t.p.i. Miniductor (B&W 3008) would be satisfactory, and again the Q would be around 200.

6) $R = 2 \times 3.14 \times 7.15 \times 12 \times 59 = 31,800$ ohms equivalent parallel resistance of a loaded LC circuit with $Q = 59$. The equivalent parallel resistance of the unloaded circuit is $R = 2 \times 3.14 \times 7.15 \times 12 \times 200 = 108,000$ ohms, and the necessary shunt resistor to bring the $Q$ to 59 is $R = (31.8 \times 108)/(108 - 31.8) = 3430/76 = 45K = 45,000$ ohms.

7) Determine coil spacing for $k = 0.034$ and record it.

Construction

The coils, spaced and loaded as previously outlined and tuned with 30-μuf. mica trimmers, were used in the circuit shown in Fig. 4. The antenna coils have about 1/3 the number of (Continued on page 118)
Multiple V Beams

High Gain in All Directions with Four Wires

BY LLOYD D. COLVIN,* DL4ZC

The theory and feeding of V beams is well covered in many radio books. However, a few simplifications were employed by DL4ZC that may make your next V-beam installation easier. An unterminated V beam is bidirectional. Gain and directivity is about the same in either of two directions 180 degrees apart. If 45-degree spacing is used between legs, five radiating wires are normally required to cover all directions. In the DL4ZC installation the fifth leg was eliminated and the first leg is used in combination with the fourth leg, to form an obtuse-angle V.

An obtuse-angle V radiates in a direction at right angles to the bisector of the obtuse angle. This combination is used to cover the missing sector A-A' in Fig. 1. Although according to theory the gain of an obtuse-angle V is not as great as with one having a proper acute angle, in actual operation the gain in directions A-A' compares favorably with gain in the other directions. The standing-wave ratio as measured in the coaxial line between the antenna coupler and the transmitter changes only a minor amount when switching to any of the available directions.

Switching of the beams is accomplished by installing two double-pole double-throw relays in a box at the apex of the beams. Standard 115-volt antenna relays were used and a plastic box of the type used to store foods in a refrigerator, mounted upside down, provides a cheap all-weather housing for the relays. To keep the box dry, a low voltage is applied to the antenna relays during all periods the antennas are not used. The voltage need not be enough to operate the relays but just enough to generate a little heat in the box. A few protected small holes on the under side of the box will help prevent sweating. The wiring of the antenna relays is shown in Fig. 2. It is advisable that the relay control line be installed

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Fig. 1 — Directions covered by the DL4ZC V-beam array. Direction A-A' is covered by legs 1 and 4 working as an obtuse-angle V beam.

Fig. 2 — Circuit showing how two d.p.d.t. relays are used to switch V-beam legs. Numbers indicate connections to leg designations in Fig. 1. For direction A-A', both relays are energized as shown. For direction B-B', both relays are energized. For direction C-C', Relay 2 is energized, and for direction D-D', Relay 1 is energized.
as far away from the antenna transmission line as possible. Different routes for the two lines should be followed if practicable.

The 45-degree spacing used between legs is a compromise value which permits reasonably high gain on any frequency between 3.5 and 30 Mc. The length of the four wires is not critical, so long as all four wires are exactly the same length. It is recommended, however, that the length be approximately that shown in Fig. 3. Each leg should be approximately the same distance from ground and other obstacles. The apex of the legs and the far ends of the legs should be close to the same distances above ground.

A well-designed 600-ohm open-wire line is recommended in textbooks for use between the antenna tuner and the feed point of the V beams. Open-wire TV line should also be satisfactory for low- or medium-power transmitters. Transmitting-type Twin Lead for high power, or TV-type for medium or low power, might be satisfactory if the line is short, but standing waves will run the losses up on longer lengths.

At DL4ZC the final “dressing up” of the installation consists of placing a great circle map in a frame on the wall and mounting eight light bulbs around the map spaced every 45 degrees in the primary directions of the beams. The lights are operated in pairs and are switched by the station operator at the same time the antenna relays are switched. A multiple-contact switch is used to control the operation of the antenna relays simultaneously with the lighting of lights on opposite sides of the great circle map. A quick glance at the map shows which beam is in use and what two directions it will operate in with maximum gain.

Operation on all bands has netted 171 countries worked in one year. Experience has shown that on the higher-frequency bands transmission reports are in general better than when using three-element rotary beams, while reception, on a relative basis, is generally poorer because of the bidirectional characteristics of the V beams.

*OM Colvin is well-known in DX circles. Besides eleven different W calls, he has been FA8JD, KL7KG, J2AHJ, JA2KG, J2USA, JA2US, and now DL1ZC. As you might suspect, the list of DX awards he holds is a yard long!*

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Lights may be installed around a great-circle map to indicate direction of beam in use.
Some amateurs have the erroneous impression that a single-sideband receiving adapter is a gadget that will eliminate the necessity for careful tuning in the reception of s.s.b. signals. That would be nice, but it isn’t true. An s.s.b. adapter system. The adapter is complete with power supply, and connecting it to the receiver requires no modification of the receiver, a point reassures-conscious hams always consider. As the block diagram of Fig. 1 shows, the i.f. signal of the receiver is picked off and fed to a 6BE6 converter stage. Assuming the receiver i.f. to be 450 kc. (the RA-1 will work with input frequencies of 450 to 500 kc.), the 6BE6 oscillator can be on 425 or 475 kc. and still heterodyne the incoming signal to 25 kc. This oscillator frequency is determined by a panel switch marked AM-UPPER-LOWER. The heterodyned signal passes through a sharp filter and then into a ring demodulator.

The toroidal filter section of the RA-1 kit is pre-tuned and requires no adjustment by the builder.

is a device that adds single-sideband selectivity to a receiver, enabling the operator to receive only one side band of an a.m. signal, to provide good reception when the other sideband has interference on it. In the reception of s.s.b. signals, it has the advantage that it passes only the single sideband and nothing else, giving the maximum chance for QRM-free reception. By removing the vestigial sideband of a mediocre s.s.b. signal, it presents a better s.s.b. signal to the detector and makes tuning seem to be an easier job, since inadequate sideband suppression makes a signal hard to “clear up” on a receiver that doesn’t have s.s.b. selectivity.

S.s.b. adapters are closely related to s.s.b. generators; they use either the filter or the phasing principle of operation. In the RA-1 kit, made by D&R Ltd. of Santa Barbara, Calif., the manufacturers have elected to use the filter.

Fig. 2 - Selectivity characteristic of the toroidal filter.

The ring demodulator is a detector circuit using four copper-oxide diodes, driven by a 25-ke. oscillator. The ring demodulator is one of the family of “product” detectors, in which the local oscillator has complete control over the incoming signals. Unlike in diode detection, a strong incoming signal does not mask, or “take over,” a weak one unless, of course, they are both on the same frequency. The output of the detector is fed to a 12AU7 triode audio amplifier and then to a 6AQ5 output stage.

Toroidal coils are used for the transformers and tuned inductors in the sharp filter. The selectivity curve of the filter is shown in Fig. 2. A toroidal coil is also used in an output coupling transformer following the demodulator which, together with R-C filters in the audio stages, minimizes the 25-ke. at
the output-audio-stage grid. The 6BE6 oscillator frequency is controlled by a slug-tuned inductor, and a mica compression trimmer is used as a pad that is cut in when the oscillator is shifted to a lower frequency. When the oscillator is on 475 kc., and an incoming carrier at 450 kc., a 452-kc. side frequency would be heterodyned within the pass band of the filter, while a side frequency of 448 kc. would fall outside. Switching the oscillator to 425 kc. leaves the heterodyned carrier at 25 kc. but throws the 448-kc. side frequency into the pass band. This is the familiar principle of selectable-sideband reception. In operation, when a signal is properly tuned in, it requires only the flick of the switch to investigate either sideband.

The AM position of the switch changes the external loudspeaker and the panel phone jack over from the adapter to the normal output of the receiver.

A gain control on the panel determines the amount of signal fed to the 6BE6 grid from the receiver, and also handles the a.c. switch for the adapter.

The RA-1 kit comes complete with all of the necessary components, with the filter wired and pretested, and with the 25-kc. oscillator circuit pretuned. A 16-page instruction book gives a step-by-step story on assembly, wiring, testing and operation, and 8 line drawings and diagrams supplement the written instructions. — B. G.

High Pass Filters for the 50-Mc. Operator

High-pass filters that will take care of TV receiver overloading from amateur signals on all bands through 10 meters are common today. Their general availability has been a major factor in the solution of our TVI problems. But they are no help to the 6-meter operator. The cutoff frequency of the usual high-pass filter may be anything between 30 and 54 Mc. and it will still do the job for the ham who is operating below 29.7 Mc., but designing and building filters that will reject 50 Mc. and pass 54 Mc. is a more critical task than most filter makers have cared to attempt.

That it is possible to build such filters was demonstrated by W2IDZ, in his prize-winning two-part article in June and July, 1954, QST.

The Drake Filter

The Drake Filter

Electronics, P.O. Box 245, Hanover, N. J., and distributed by Hudson Radio and Television Corp., Newark 2, N. J.

The Drake Type TV-300 HP Filter (R. L. Drake Co., Miamisburg, Ohio) is a 4-section ladder of unusual design. Tiny bifilar-wound coils on iron cores are used to achieve perfect center-tapping and close coupling between each half of the windings.

Where the interference is mild in nature both the Grallen and Drake filters may be used without grounding them to the TV chassis. Insertion in the 300-ohm lead at the back of the receiver will do the trick. If the interference is severe the case of the filter should be bonded to the TV chassis, and provision for this is made in both filters. Connection of the filter right at the point where the lead enters the tuner may also be important.

It should be pointed out that these filters are not solely for use where 50-Mc. operation is a source of TVI. They are the first commercial products that will help the 6-meter man, but they also do an equally-good job of preventing fundamental overload from any lower amateur frequency as well. — E. P. T.
Simple Voice Control for the A.M. Station

An Easily-Constructed Unit for Break-in Operation

BY ARTHUR FARRINGTON, W2NDG* AND ROBERT E. DRUMMOND,** K2DKD

There is little need to discuss the advantages of a voice-controlled break-in system. Recent articles in QST have already done so. However, once sold on voice control, it remains for the amateur either to purchase a commercial unit or to find and construct the circuit best suited for his particular needs.

The unit described herein was designed to be built on a budget yet retain the best points of the more elaborate systems. Our original desires were as follows:

1. A “use” or “not-use” item, simple to connect or disconnect, and one that would require no modification of the receiver or transmitter.
2. Flexible operation, preferably with some means of limiting sensitivity and with adjustable delay (cut-off) time.
3. Small physical size, but self-contained.
4. Construction as cheap and simple as possible, consistent with the features desired.

We were obviously limited to a relay-type keyer. Further, since sensitive plate-circuit relays are not designed to handle heavy loads nor to feature the plurality of necessary contacts, it should be assumed that a push-to-talk system is already in use or can be installed.

The unit shown in the photographs has been in use at this QTH for over six months and has fully satisfied the authors in every respect. No alterations have been made to our equipment other than installing the push-to-talk relay recommended for the Viking-to-talk relay recommended for the Viking Ranger by the Johnson Service Manual. The total cost should run $20.00 or under.

Circuit Details

The voice-control input is fed in parallel with the speech-amplifier input from a crystal mike. (If the speech amplifier has no blocking capacitor between the microphone connector and the grid of the first speech-amplifier tube, the connection can be made simply by plugging into the speech-amplifier microphone jack.) The 12AX7 twin-triode, V', is in a two-stage amplifier with a variable-resistor sensitivity control in the cathode of the first stage. The a.c. voltage output from V' is rectified by the detector tube V2A, filtered by R4 and C1, and the resultant negative d.c. voltage is applied to the grid of the relay tube V2B. The d.p.d.t. relay K1 in the plate circuit of V2B keys the control circuit, and is shown in the schematic in the “transmit” (relay coil de-energized) position.

With no signal input from the mike, there is no output from the detector, and therefore the control-grid voltage of V2B is effectively 0 volts (actually the grid is slightly negative due to the cathode resistor R4); V2B is conducting and the relay is energized.

When an adequate signal is supplied by the mike, the grid of V2B is driven in a negative direction, reducing the conduction through the relay tube sufficiently to de-energize the relay which keys the transmitter. Simultaneously, the relay switches C2 into the grid circuit. As a result, C2 acquires a negative charge. Thus, when the source signal ceases, the grid of V2B will stay negative (leaving the transmitter on) until the RC delay network, consisting of C1, C2, and R5, discharges to ground. This cut-off time is adjustable within limits by potentiometer R5.

Power Supply

The power supply was included to make the unit self-contained, and to reduce the number of connecting cables required. However, if desired, power may be taken from the receiver or transmitter.

* 552 Milton Road, Rye, N. Y.
** 632 Milton Road, Rye, N. Y.

QST for
Fig. 1 — Circuit of the voice-control unit. All capacitances are in μf. Capacitors marked with polarity are electrolytic. All resistors are ½ watt unless otherwise specified.

CR₁ — 35-ma. selenium rectifier.
J₁ — NE-51 neon pilot lamp.
J₂ — Microphone connector.
K₁ — 10,000-ohm d.p.d.t. sensitive plate-circuit relay (Potter and Brumfield LM-11).
R₁, R₂ — Linear taper.
RFC₁ — 1-Mfd. (Olmite 141).
S₁, S₂ — 8-p.s.t. toggle.
T₁ — Half-wave power transformer: 150 r.m.s.v., 25 ma; 6.3 volts. 0.5 amp. (Staneco P-8181, Merit P-3016, etc.).

The power supply shown is conventional, excepting only the substitution of a resistor for a filter choke.

Construction

The only critical wiring of the unit is in the grid circuit of V₁A, and care should be taken that the unshielded portions of this wiring be kept as short as possible. This was accomplished by placing the 12AX7 directly behind the mike connector. Notice that there is no grid-return resistor in this stage; the grid resistor in the speech amplifier performs this function. However, if the speech amplifier used has a capacitor between the microphone connector and the first speech-amplifier grid, a 1-megohm resistor should be connected between Pin 2 of V₁A and ground. The small choke in series with the grid of V₁A prevents r.f. from the transmitter entering the voice control and causing erratic operation.

The entire voice control is built in an inexpensive 6 × 5 × 4-inch utility box (with removable covers on the 6 × 4-inch sides) (Insuline 3821). The tube sockets are mounted close behind the front panel, with the 12AX7 on the left behind the mike connector. The relay is positioned behind the 12AU7, and the power supply is laid out across the back edge. Three grommet holes along the back apron are for the power cord, the control cable and the shielded mike cable lead to the speech-amplifier input. The sensitivity control is on the upper left panel, the delay control on the upper right panel and the tune-up switch centered between them. The on-off switch and the pilot are mounted under the chassis in line with the two controls.

Operation

The switch S₄ is included to allow the operator to turn the transmitter on manually for tuning up, etc.

(Continued on page 118)

Wiring underneath is simplified by the use of a multi-terminal tie point across the middle of the chassis.
Improved Keying for the DX-100

BY ROGER MACE, WSMWZ

More than one ham has observed that the keying of the DX-100 leaves something to be desired. Cathode keying of the v.f.o. and buffer stages results in rather "hard" keying, a polite way of saying that the signal has key clicks. This article is intended to show DX-100 owners how to become friends with the ham in the next block, provided the improved signal does not result in a higher Sweepstakes or DX score. The basic change is to key the buffer stage in the grid circuit, instead of keying the v.f.o. and buffer stages simultaneously in the cathode circuit. While buffer keying precludes the use of break-in on one's own frequency, it was felt that the advantages of the improved keying outweighed the disadvantages of not being able to operate good break-in. The few additional components required for the conversion are readily available. One hole must be added to the panel, for a pushbutton "spotting" switch. The appearance is not impaired a bit by the addition of the switch; in fact, it tends to balance the panel a little better.

Circuit Description and Operation

Referring to the partial schematic of Fig. 1, the 22K resistor provides isolation from the bias supply. It also controls the charging time of the shaping capacitor $C_1$.

The 10K resistor in series with the key controls the discharge time of $C_1$. The 100K resistor isolates the grid of the 12BY7 stage from the keying circuit and the 0.005-mu capacitor provides an r.f. ground at this point.

In operation the v.f.o. and buffer cathodes are returned to ground through one side of the plate switch. This turns on the v.f.o. and keeps it operating as long as the high voltage is on. The buffer stage is prevented from operating by the -50 volts applied to its grid. When the key is closed, the voltage on the buffer grid drops to approximately -17 volts, allowing this stage to excite the rest of the r.f. stages. The shaping capacitor $C_1$ has to discharge through the 10K resistor, providing a time constant in the keyed stage. This introduces a slope on "make" and prevents the click. When the key is opened, $C_1$ must charge through the 22K resistor. Thus the buffer grid voltage does not rise instantaneously to the cut-off value, and the trailing edge of the envelope is again rounded off. The overall effect is to soften the keying and prevent the starting and stopping transients which cause key clicks.

A double-pole push-button switch on the panel duplicates the effect of the cathode side of the plate switch and also the key. It turns on the first three stages of the transmitter without applying high voltage to the final. It is handy for checking v.f.o. frequency on the receiver, and it also helps to save 6146's during tune-up.

Modification Procedure

It will be necessary to drill a 3/8-inch hole in the panel for the push-button switch. This hole can be located on the right-hand side of the front panel, 3 inches from the side and 4 3/8 inches down from the top. As the average ham probably doesn't have a 3/8-inch drill, the best way to do this is to drill a small hole first and then drill larger and ream to size. To protect the filter capacitors, place a wood block behind the panel while drilling.

Wire the push-button switch before mounting it on the panel. Connect two terminals of the switch together as shown in Fig. 1, and attach a wire about 7 inches long to this junction. Either use a different colored wire for this connection, or tie a knot in the end of the wire for identification. Attach 7-inch wires to the two other terminals. Pass all three wires through the hole between the filter capacitors and mount the switch. Now turn the transmitter over and, using the capacitor mounting screw near the key jack, mount a one-lug terminal strip. Remove the end of the line choke from terminal 9 on the phone-cw switch and connect it to the strip; also connect a wire 14 inches long to this point and run it over into the center compartment near the 12BY7 buffer stage socket. Of the three wires coming from the push-button switch, connect the knotted or otherwise identified wire to the grounded (Continued on page 35)
Portable Beam for 50 and 144 Mc.

BY EDWARD P. TILTON, WIHDQ

Mobile work on 6 and 2 is fine, but to get the full value out of a v.h.f. rig in the car you need something better than a simple whip. Even where vertical polarization is in general use, the mobile whip is nothing to get excited about for coverage. Some sort of portable beam antenna that can be set up readily when time and circumstances permit will extend the sphere of influence of the mobile station tremendously.

If the station works only on the 144-Mc. band the problem of a portable beam is easily solved. Most 2-meter beams now on the market can be dismantled and stowed in a small space, and a cut-down TV antenna is a practical and inexpensive solution if you want to save some money. An efficient antenna for 6 takes a little more room, however, and something in the way of sectional elements is desirable if the array is to be carried in the average family car.

The arrays for 6 and 2 described by the writer in QST for August, 1955, and in the 1956 edition of the Handbook, have been used in five call areas since they were built last spring. They have been well worth their small cost, but what ham is ever satisfied with anything for long? We decided that something still more compact and light in weight was in order for a long trip coming up this summer.

This was accomplished by making the 6-meter elements in sections of such length that the middle portions would be suitable for 2-meter elements as well. The result is a 3-element array for 50 Mc. and a 5-element one for 144 Mc. with a combined weight of $2\frac{1}{2}$ pounds, including the boom. The latter was made in two sections, so elements, boom and 16-foot support carry easily in the smallest size canvas golf bag. Either array can be set up in less than ten minutes’ time, and their performance is as good as that of home station arrays of similar size. The 6-meter assembly looks a bit flimsy, but has taken mountaintop winds in its stride so far.

As may be seen from the photographs, the center section of the reflector element for 50 Mc. is also the 144-Mc. reflector. A separate driven element is used for 144 Mc. The middle of the 50-Mc. driven element doubles as the first director for 144 Mc. One of the extensions for the 50-Mc. director is used for the second 144-Mc. director, while the forward director dismantles to serve on both bands. Both driven elements are gamma matched. This feed method provides a means for matching at any frequency, and also is readily adapted to dismantling. The basic features of the arrays are shown in Fig. 1. The elements are $\frac{3}{4}$-inch dural tubing. This size was

A 5-element 2-meter beam becomes a 3-element 6-meter beam in a matter of seconds. Four extensions all the same length screw onto the reflector and middle element. One of them is the second 2-meter director, which is slipped out of the boom for this purpose. Two shorter extensions screw onto the forward director. The coaxial cable is shifted from one gamma section to the other, and the 6-meter beam is ready for use.
selected because it may be tapped for \( \frac{3}{4}-20 \) threaded inserts. The latter can be made by threading \( \frac{3}{4} \)-inch aluminum rod, or sections of aluminum \( \frac{3}{4}-20 \) bolts can be used. Such aluminum hardware is readily obtained from "do-it-yourself" hardware stocks. Brass or cadmium-plated steel bolts may be substituted, if necessary. Slip-on inserts can be used, but the threaded rod method is preferable. Dimensions for the various elements are given in Table I.

The method of mounting the elements to the boom was taken from a neat idea we first saw in use on Telrex v.h.f. arrays. The boom is drilled to pass the element, and then two small clips of sheet aluminum hold it in position. When the nut is tightened, pulling the clips together, the element is clamped tightly in place.

The boom can be anything around 1-inch diameter. It is made in two 30-inch sections and clamped together (and to the vertical support) between two pieces of aluminum angle stock and a TV U-clamp as shown at the lower right in Fig. 1, and in a photograph. The angle stock braces are about 6 inches long.

The series capacitors and the coaxial fittings for connecting the feedlines are mounted permanently to the boom on small U-shaped brackets of sheet aluminum. The capacitor should be about 50 \( \mu F \); maximum for the 144-Mc. driven element and 75 \( \mu F \) for the 50-Mc. one. We used shaft-type Hammarlund MAPC trimmers. With low-powered portable rigs of 25 watts or less the smallest available capacitor is operating well within its voltage breakdown rating.

The gamma sections are supported on 3/8-inch ceramic cones. Their lengths should be about 13 inches for 50 Mc. and 5 inches for 144 Mc. Be sure that the slinging clamp makes solid contact to both the arm and the driven element. To facilitate dismantling, a flexible copper strap connects between the capacitor and the matching arm. The strap slips under the head of the screw that holds the arm to the cone insulator.

In adjusting the matching an s.w.r. bridge should be used. The position of the adjusting clamp and the setting of the series capacitor are varied, first one and then the other, until the readings are correct.

### Table I

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<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
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</thead>
<tbody>
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<td>114.5</td>
<td>40.5</td>
<td>37.5</td>
</tr>
<tr>
<td>50-Mc. Dr. El.</td>
<td>110.5</td>
<td>36.5</td>
<td>37.5</td>
</tr>
<tr>
<td>50-Mc. Dir.</td>
<td>107</td>
<td>35.5</td>
<td>36.5</td>
</tr>
</tbody>
</table>

The 144-Mc. driven element is 3.85 inches. Boom is six feet overall, in two sections. Reflector to driven element, 50 Mc.: 32 \( \frac{1}{4} \) inches. Driven element to director, 50 Mc.: 38 \( \frac{1}{4} \) inches. 144-Mc. element spacings are, back to front, 21, 11 \( \frac{1}{4} \), 16, 22 \( \frac{1}{4} \) inches. None of these element spacings is particularly critical, and other combinations could be worked out readily enough.

The gamma section is made of 3/8-inch tubing. It is cut and shaped to the proper dimensions as given in Table I. The tubing is clamped to the boom with a U-clamp as shown in Fig. 1. The clamp that holds the two portions of the boom together, and to the vertical support, is seen at the right.

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better than one megacycle at 50 Mc. Any type of coaxial line may be used, with RG-58/U and 59/U being preferable for portable work because of their small size and light weight. Line loss is negligible with the 20 feet or so needed for this installation.

The vertical support is made from sectional aluminum TV masting. Originally the sections were 10 feet long. We bought two and cut them in half, using three of the 5-foot sections that resulted. This was fine, except that the rear compartment of our car wasn't quite long enough to take 5-foot lengths, without laying them crosswise. When a long trip loomed, and with it the problem of accommodating baggage for two people for seven weeks travel, we had to devise a package that would lay along one side of the luggage space, over the spare tire.

The solution, which incidentally also gave us another foot of height, was to cut each length of masting to 4 feet, and add another 4-foot section. The four lengths of masting, the boom sections and all the elements now stow neatly in a canvas golf bag of the type commonly known as a "Sunday bag." The zipper pocket carries the miscellaneous hardware, a screwdriver and a socket wrench, to use in assembling the array. The entire package weighs under 10 pounds and it fits into a space that is of little value for anything else.

The mounting arrangement for the mast is the same as described previously: a sheet aluminum clamp that was made to fit the masting and the car door handle. The mast is held firm at the ground by pushing an old screwdriver into the ground and setting the bottom mast section down over it. Rocks piled around the bottom will serve the same purpose, if you're on a rock ledge, where you can't drive a pin into the ground.

We've added a few refinements to the mast since the original description last summer. It is now keyed to prevent the beam from turning in the wind as one section slips on another. This was done by notching the end of each mast section, and then putting a self-tapping screw into the sleeve of the adjacent section, to catch in the notch. The section just above the bottom one has a four-inch 1/4-20 bolt through it, at a point so that the bolt just rides on the top of the section below. This makes a bearing surface inside the mast, and the portion outside the mast serves as a turning handle and direction indicator. It should be lined up with the boom, of course, to perform the latter function. It may be seen in the two assembled views, just below the top of the car window.

Concerning the June QST item on "Mobile Lawa," W2DKH points out that the law in New York State was amended some time ago to exclude amateurs from the provisions which require a local police permit for mobile installations capable of tuning to certain frequencies. Since the amendment of the law, Section 1916 of the Penal Law of the State, there has been no problem of permits.

K2MPB, "Methodist Preacher Bill," has perhaps been an over-zealous operator during his first year of amateur radio. An error in the spelling of a sermon title posted on the bulletin board outside his church has almost convinced him that he had better employ more of his time with church work and less with amateur radio. Recently his sermon title was "Our Brother Man." On the bulletin board it read "Our Brother Ham."

Add recent QSOs — K2HOG working W2PIG.

Who says the FCC doesn't have a sense of humor? W1HAG was just issued to Sandra Burke.

The American Bible Society of 450 Park Avenue, New York 22, N. Y., will be pleased to send a supply of their Bible Stamps to amateurs who wish to paste them on QSL cards in order to encourage reading of the Bible.
Modulation Monitor Using an Electron-Ray Tube

Negative-Peak Overmodulation Indicator in a Simple Unit

BY J. G. CORMACK,* W4ERE

• Although the cost is negligible and the construction shouldn’t occupy more than an evening’s spare time, this circuit not only gives you an approximate idea of how well you’re modulating your Class C amplifier but gives positive indications of negative-peak overmodulation. No calibration is needed.

Every radio amateur who operates an a.m. transmitter needs a method for measuring the modulation percentage. This need, in practice, reduces to two “measurements” to answer the following questions:

1) Is the modulation sufficient, and
2) Is overmodulation occurring?

While the need for these measurements is widespread, it is the author’s observation that many hams have no method of measuring modulation percentage except the plate-current meter of the Class B modulator—or perhaps a neon bulb attached to one of the antenna feeders!

The inexpensive modulation monitor described below provides, simultaneously, three items of information:

1) Whether or not the transmitter is on the air,
2) Whether or not the carrier is being modulated, and
3) A definite indication whenever negative-peak overmodulation occurs.

Negative-peak overmodulation, which is a principal cause of severe sideband splatter, is easy to detect with this monitor.

The indicator is a type 6AL7GT tube, commonly used as the tuning indicator in f.m. broad-

*LCDR, USN, 9 Moore Drive, Westwood, Charleston, S.C.

cast receivers. Fig. 1A shows the presentation on the 6AL7GT when the transmitter is off the air. This is the normal pattern for this tube when no voltages are impressed on its deflection plates. Fig. 1B shows the indication when the transmitter is on the air unmodulated. The right half of the pattern has increased in height but no other change has taken place. When the transmitter is modulated, the indication is as shown in Fig. 1C; i.e., the bottoms of both halves of the pattern wiggle up and down with modulation. With some experience with this modulation indicator it is possible to estimate roughly the modulation percentage by the amount of wiggle. When negative-peak overmodulation occurs, the top portion of the left half of the pattern moves up and down with each overmodulation peak as shown in Fig. 1D. In addition to these visual indications, the transmitter can be monitored aurally by plugging a pair of headphones into $J_1$, Fig. 2, and adjusting the headphone volume with $R_5$.

How It Works

The theory of operation is simple. R.f. energy is fed in through link $L_1$, which is loosely coupled to the final amplifier tank coil. The r.f. is rectified by one diode of the 6AL5 and the audio component of the detected signal is impressed on plate $P_1$ of the 6AL7GT. $P_1$ controls the deflection of the bottom parts of both halves of the pattern. The detected signal also is filtered by the low-pass filter composed of the two 0.05-μf. capacitors and the two 2.2-megohm resistors to remove the audio, and the resulting d.c. is impressed on plate $P_2$. This plate controls the deflection of the top part of the right half of the pattern as seen in Fig. 1B.

To obtain the overmodulation indication, a

![Fig. 1 — Patterns on the 6AL7GT indicator tube under various conditions. With modulation (C) the dotted area expands about the lower edge, $X$, of the pattern line in proportion to the modulation percentage. Negative-peak overmodulation is indicated by a similar movement about the upper edge, $Y$, of the left-hand side of the pattern.](image_url)
Fig. 2 — Circuit of the modulation indicator. Capacitances are in μμf. except where indicated otherwise. Resistors 1/4 watt unless otherwise specified.

J1 — Open circuit phone jack.
L1 — Pickup coil: one or two turns coupled to final amplifier tank. Adjust coupling for suitable deflection on 6AL7GT.
R1 — Depends on modulated-amplifier plate voltage. See text for method of determining value. Power and voltage ratings of resistors making up R1 should be observed.
R2 — Volume control potentiometer.
T1 — Microphone-to-grid transformer (Stancor A-4700).

Portion of the modulated plate voltage of the Class C amplifier, taken through voltage divider R1R2, is fed to the remaining 6AL5 diode. Negative-peak overmodulation occurs whenever the instantaneous plate voltage of the plate-modulated final amplifier goes negative. When this happens the diode conducts and current flows in the primary of transformer T1. The voltage developed across the secondary and applied to plate P1 causes the top part of the left half of the pattern to wiggle, as seen in Fig. 1D.

Resistors R1 and R2 are mounted inside the transmitter as a safety precaution to avoid bringing the final amplifier plate voltage out of the transmitter. Their values were chosen so that the peak inverse voltage rating of the 6AL5 tube would not be exceeded at 100 per cent modulation. The author's transmitter uses 1250 volts d.c. on the plate of the final amplifier, and therefore the peak plate voltage with 100 per cent modulation is 2500 volts. The peak inverse voltage rating of the 6AL5 is 330 volts. For R2 = 100K, the correct value for R1 can be found by the following formula:

\[ R_1 = 300 \left( \frac{E_{6A5}}{330} \right) \text{ ohms} \]

where E6A5 is the final-amplifier d.c. plate voltage.

No constructional details are necessary since the circuit is very simple and construction is not critical. The author's unit is built in a homemade cabinet 3 inches wide by 4 inches high by 4 inches deep, with a sloping front panel. A commercially made cabinet of slightly larger dimensions, with a sloping front panel, is available for less than one dollar. B+ and filament voltages were obtained from the station receiver since the current drain is negligible.

This unit has been in use for several years, and is now considered indispensable.

ARRL NEW BRUNSWICK CONVENTION

Bathurst, N. B. — September 1–2

The North Shore Amateur Radio Club is sponsoring the big affair of the year at Kent's Lodge on Chaleur Bay, Bathurst, on September 1st and 2nd. Activities start at 9:00 a.m. Saturday, and arrangements have been made for the Jr. Ops, YLs, and XYLs. You will be treated to a great display of Swap and Shop gear, so be sure to bring along all your excess gear. If you can't trade it, sell it, and if you can't sell it, we'll help you throw it away. Refreshments? Food? Your between-meal snacks have not been forgotten, and there will be a banquet to satisfy any gourmet. Lots of entertainment, but to appreciate it you just have to wait until you get there. Advance registrations may be made through Lawrence Anderson, VE1WF, 243 St. John Street, St. John, Bathurst, N. B.

FEEDBACK

We hasten to call to the attention of the Confederate Signal Corps an error in the map of 160-meter band privileges, page 66 of July QST. The table on page 67 is correct, and South Carolina is allowed to operate 200 watts during daylight hours and 50 watts at night on 1800–1825 ke, and 1875–1000 ke. Thanks to W4PVT for catching this one.

Strays

That famed radio station, NAA, closed down permanently on June 30th, after 43 years of service. You young squirts might find it hard to realize how many of the old-timers learned the code from the weather and news that was transmitted from NAA. Back in "the good old days" NAA's signal went out on a wavelength of about 3000 meters!

On June 27, 1936, W8NAF worked his first out-of-state DX on 5 meters. On June 27, 1956, W8NAF worked his first out-of-state DX on 6 meters. What will he have to report on June 27, 1976?

Dr. John Kraus reports that signals which in many ways resemble radio telegraphy are being picked up on a sky radio telescope pointed at Venus. (See p. 17, May 56 QST.)

MEMBERSHIP CHANGES OF ADDRESS

Four weeks' notice is required to effect change of address. When notifying, please give old as well as new address. Advise promptly so that you will receive every issue of QST without interruption.

August 1956 39
Single-Ended Push-Pull Modulator

Class B without a Modulation Transformer

In the few years that have elapsed since a single-ended push-pull audio amplifier was described by engineers of the General Radio Company, it must have occurred to some amateurs who saw the circuit that it might have an application in Class B modulators. Walt Nettles, W8AJL, thought so and proceeded to try it. The practical circuit information given below is based on W8AJL's experience.

The basic circuit is shown in Fig. 1. The two tubes are connected in series, cathode of V1 to plate of V2. This requires that the plate supply have twice the output voltage that would be used for the same tubes in the conventional push-pull arrangement. However, the total current is the same as for one tube, so the power consumption is not altered from that of the standard circuit. The audio load is connected as indicated.

The grids of the two tubes are driven out of phase with audio in the normal push-pull fashion. Transformer input is shown in Fig. 1, separate input transformers — or at least a transformer with two separate secondaries — being necessary because the cathode of V1 is at a different d.c. potential than the cathode of V2. (Resistance coupling between the driver and amplifier is perfectly feasible when the amplifier is operated without grid current, as shown in the referenced article.)1) The polarities of the windings are such that the grid of V1 is driven positive when the grid of V2 is negative, and vice versa. Now since the plate of V1 is connected to one end of the load (through the plate supply HV1, which is assumed to have negligible audio impedance), while the plate of V2 is connected to the other end of the load, the output is true push-pull in the load, although no center-tapped transformer is needed.

Let us assume that the two high-voltage supplies have the same output voltage. The voltage drops from plate to cathode in each tube can be made to be the same if the individual bias voltages are adjusted to that end. Then there is no d.c. potential across the terminals of the load and no direct current flows through it. In fact, it is not necessary to have a d.c. path through the load — that is, between the junction of the cathode of V1 and the plate of V2, and the junction of the two plate supplies. A blocking capacitor of appropriate value for the frequencies to be handled can be used here, if desired, giving the effect of parallel feed without the necessity for using a shunt choke or resistance.

When such a blocking capacitor is used the end of the load shown connected to the junction of the two supplies in Fig. 1 may be grounded. A single plate supply of the proper total voltage will suffice, of course.

Note that since the two tubes are working into the same load without any transformer to change the impedance picture, the load resistance is the same as it would be were the two tubes working in parallel with the same operating conditions. That is, the optimum load for straight Class A operation would be one-half the optimum Class A load resistance for each tube working alone. In pure Class B each wants the optimum Class B "per tube" load resistance — i.e., one-fourth the plate-to-plate load resistance as given by the data sheets — and this is also the total load resistance since the two tubes work alternately.2 This figure also applies in Class AB1 or AB2 operation.

There may be cases where the required value of load resistance is essentially the same as the modulating impedance of the Class C amplifier that is to be modulated. If this is so, then no modulation transformer is needed, and simple capacitor-choke coupling will suffice. The fact that a judicious choice of tubes and operating voltages will permit the use of a comparatively inexpensive choke instead of a modulation transformer would appear to be one of the principal advantages of the circuit from the ama-

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2) For discussion on load impedances, see "Twice or Four Times?", Tech. Topics, QST, April, 1950.
A Practical Circuit

The modulator circuit as used by W9AJL with a pair of triode Class B tubes (810's) is shown in Fig. 2. \( T_1 \) is an audio input transformer of conventional design, made for coupling a pair of push-pull 6B4G drivers to 600 ohms. \( T_3 \) is a 600- to 600-ohm transformer having sufficient insulation to stand the voltage at the plate of \( V_2 \), which at full output will reach an instantaneous peak equal to nearly twice the no-signal d.c. voltage between its plate and cathode.\(^3\)

Bias supply B has no special insulation requirements to meet, but bias supply A, like \( T_3 \), has to be insulated for twice the plate voltage on \( V_2 \). With one exception, the insulation problem here is not a difficult one since ordinary components can be used and the entire assembly can be given the necessary voltage rating to ground by mounting it on stand-off insulators having adequate height. The exception is the power transformer used in the supply which, for a low-voltage unit, would have to be exceptionally well insulated and thus not readily obtainable as a catalog item. This problem was neatly dodged on a suggestion from W9LMB, a filament transformer connected to the filament of \( V_1 \) being used so that the primary rides up and down with the voltage at the plate of \( V_2 \). The circuit of the supply is given in Fig. 3, about 80 volts bias

\(^3\) The transformer is made by E. C. Stockman, 618 So. Williams, Denver, Colo.

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Fig. 2 — The modulator circuit used by W9AJL in a kilowatt transmitter. This has choke coupling to the modulated stage and eliminates the customary modulation transformer. Bias supply A must be insulated from chassis for about twice the d.c. voltage appearing at the plate of \( V_3 \). See Fig. 3 for bias-supply circuit. The 200-ohm resistors at the tube plates are for parasitic suppression.

- \( C_2, C_3, L_2 \) — Splitter filter (see text).
- \( T_1 \) — Driver transformer, 6B4G plates to 600 ohms.
- \( T_2 \) — 1-to-1 transformer, 600 ohms, 10,000-ohm insulation (see text).
- \( T_3 \) — 10-volt filament transformer for 810 or 822.
- \( T_4 \) — 10-volt filament transformer, 10,000-volt insulation.
- \( T_5 \) — 5-volt filament transformer for 872A, 10,000-volt insulation.
- \( V_1, V_2 \) — 810.
- \( V_3 \) — 872A.
- Power supply \( H'V_1 \) delivers 2500 volts; \( H'V_2 \) delivers 5500 volts.
being required for the 810 grid. The circuit of bias supply B is the same except that a transformer delivering about 150 volts and working from the 115-volt line is used.

The audio output voltage is developed across $L_3$, which is coupled to the tubes by $C_1$. $C_1$ must be insulated from the chassis for the maximum instantaneous voltage at the plate of $V_2$, but the capacitor itself only has to stand the difference between the d.c. voltage on $V_2$ and the voltage on the Class C stage. Hence the 1500-volt rating shown, even though W9AJL uses 2500 volts ($HV_1$) on the Class C amplifier and 5500 volts ($HV_2$) on the modulator tubes.

As with all plate-modulation systems in which no modulation transformer is used, the d.c. voltage on each modulator tube must be higher than the d.c. voltage on the modulated amplifier in order to get 100 per cent modulation. Just how much more voltage must be used depends on the minimum permissible instantaneous voltage, for undistorted amplification, at the plate of the modulator tube. The exact figure has to be obtained from the characteristic curves of the modulator tubes. It is about 100 volts in W9AJL’s case.

The normal method of adjusting the system would be to set the output voltages of the two bias supplies so that the voltage at the plate of $V_3$, as read by voltmeter $V_3$, is one-half the total supply voltage. It is possible, however, to adjust the biases so that the d.c. voltage on $V_2$ is somewhat less than that between plate and cathode of $V_1$, although $V_2$’s plate voltage should not be less than the voltage applied to the Class C stage. Using unequal voltages in this way permits $V_2$ to swing up farther than would be the case with equal division of voltages, hence gives increased upward modulation. If the voltage on $V_2$ is about the same as that on the Class C stage, a certain amount of negative-peak clipping will take place in $V_2$. This, in conjunction with a following splitter filter, will prevent overmodulation downward. In W9AJL’s arrangement a diode, $V_3$ (an 872A), is used to accomplish the same result, so the voltage on $V_2$ is ordinarily adjusted to be equal to the Class C voltage.

$L_2C_2C_3$ is a low-pass filter for splitter suppression, and may be designed from the ordinary formulas based on the modulating impedance of the Class C amplifier.

The system should be set up with the aid of an oscilloscope. The two biases should be adjusted for the type of operation wanted, as described above, the values being chosen to give a no-signal plate current that results in 100 per cent modulation with the least observable distortion, using sine-wave audio input. The scope can be used as a modulation monitor in the regular way if the wave-envelope pattern is used. The modulator plate current with voice input may be checked against the scope pattern to determine the value that results in full modulation.

For the high-voltage supply, a bridge rectifier can be substituted for the familiar center-tap arrangement to double the output voltage.

Filter capacitors of adequate rating must be used, of course. A combination supply, built around an already-available center-tap system, is used by W9AJL. As shown in Fig. 4, it requires the addition of two rectifiers, $V_3$ and $V_4$, two rectifier filament transformers, $T_3$ and $T_4$ (or a single transformer with two separate secondaries), and the filter components $C_3$, $C_4$, $L_3$ and $L_4$. This supply gives two output voltages, one the voltage that normally would be obtained from the center-tap rectifier, the other approximately twice as high. A strict 2-to-1 relationship between the two

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4 The Radio Amateur’s Handbook, chapter on modulation equipment.
voltages would not permit full 100 per cent modulation, but in practice the voltage between terminals HV and Vr is somewhat more than the voltage between HV and negative because the upper section carries only the modulator load while the lower section has both the Class C and modulator loads. There is thus less voltage drop in the upper section, so that the total voltage available from HV and negative is greater than twice that available from HV. Although Cg, C1 and L4 may have ratings as suggested in the caption, these components are at considerably higher voltage to ground and should be mounted on insulators.

**Parallel Plate Supply**

It is possible to operate triode modulators with the same plate supply that would be used with the normal push-pull arrangement, provided a modulation transformer having separate windings for the two halves of the primary is used. Most multimatch units are of this type. The circuit is shown in Fig. 5. The input side is the same as Fig. 1. On the output side, the plate voltage for V1 is applied through primary P1 of modulation transformer T3, and the d.c. return circuit of V1 is completed through primary P2. This places the plate circuits of the tubes in parallel for d.c. as well as audio.

Capacitor C1 is an audio by-pass for the purpose of bringing the cathode of V1 and the plate of V2 to the same audio potential. It should have low reactance compared with the plate load resistance required by one tube. A capacitance of 4 μF should suffice for most modulators, although a larger capacitance will do a somewhat better job with low load resistances at low frequencies.

Choice of transformer ratio is based on the same considerations as discussed above — i.e., the load reflected to the tubes through either P1 or P2 should be one-fourth the rated plate-to-plate load resistance for the desired power output. The transformer manufacturer's sheet can be followed, except that the two primary terminals designated for connection together and to B+ should not be connected together. One lead (from the lower end of P1 in Fig. 5) goes to the plate of V2 and the other (from the upper end of P2 in the figure) goes to the B-minus terminal.

Unfortunately, this circuit cannot readily be applied to tetrode modulators because of the complications caused by the necessity for supplying screen voltage. With a double-voltage supply, however, a somewhat similar arrangement of dual primaries will permit screen current to be series-fed through the transformer windings.1

— G. G.

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**Strays**

W6HS writes that he worked W9WBF, Westmont, Illinois; WSTOZ, Dayton, Ohio, and W8YHO, Akron, Ohio, all within a short time and that later, while writing QSLs, he discovered that all three stations have QTHs on Roslyn Avenue.

One of the more interesting accessories available from the telephone company is their Speakerphone. This unit has a microphone built into the base of the set, and a separate loudspeaker. Thus, any sound present in your shack would be picked up by the Speakerphone, and any voice coming over the Speakerphone could be picked up by another microphone.

Amateurs desiring information on types of tubes not available from the Handbook may obtain it from the National Bureau of Standards, Washington, D. C., where a tube information service for accumulating and disseminating technical data on both domestic and foreign radio tubes has been established. At this time nearly 10,000 cards, filed by tube type number, are appropriately referenced to manufacturer’s source material.
An Outboard Automatic Band-Scanner

Monitoring the Bands with a Simple Motor-Driven System for the Receiver

BY CHARLES M. ARNOLD, W3YDF

- An automatic tuning system for the receiver can save a lot of effort in keeping an eye out for band openings and rare DX. This motor-driven system can be quickly adjusted to cover an entire band, or a portion of it as desired. It requires no alteration of the receiver except replacement of the original tuning knob.

The operating activities at W3YDF are mostly on 10 and 15 meters, with a smattering of 40 and 75 thrown in. Anyone acquainted with the higher-frequency bands knows that they open up sometimes without notice, and you have to be there in the right spot at the right time to grab a rare one. Even after a band has opened up, it is often a great convenience to have some sort of automatic tuning device so that you won’t have to stay glued to the receiver in order to keep tabs on any new DX that may show up.

The photograph shows a simple outboard motor-driven tuning system applied to a Collins receiver. The same system may be adapted to most other makes of receivers. You don’t have to touch the inside of the receiver to install it. It doesn’t impair the normal functioning of the receiver in any way. You can set the automatic stops to cover as much or as little of the band as desired.

Construction

In this system a small reversible motor drives the receiver tuning shaft by means of a chain engaging in sprockets. The chain carries a bar with adjustable stops. The stops operate a d.p.d.t. toggle switch which reverses the motor.

In this instance, the original tuning knob was replaced with a knurled brass knob 3 inches in diameter, turned out in a lathe, as shown in the sketch of Fig. 1. A 5/16 inch shaft to fit the hub of the sprocket is turned out on the front of the knob, and a hole to take the tuning-knob shaft on the receiver is drilled out on the back.

The sprocket is CA-24 (24 teeth) obtained from Boston Gear Works, 14 Hayward St., Quincy 71, Mass., if you cannot find one of their distributors locally. For normal manual operation, a thumb set screw on the sprocket releases the sprocket from the tuning shaft. Similar sprockets are mounted on the motor drive shaft and on a section of shaft threaded into one of the panel-screw

The automatic band-scanner installed on a Collins receiver. The motor-driven chain that operates the tuning shaft of the receiver carries adjustable stops that actuate a reversing switch. As much or as little of the band can be monitored as desired.

QST for
Fig. 1.—Sketch showing the details of the 3-inch brass knob that replaces the original tuning knob.

holes. The drive chain is No. 1A brass ladder chain also obtainable from the firm mentioned above. About 4 ft. of chain is required.

The motor is a Bodine KVC-22-1RPM obtainable from Bodine Electric Co., 2254 West Ohio St., Chicago 12, Ill. I found the 1 r.p.m. perfect for the purpose. At this speed, a few words can be caught from each signal as it passes by.

The bar carrying the adjustable stops is made up of two pieces of \( \frac{3}{8} \times \frac{3}{4}\)-inch aluminum strip 8 inches long. A channel \( \frac{5}{16} \) inch wide and 0.08 inch deep is milled into one of the \( \frac{3}{4}\)-inch sides of each piece. When the two pieces are placed with their grooved sides together, a rectangular hole to take the chain is formed.

The adjustable stops are made of pieces of brass soldered together as shown in Fig. 2. When the stops are slid over the aluminum bars and the set screws tightened, the chain is clamped between the two bars. The projections at the bottom of the stops operate the reversing switch as the chain passes back and forth. Other methods of construction may be used, of course, to arrive at the same objective.

I find a 2-kc. coverage handy for spot-frequency skeds, and a spread of 300 kc. for monitoring the 75-meter band. The usual setting for 15 meters is 100 kc., covering 21.2 to 21.3 Mc.

The effort that is saved by a device of this type is hard to believe until you have tried it.

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**NEW BOOKS**

**TV Repair Questions and Answers**, by Sidney Platt; 3 volumes of a series. Vol. 1, Front Ends; Vol. 2, Video Circuits; Vol. 3, Sync and Sweep Circuits; each 128 pages, 5½ by 8½, paper covers. Published by John Rider Publisher, 480 Canal St., New York 13, N. Y. Price, $2.10 each.

Typical TV receiver faults discussed in question and answer form. Vol. 1 covers antennas, transmission lines, and mechanical and electrical features of various types of TV tuners; Vol. 2 the various sections of the video system, including i.f. amplifiers, detectors, video amplifiers, and a.c.c. systems; Vol. 3, horizontal and vertical sync systems and oscilators, and a.c.c. circuits.

**Basic Electronics**, by Van Valkenburgh, Nooger & Neville, Inc. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.; 6 by 9 inches, paper covers; in five volumes; price, $2.00 per volume or $9.00 per set.

This is the second set of a "basic" series, the first of which (on basic electricity) was described briefly on page 138, QST for November, 1955. The same style of pictorial presentation is used, the average length of each book being about 100 pages. Vol. 1 covers diodes, dry rectifiers, power supplies, filters and voltage regulators; Vol. 2, triodes, tetrodes and pentodes, audio voltage and power amplifiers; Vol. 3, video amplifiers, r.f. amplifiers, and oscillators; Vol. 4, transistors, transmission lines, antennas, c.w. transmission and amplitude modulation; Vol. 5, receiving antennas, detectors and mixers, t.r.f. and superhet receivers. Those who have trouble in learning their fundamentals ought to find these books helpful with their easy-to-grasp illustrations and minimum of text.


These three volumes are a continuation of the series initiated a year ago (see p. 126, QST for February, 1955). Kinroscope pictures showing the effects of typical faults are shown, together with associated oscilloscope waveforms at significant points in the circuits. Each book has a "fold-out" insert on the inside rear cover repeating the important illustrations in convenient reference form.

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August 1956
Socorro Island—1956

BY LEE BERGREN,* WØAIW/XE4A AND F. A. CARMICHAEL, M.D.,** WØMAY

In June there was a flurry of activity on the DX bands as Socorro Island was on the air for a brief but productive session. XE4A was manned by WØAIW, WØEIV, WØIEV, WØMAF, WØ0JW and WØUQV, who battled weather and land crabs to make over two thousand contacts. Socorro has subsequently been added to the ARRL Countries List, as noted on page 80 of this issue.

WHEREAS the never ending hunt for new DX continues, the geographical choices fitting such criteria have been diminishing to the vanishing point. For a DXpedition, Socorro Island seemed the most desirable of the remaining spots, and was thereby chosen in spite of the sparse amount of geographical information available. This island is one of the group of four which comprise the Revilla Gigedo Islands owned by Mexico, the location being about 18° 20′ N Longitude, 110° 48′ W Latitude. The group was apparently named for Count Revilla Gigedo an early administrator of Mexico under the Spanish Conquistadors. The only previous amateur operation from this group of islands occurred a few years ago when a radio operator with a temporary Mexican weather station had a limited number of contacts on 40 meter phone, in the Spanish language only.

The expedition had been conceived in the minds of several Kansas City hams, notably WØAIW, WØUQV, and WØMAF. Once preparation for the DXpedition was under way, WØEIV, WØ0JW, and WØIEV quickly threw in their ears. WØMAF’s son, Mike, along with Dr.

*Lipscomb, a neurosurgeon of Denver, and Dr. White, an anesthesiologist of Kansas City, intrigued by the fishing possibilities, rounded out the party.

Obtaining a license to operate in the Revilla Gigedo group of islands presented a considerable obstacle when information obtained on weather conditions dictated that these forbidding islands must be visited not later than the first half of June if the most desirable of weather conditions were to be availed this year. This occasioned a rather tight time schedule which could not have been consummated without the timely and efficient aid of XE4H, XE1AX, and the Liga Mexicana de Radio Experimentadores. With such excellent assistance, a license for XE4A was obtained in about two weeks.

The diesel yacht Malibu, skippered by Capt. Leslie Thuet, was chartered to sail from Mazatlan, Mexico, on June 4. The Malibu is a twin screw, 100-foot boat fitted with excellent navigational gear and is extremely seaworthy. Even so, the Pacific tossed the Malibu about like a cork in a mill race.

On May 30, WØUQV at the wheel of his grossly overloaded station wagon, and accompanied by WØEIV and WØAIW, weighed anchor in Kansas City, bound overland for Mazatlan. The vehicle somewhat resembled its western predecessor, the Prairie Schooner, except possibly for the “putting” gas-powered generator mounted on the top luggage carrier and one of the Rangers and 75A4s mounted in the rear compartment, ready for mobile operation. All of the other various gear was somehow wedged in the remaining spaces, which was rather miraculous considering the displacement of WØUQV himself. The equipment selected for the trip consisted of a pair of Ranger-75A4 combinations powered by two PE214B generators. The generators were generously loaned by the Johnson County Radio Amateurs.

On the beach at Socorro, in front of the "shack"—WØAIW, WØUQV and WØ0JW (l. to r.)


**Plaza Time Bldg., Kansas City, Missouri.

QST for
These are the land crabs that launched the counter-attack. This black-and-white reproduction doesn't do justice to the brilliant colors in the 35 mm slide sent in by W9A1W.

The Captain was not long in acquainting everyone with the fact that this volcanic island group was particularly unsavory weatherwise at this time of year. Chubascos, the Mexican term for hurricanes, of unpredictable violence seem to swirl about these islands during the summer months with an average frequency of one about each 10 or 12 days. Landing facilities and shelter from these storms were said to be particularly meager. Also, the surrounding waters were rather copiously infested with Manta Rays and sharks of various sizes, types and ravenousness. All of these facts were to be verified beyond all doubt.

Mazatlan, the Pearl of the Pacific, is the largest west coast port of Mexico. Its picturesqueness was amplified in the brilliant afternoon sun as the Malibu set out on June 4, passing in turn, elements of the Mexican Navy, charter fishing craft, and small skiffs much farther at sea than caution would dictate. The passage to Cape San Lucas at the tip of Baja California was uneventful and smooth, allowing continuous operation of XE4A, maritime-mobile. Near the Cape, sea life was everywhere in evidence; marlin could be seen finning and leisurely sunning themselves. Two of the marlin struck trailing handlines, promptly breaking off the fishing gear and suspending all ham operations as everyone watched their graceful leaps for what seemed like miles astern. Giant green turtles, sharks, and fishing birds were likewise abundant. After a brief pause at Cape San Lucas to accomplish necessary formalities with the Mexican authorities, the DXpedition put out into the Pacific late the afternoon of June 5.

Immediately on rounding the Cape to the seaward side, the heretofore tranquil Sea of Cortez became the not-so-peaceful Pacific. Spray came aboard and the ship lurched rather unpredictably, necessitating the removal of all radio gear from the fantail to the aft cabin and the rerouting of the generator cables and antenna lead which descended from the boat deck above. This was accomplished rather rapidly but not without jeopardy to the equipment due to the inadequacy

This is operating position number one at XE4A. The body in the background is unidentified.

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of landlubber legs which poorly anticipated the aquatics of the ship. Actually, the next 24 hours of open sea passage to the islands were so rough that marine operation was accomplished only by placing all of the gear on the cabin floor and operating from a prone position. Even so, speakers, logs, personnel, and equipment were rather loosely coupled to the surrounding fixed objects of the cabin.

San Benedicto Island was sighted early in the afternoon of June 6, but could be seen only as the ship created the very large swells which had prevailed during the past 20 hours. Approaching the island, it revealed itself as a very blunt, low-lying cone of gray and black stone entering the sea by precipitous palisades against which the unrelenting onslaughts of the sea seemed to have made no impression. Its visage was distinctly forbidding and barren of any vegetation. From a blunt peak of several hundred feet it seemed to reach down to the sea in curving redundant folds of black lava, broken here and there by fissures and crevasses into which the sea pounded, forcing beautiful geysers of fine spray 50 to 100 feet skyward. There was no shelter, no harbor, no beach, only magnificent desolation. Contemplation of the island was interrupted by activity of a major nature on the trailing handlines astern which were undergoing a vicious attack by several large and beautiful Wahoos. Three measuring five and one-half feet in length were boated with some difficulty. Socorro, 32 miles to the south, was not yet in view.

Some interesting medical problems arose on this overwater passage. The two main ones presenting themselves were the well known turista and mal-de-mer. W9IEV, W9EIB, and W9AIW stoutly contended they were impervious to both maladies though the best medical consensus was to the contrary. The medicos (Lipscomb, White, and W9MAF) were in a fair way to judge but in a poor way to administer to suffering hamhood since they were obviously afflicted with at least the mal-de-mer. W9OJW was strangely mute which attested to his degree of disease, and young Mike, now the cabin boy, simply didn’t feel well. All this time, the deplorable status of the ailing medico was being transmitted to all listening ears via the A3 being emitted from XE4A/MM. W9UQV presented a knotty problem inasmuch as he professed the “reverse turista” and pleaded for medical relief.

Socorro became a reality about 3 P.M., June 6, as a low-lying blur above the horizon. On nearing

The Malibu anchored at Socorro, with the inaccessible peaks in the background.
the approach, the 4,000 foot peak of the island became apparent though its summit was obscured by clouds which were ever-present. The overall impression of lush emerald green was a decided contrast to the rocky and barren appearance of San Benedicto. Seeking a safe haven for the Malibu, the Skipper spotted a small opening to the northeast which afforded entrance between jagged, menacing rocks protruding from the rough sea. With the aid of the electronic depth recorder, he adroitly maneuvered all 100 feet of the Malibu into this semi-sheltered cove and dropped anchor.

Meanwhile, furious activity was in progress aboard as W9LEV, W9OJW, W9UQV, and W9AIW prepared for the electronic assault of the island. At the head of the cove was a semi-lunar strip of steep beach about two city blocks long and flanked by rugged sea-rounded rocks inclining to impending cliffs. A skiff was quickly lowered overside and loaded with equipment while crab army. After dark, literally thousands of dinner-plate size, brilliant orange-colored land crabs descended upon the operating tent from the surrounding hills and mountains, being attracted by who-knows-what. This necessitated a constant vigil by the machete detail who discouraged the invaders with difficulty, but with considerable Carnegie. For peaceful radio operation, the “crab patrol” had to mobilize and function hourly during nighttime operation.

With the crab population reduced, at least locally, to a size of competitive decency, radio contacts continued at a furious pace. The skiff was almost constantly plying between the Malibu and the beach, reinforcing the radio garrison with fuel for the generators, food, water, and operator replacements. After the first day of activity, the off-duty operators took time off for sleep, limited exploration of the island, or fishing as inclination dictated. Further circumvention of the island by motorboat verified that Socorro is no place for a

all onlookers held their breaths, as even the bay was not entirely calm.

The landing party immediately perceived upon reaching shore that the choice peak which flanked the beach was unattainable by reason of dense low-growing cacti, briars, and other flora, all abundantly armed with stinging equipment. A later attempt on this small peak returned medicus Lipscomb and White to the beach, bowed and bleeding to mid-thigh.

Wishing to begin operation immediately, the beach site was selected and the tent quickly pitched, although the tent stakes would not hold in the sand, and volcanic rocks had to be substituted for stakes. The antenna masts were constructed from remnants of an old shipwreck and two long wire antennas, 275 feet long, were strung about 30 feet in the air. By this time, darkness had intervened, but XE4A was ready for operation. A short CQ was promptly answered by W6DZ2 and the c.w. fracas was off to an excellent start.

The steady grind of several QSOs per minute was well under way when the first counter-invasion was begun by the Socorro Island land-based tourist of the pleasure seeking type. Actually, the anchorage which the Skipper found was the only semi-protected one around the entire periphery of the island. The sole population seemed to consist of crabs, lizards, and a few wild goats.

From the Malibu, myriads of exotically colored fish were observed through the clear water of the cove. Pompano, groupers, parrot fish, grunts, triggers and an occasional small shark seemed voracious and were caught with great facility from the deck. Fishing off shore from a motor launch was a matter considerably different. Here the seas were continuously rough and the fish large, speedy, and durable. Wahoo and tuna predominated though many other types were raised. This off shore fishing was accompanied by some hazards. It was quite difficult on occasions to boat a fish at sea before the sharks attacked and either removed all of the hooked fish, or reduced the residue to shreds. This spectacle admittedly discouraged even the more avid fisherman.

XE4A operation continued at a mile-a-minute clip until the afternoon of June 9. At this time (Continued on page 180)
Ham Vacation à la W3VKD

One frosty morning last January, Art Lewis, W3VKD, accompanied by his XYL and 10-year-old daughter and equipped with a fistful of airline tickets, trolleyed off to the Caribbean. The move climaxed some 5 months of planning. Art’s objective was threefold: (1) to provide the W/VE gang with DXCC help and contest multipliers by operating from 4 countries during the 22nd ARRL International DX Competition; (2) to visit as many on-the-air amateur friends in the Americas as possible and, where regulations permitted, to operate their stations; (3) to indulge in some plain, old-fashioned sightseeing.

Highly successful, the trip took the Lewises around the West Indies, Central and South America, to these 23 countries: VP5 (Jamaica), HHI, HI, KP4, KV4, VP2 (Lewards), FM7, VP4, VP3, PZ1, FG7, YY, HK, HC, OA4, K2S, CO, TT, YN, HR, YS, TG9 and VP1. At almost every stop the “red rug” was lavishly unfurled as delegations of enthusiastic amateurs showed up at airdromes to whisk the W3VKDs to especially-arranged club meetings, banquets of native cooking, radio shacks or local landmarks.

Back home again in Indiana (Penn., that is!), Art fondly thumbed through his Kodachromes and tangles as he recalls the hospitality accorded him on the ten-week whirlwind journey. He urges that any wanderlusting ham due for a vacation investigate the thrill of being the cause of a pileup, and suggests that would-be travelers obtain New Horizons, available at any airline office, for currency, customs, passport and other tourist information.

“Then write some letters and try your luck at meeting some of the DX gang face to face, or in OA4AT’s words, ‘QSO cara a cara, pecho a pecho.’”

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Calls of the 20 stations operated appear prominently on face of “W3VKD on vacation” card, 2000 of which were mailed to QSL Bureaus on May 19th.

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Above: Widely-known aficionados abound at this Lima Radio Club meeting. Front row — Secy. OA4AT, Vice- Pres. OA4AV, W3VKD, OA4CM (first YL to obtain a Peruvian license). OA4H, OA4AO, SWL; second row — OA4AH, President OA4B (just re-elected for 26th consecutive year), SWL, Treasurer OA4DE, SWL, OA4A; on stairs — Club-paid decor. Lower left: Welcoming committee at Point-a-Pitre consisted of entire Guadeloupe ham population, namely FG7XB and FG7XA. Center: Martinique half session starts. FM7WP, FM7WD, FM7WF and FM7WN. Milo, FM7WF, chauffeured Art, precariously perched on rear carriage of motorcycle, from station to station. Lower right: W3VKD in action at PZ1RM in c.w. period of ARRL DX Test. Other contest week ends were spent at VP1SD, HC2OM and 5 FM7 rigs.
CONDUCTED BY ROD NEWKIRK.* W9BRD

Whoa:

We bumped into an old friend the other day, one Sunspot Sam McSquagg. Sam moves in rather eccentric ham circles but we weren’t quite prepared for the weird yarn he spun in response to our usual “What’s new, Sunspot?” Sam looked around furtively, established the absence of kit-busters, and proceeded in a voice not far above a whisper.

It seems that Orson A. Roundalot, the hottest DXperimenter among the old gang, had been doodling around with a variety of midget indoor loop antenna configurations. His shack, normally a maze anyway, was really making like The Web. He was continually rearranging one particular 14-Mc. loop circuit, striving for lowered Q, when suddenly he hit something. Hooked to his rig, that small jumble of copper began to load as smoothly as a wide-spaced one-element beam.

Orson immediately switched the thing onto his receiver, slid between the phones, and tuned in an $7 FWS. He swung the loop a bit to establish its directivity, and the signal appeared to drop out. It didn’t fade out, though; it was now blocking his receiver. Orson next switched to his 8-element 80-foot-high rotary for a comparison. He found there just wasn’t any. The FWS was barely audible on the big beam!

Using the loop, Orson gave the FWS a shout, raised him, and was forthwith accused of being a Wallis Island bootlegger signing, of all unlikely things, a W call. He QRT’d before fully explaining things to the FWS, however, for he noticed a smoking black hole in the shack wall, drilled right through the “D” in his treasured 2DSSC QSL. Obviously this practitioner had radically no lobe width — it was as sharp as a needle, with enough forward gain to rival a Buck Rogers disintegrator!

Like the true scientist he was, Orson Roundalot grabbed a pencil and began to log details of this epochal experiment. Subject, date, time, weather, band conditions, dimensions —

WHAM!! The whole works vanished before his eyes in a puff of smoke and flame, leaving only a residue of molten copper and the stench of vaporized insulation. Gone! Where? Why?

When Orson’s hearing returned to normal he detected key clicks rattling the remains of his headset. It was Sunspot Sam McSquagg, calling his usual prebreakfast series of $QS DX. And Sam’s QTH, just three blocks away, lay directly on line between Orson’s location and FWS.

“Yeah, I guess I did it,” moaned Sunspot Sam.

“But how was I to know? Orson’s taking it hard. Can’t recall the hook-up. Plays cat’s cradle all day long with No. 14. Mebbe it was for the best, though. He mighta killed somebody with that darned thing.”

Either that, or won next year’s ARRL DX Test with a 6C5.

What:

What a summer 1956 has handed to the world of DX!...

1) Conditions the best in years — “NS” at times, according to the Bureau of Standards — despite usually became W7 K 4.7 propagation, 2) DXpeditions by the faithful; both St. Martins, the Comoros, Aves Island, the Revillagigedos, Easter Island, San Marino, Liechtenstein, Monaco, Luxembourg, plus immediate Zanibar, Seychelles and Nauru DXcursions. 3) Accelerated liberalization of Russia’s world-wide ham QSO policy, permitting generations of new DX hunters to score their initial U.S.S.R. contacts.

Ever since U6Ba broke a four-year precedent by QSOing Yania early last year (see p. 63, September 1955) QST your reports to “How’s” have documented an increasing relaxation of the long-constricted Iron Curtain QSO pattern. This summer’s output of U-WK communication, fired across the entire polar perimeter from UN1 to U6AR, is a flashback to the postwar 1940’s when QSOs and QSOs from 18 of the 19 U.S.S.R. DXCC entities were available for the calling. Now how about a DXpedition of U operators to Wrangel Island, rarest of the bunch? [Does, comes a drag on that before you throw it away. — Jssrz.]

20 c.w. frequencies were overrun by signals from U6A

AM AD BI BJ BD KH KAB KAI KAO KBB KKA KMC KIA UQ, U4A4 AF BE BN CR EG ER FG KAA KAH KBA MD TT VB WZ, U4A4 FC FE KCE KCC KLE KNA KPA, U4A4 UI UR, U4A4 CC CR DA DB DN KAB KBA KCA KKA KJ KOB OG VB YF, U4A4 AB AF AG CN DN KAA KAB KKA KKC KCH KFC KJA KKB OM RA KJ, U4A4 BB BP CA CI CR CW ID KAA KAB KAD KAK KCR KKK KEP UR WD WF, U4A4 AA AB KAB KAC KAK, U4A4 AF RM, U4A4 AM VP KAB KPA, U4A4 KAA KAA KIA, U4A4 KAA U4A4 KIA, U4A4 AA AO KAA UA, U4A4 AF YK, KPS, U4A4 AN AS KAA KAO, U4A4 AK and KAA.

Kazakhstan, Kirghizia, Fridtjof Nansen Land and Wrangel Isle are the only Russian DXCC areas not reported worked. U4A4s and U4M4s are said to be active, however, and F.N.I.

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* 1822 West Berent Avenue, Chicago 41, Illinois.

1 Apparently Mr. Roundalot managed to invert the field pattern of a small loop. In such case the usual broad-lobed sharp-null characteristic would be transformed into its reciprocal. — Ro.
The ham career of IICW goes 'way back to collaboration with Marconi aboard radio yacht Electra. Giovanni's present hamshack breaths sunny Italy particularly because his station is located at the Italian government's Telespazio meteorological observatory where the OM studies electromagnetic wave propagation. IICW is a past president of Italy's radio society and a counselor of ART, Ham hi-fi enthusiasts of classical bent will be interested to know that Mario Del Monaco, singer of tenors for the Met, is IICW's son-in-law.

...can't be far behind, Wranere? Well, better not pass up any G8As ... Such transarencies are...
Where:

Encouraging augury this August: Russian amateurs are talking Box 88, Moscow, once again. Your WRRL QSL Bureau watchfully holds Box 88 exhalations. Meanwhile, some U stations still specify RSCB, DARC, PZK and other bureaus, a few distances away. And others murmur SRI NO QSL... Signal Section, HQ, SIRF, Army, 108, New York, N.Y., has on file stacks of QSLs belonging to Army personnel. Ask them to forward stamped self-addressed envelopes to that address before back calls must be liquidated. This word from 144 HJ, ex-ORISL AL, OMAHA, Neb., when heard in Cleveland... On the same plane, a plen from 144 HJ. WTJW says he is the new QSL manager for 144 stations and currently has 1444 cards to return to the States without leaving forwarding addresses. I urge these operators to send self-addressed stamped envelopes to the 144 HJ QSL Bureau, 144 HJ, Rochester, New York, N.Y., to claim their cards. Ray also stresses that a single DX card may be mailed with several operating positions and a variety of addresses, so the longest delay of your required-board QSL bureau is via his bureau. DX8Y manages a bit of DX activity at least daily on 20, 15 or 10 meter... From ZS1T, SARL proxy: "QLS confirming contact with ZS8AM in future will be issued only when a card from the other party in QSO is received. The ZS8AM cards will be made out by the department of the South African government upon receipt of the required..."

VTZDC, thoroughly worked on hands 20 through 6 meters, is home-constructed throughout. His rooftop rotary is a 10/15/20 meter of phunolifer-delight design and the tower, too, is homemade. Jose, more familiar to veteran DXers as old L12UAJ, has scored radiophile WAS and veriges on climbing his vocal DXCC...
FSPO, New York, N.Y. ... VP3WO, Shemuel C. Wong, 26 Pennsylvania Ave., Long Beach, Calif. ... VP4BN, E. E. Siegel, VE2EBN, 26 Gamble Ave., Toronto, Ont., Canada. ... VP9Y, Jim Amos, Pits Bay Rd., Hamilton, Bermuda. ... VE3K, Phil Palmer, English Harbour, Fanning Island. ... VR3D, Chas. H. Freeman, c/o So. Pac. Airlines, Honolulu, Oahu, T., H. ... V8SEL, K. R. Seacombe, Chief, F.A.E.R. Ltd., Singapore. ... VS1HH, C. C. Smith, No. 2, Seta, Masa. R.A.F. Selatar, Singapore. ... ex-VE3SEL (QLS to V8SEL) ... VS5PA, R. H. Phillips, Mangrove Estates, Eliza, Johore, Malaya. ... VS2FB (QLS to MARTS). ... V84B0 (QLS to MARTS). ... W50XJJ/MM (QLS to W5QXJJ). ... ex-W4EA (QLS to W50XJJ). ... W6COI/MM (QLS to W6COI). ... ex-YM1PC-HP1ZZ (QLS to HG3PO). ... YV5R6A (QLS to CV6) - YUN0 (QLS to S6). ... ZS2B (QLS to CV2). ... ZS2B (QLS to CV2). ... ZCSSF, G. Harrison, SP5KAB, Central Radio Club, Warsaw, turned in one of the more impressive European scores in ARRL's 1956 International DX Competition. That's an AR-88 receiver and the operator is 5PSAR.

Box 222, Sandalsan, No. Borono ... ZD2ROG (QLS via ZD2SCP). ... Z9BY (QLS via SARL). ... ZSPSH, USA/Pf. Frazier c/o U.S. Embassy, Bangkok, ... ZS5MI (QLS via SARL). ... 3W8A (QLS via O8KRF).

Whence: Asia — MP14AQ, a rare rather familiar catch on DX bands since he fired up in early '55, can throw no light on the status of MP40 other than that the call is unofficial. Ferguson states further: "My MP40 countries total is 228 with about 90 confirmed and I'm keeping my fingers crossed. I'll continue RF for good in June and will continue to my home location in Dublin." From GM3BN comes a clipping announcing the marriage of ex-AC4RF, Bob Ford, of unpleasant Red Club prison memories, to a British girl of long acquaintance. Another good for certificate classes: WTPFRAS (Worked Twenty-Five KA Stations) sponsored by EARL. Any 20 KA combinations will do the trick, but check with Awards Mgr., EARL, P.O. Box 111, APO 500, San Francisco, Calif., for full details before sending QSLs. According to CARARRA's Multiview Radio Amateur, only eight 487s have 100-watt permits (487s AE DJ (87 KI MG MF) and MG included) and the remaining 50 licenses rate 20-watt inputs. Also, YS8A and CG carry out DX experiments with two-band cubical quad; both QSLs were licensed back in '39. VB6PG wishes us to know that "Australians among Hong Kong amateurs. - - To W6YY, C'RAHH reports a pair of brand new Macao workables signing CR4B6K and CR8AL. That makes it an even half dozen D4's from those. - - From VS4BA via W6YY: "At present my transmitter is on a small chassis about 90x6 inches, having c.o., 750 and 500 M. input. My transmitter is 800 watts at 500 M."

That's the South Seas side for who wants to sign QVO1 on Zanzibar (p. 49, July QST). QRV. ... More from W6YY's bristling tile, from ETSIAH: "I'm to get a new key and a new P&O. Vilding and Windham should do real good." Frank occasionally is troubled by leopards lurking on his lawns. ... ZS7F puts the finishing touches on all vacuums and reserves neighbor ZS7C digging for W6A, ... 2Z3s A and BFC shut down for U.K. holidays for several months, effectively silencing Gambol possibilities for the summer. ... CR7CO reports the probability of stronger CR7 signals henceforth, for some Mozambique power facilities are switching from 250 volts d.c. to 240 volts a.c. ... According to ZS1TR, the new ZS2MT QSL is a real collector's item. "Green and gold, of the folded type, including a pictorial map of Marion Island."

Everybody talks about those brawling 20-meter piles up but CTI1N is among the few who do something about 'em. Frank, an armorman in the Portuguese Army, suggests this technique as defense against an e.t. barrage. (Photo via W2B1S)
REGION I CONFERENCE

The Second Triennial Conference of IARU members in Region I was held in Stresa, Italy, on June 12–16 under the sponsorship of the Associazione Radiotecnica Italiana. About forty official delegates from 14 countries were present, and three other societies were represented by proxy. Present as observers were W1BUD, IARU and ARRL Secretary, and W1LVQ of ARRL.

R. G. Hammans, G2IG, president of the Radio Society of Great Britain, was elected chairman of the conference, after welcoming speeches by Sig. Roberto Sesia, I1FA, president of the host society and President of Honor of the conference; the Mayor of Stresa; the head of the Tourist Office; and Capt. Per-Anders Kinnman, SM2ZD, president of Svenska Sandare Amatörer and chairman of the Region I Executive Committee.

The first session was devoted initially to the organization of the conference and to receiving the reports of the officers and of the Executive Committee. Jean Lips, HB6I, was elected chairman of the Administrative Committee and H. A. M. Clark, G6OT, chairman of the Technical Committee. After discussion, it was decided that it would not be necessary to send a delegation to the CCIR meeting at Warsaw in August. A number of recommendations by the Executive Committee dealing with routine business matters of the Region I Division were acted upon.

It was voted unanimously to send delegates to the next ITU Convention. A considerable fund has already been set up to cover the expenses of IARU representatives from Region I, and additional contributions to the fund were voted later in the meeting. The Executive Committee was authorized to appoint delegates when the time comes.

The Executive Committee presented a draft of Rules for the Region I Division of the International Amateur Radio Union. After discussion, the Rules were adopted with a few minor changes.

The next two days were devoted to meetings of the Administrative and Technical Committees, each of which forwarded recommendations to be acted upon at the final session. On Friday, the delegates and their wives and families enjoyed sightseeing tours, a banquet and a ball arranged by the host society.

The final session was held on Saturday. In connection with the problem of non-amateur stations in the amateur bands, the group adopted a standard form for reporting such stations. It was decided to limit reporting at first to broadcast stations and identifiable commercial stations with a wider range of monitoring to follow after the societies and their members have gained experience. The conference urged occupancy of all the amateur bands by all amateurs to discourage “squatters’ rights” use of the bands by non-amateurs, but they disapproved of tactics involving deliberate interference to legitimate stations sharing the 80-meter band.

The delegates commended the growth of reciprocity in licensing, especially among European nations, and expressed the hope that work in this direction would continue. The Administrative Committee had discussed the possibility of Region I amateurs getting temporary permission to use the 50–54 Mc. band during the present part of the sun-spot cycle, but the chances appeared most remote since TV is operating there in Region I. The French and Russian amateurs already having a segment at 72–72.8 Mc., it was agreed that other Region I members seek privileges in that segment. An extensive paper submitted by the Savce Radiomamatera Jugoslavije, concerning ways of increasing comradeship and good will among amateurs, is to be studied in greater detail.

The assembly also urged that more emergency networks be set up. This action followed reports (Continued on page 18.)

Delegates from fifteen nations assemble at the Grand Hotel in Stresa.

August 1956
Open Letter to OMs

The following is typical of a number of letters received by this department during the past few years. We are aware that sometimes the subject can have more serious aspects. We hope that in all cases the matter may resolve happily for those involved.

Dear Miss Wilson,

What can I do to interest my wife in amateur radio? I've tried everything but nothing seems to make her want to become a ham. Any suggestions you can offer will be greatly appreciated.

Yours truly,
OM

Dear Wifeful OM,

You do have a problem. Do you?

Let's see — you are an avid ham who thinks, lives and dreams amateur radio, and you simply can't understand why anyone, much less your wife, would decline to join you in the world's most fascinating hobby! Thus far your wife has preferred to be an adoring, dutiful spouse whose first concern is your comfort. Now you would like her to become a ham too. Are you braced for the possible consequences?

All too true experiences reveal that often when a wife becomes a ham, the husband loses his own identity and becomes recognizable only as Mr. (insert wife's call here). Coincidentally, said male often suffers other ego-deflating setbacks such as development of an acute infirmity complex resulting from the little woman's supremacy in the fields of QSL and certificate collecting, DX, etc.; forfeiture of rights to his own rig; sharp increase in the number of his household chores; and other complications too numerous to go into. Your very way of life may be recast. Still think you want your wife to get her ticket too? Okay, but never forget, you asked for it.

Here are some stock don'ts and dos which may or may not work for you. (Every wife is different, you know, praise be.)

Don't push too much or you'll be sure to push a hair too far, and that will be that.

Don't try to make her do anything she doesn't want to; she won't anyway so save your energy.

Don't throw at her all at once all of the radio theory you have picked up over the decades.

Don't read the Handbook to her word by word, or you'll be drying away tears of confusion pronto.

Don't hold other Y Lis as shining examples of accomplishment. Granted, some competition is stimulating, but this type has delicate implications and may boomerang.

Don't bark and wring your hands in despair when she forgets for the ninth time that E = IR.

Don't threaten divorce or beat her; the latter is probably against the laws of yourAnyway.

Do develop your patience along the lines of Job. Gentleness, understanding, and encouragement are clues to winning any woman in any situation.

Do take things in short easy doses. Perhaps the kids and the neighbors' dogs have given her a hard time all day. Take her out to dinner first — homework will come easier after that.

Sincerely,

WIQON

P.S. It's Mrs. W., thank you, and the OM has taken to radio control of model planes and boats. No problem over whose turn it is at the rig now.

Some one hundred guests enjoyed the third annual Open House of the Chicago YLHL on June 2 at the club's rooms in Gumper's Park Field House. In the picture the unit's Vice President June Todd, KSCQF, is demonstrating two meter equipment of the club station, W9DEO, to visiting OMs W9BWM, W9UZ, SCM W9YXR; ARRL communications manager W1BDI; and W9KLB. OMs W9UQT, ARRL Central Division Director; EC W9HPG, and W9KA were present and also spoke briefly. Y Lis who participated in the program were W9s BOC, COF, GME, KFC, LKD, QV, QXI, RFC, SEZ, SIR, SSI, STR, UON, WZL, and YIC.

WAC-YL YL Firsts

The first YL to receive the Worked All Continents-YL certificate, issued by the YLHL, is VK3YL, Mrs. M. A. Henry of Murrumbeena, Victoria, Australia. Ten OMs preceded Mrs. Henry to the prized award.

With the receipt of award No. 12, multiple DX certificate-holder W9UHA, Maxine Willis, of Los Angeles, becomes the first W YL to make the grade.

Custodian of the WAC-YL, Opal Jones, W9PCA, brings the complete list of award holders up-to-date: No. 1 — W2QHII; 2 — ZL1BY; 3 — G4SU; 4 — C5EAW; 5 — VR3CZ; 6 — JA1AA; 7 — G3DO; 8 — PY20E; 9 — W8JH; 10 — W6DL; 11 — VK3YJ; 12 — W9UHA; 13 — W9GP; and 14 — UIJCA.

More OK YLs? — Cleared from the English translation by W3AZ of the editorial in the May, 1959 issue of the Czecho-Slovakian magazine, Amaturska Radio: "One of the more immediate problems to be discussed by delegates to the first convention of the Swazarm, a top organization of Czech hams and other related groups, to be held in Prague May 25th will be the question of how to recruit more Y Lis.
or ham radio, and thus for the communications set-up of the Swanvan.

Perhaps the foregoing don't's and do's may aid the Swanvan in their recruiting program!

From South Africa — Another quote from a periodical which we consider has real merit. As part of her editorial in YL Beam, April-May 1956 issue, published by the South African Woman's Radio Club, Editor Marie Cornack, ZS6KKS, has written:

"The exchange of lengthy recipes forms, if one has to judge by the reports in the newspapers, is the main topic of conversation between YL operators. Now although this may happen occasionally and there is nothing seriously wrong with it, I fail to see why this aspect is always highlighted in the newspaper articles."

YLs, don't, after all, discuss recipes only, and if publicity is to be given then why not enlarge on the other interesting and factual aspects of Amateur Radio -- how exciting it is to contact people all over the world, how many true and lasting friendships are made, how interesting it is to hear about other lands, their way of life, and about everyday occurrences, the weather, the occupation of the operator at the other end, the different contests that are held, and the certificates which are offered for operating skill. Things like hams planning expeditions to remote islands to set up stations in order to give other hams a chance to establish contact with yet another country, the correlation of propagation conditions, and finally, the sterling assistance given by overseas hams to their local authorities in times of disaster, such as floods, hurricanes, etc. -- are the things which should be given prominence and which will increase the prestige and give the true picture of the activities of the Ham."

Marie has served us some of the proverbial good food for thought.

The following item about the YLs who attended the 1955 Edison Radio Amateur Award Presentation dinner in February comes very late; nevertheless, we think it's still of interest.

W2ZJX and W3S AKB, CDQ, MSU, and RKJ were the five YLs who were invited to attend the impressive ceremony honoring Robert Gunderson, W2JHJ, for "his great service in opening the field of electronics to the blind as an occupation." Before the dinner, Under Secretary of State, Herbert Hoover, Jr., W6ZIJ/KF4EH, specifically asked for Liz Zandonini, W3CDQ. The two chatted about days bygone and later during his formal speech, Mr. Hoover reminisced: "I remember that during those early tests I got permission to put up an antenna on the top of the old Bureau of Standards building out on Connecticut Avenue and to use their storage batteries to power a homemade rig. The signals from 3Z9 (Liz' first call) were reported in Scotland along with many others to the complete amazement of the whole staff, including myself. Miss Zandonini, who is here, was out there with me at that time and it raised a lot of memories when I began to talk with her about this evening."

From W8QOM comes a special letter of praise for Father, W8ATB, and her husband W8QBO. Anne relates how the Stewees again gave selflessly of their time, energies, and radio facilities to the people of Flint, Michigan, when the city suffered a second tornado disaster this Spring. In 1953, following the first Flint tornado, the Stewees assisted similarly, only in the newest disaster, they suffered considerable personal loss to their own house and garage. For more than 40 hours Ester and John worked without sleep to do what they could for the city radiovan. A job well done.

Can you add any others to our list of YLs who are Registered Nurses? If so, please let us know. W7s TRE, W2EX; K2INQ; W6FBM; W7s OLP QYL; W8SBX; W8FDAT; W8UVV, and W8YKJG.

You're looking at the largest group of YLs ever to get together in Oregon. The occasion was the annual convention of the Oregon Amateur Radio Association at Eugene, May 5th and 6th. Gathered for a business meeting, those in the photo are, seated left to right: W7a SJS, ZKY, WDC, UEL, OKU, IIIH, ZLT, ENU, CPY, ITZ, SCP, GLV, Standing, W7a WTK, SPA, YHO, ZLS, GLK, FKs; K6CXZ; W7s QWX, VLG, RAX; WNTJIC; Lena Westom; W7s SBX and GLY. Six girls who eluded the photographer were W7s AEF, NJS, NTT, RIC, SJW, and WNTDLK.
ELECTION NOTICE

To All Full Members of the American Radio Relay League Residing in the Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern and West Gulf Divisions.

An election is about to be held in each of the above-mentioned divisions to choose both a director and a vice-director for the 1957-1958 term. These elections constitute an important part of the machinery of self-government of ARRL. They provide the constitutional opportunity for members to put the direction of their association in the hands of representatives of their own choosing. The election procedures are specified in the By-Laws. A copy of the Articles of Association and By-Laws will be mailed to any member upon request.

Nomination is by petition, which must reach the Headquarters by noon of September 20th. Nominating petitions are hereby solicited. Ten or more Full Members of the League residing in any one of the above-named divisions may join in nominating any eligible Full Member residing in that division as a candidate for director therefrom, or as a candidate for vice-director therefrom. No person may simultaneously be a candidate for both offices; if petitions are received naming the same candidate for both offices, his nomination will be deemed for director only and his nomination for vice-director will be void. Inasmuch as all the powers of the director are transferred to the vice-director in the event of the director's resignation or death or inability to perform his duties, it is of as great importance to name a candidate for vice-director as it is for director. The following form for nomination is suggested:

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

We, the undersigned Full Members of the ARRL residing in the Division, hereby nominate as a candidate for director; and we also nominate as a candidate for vice-director from this division for the 1957-1958 term.

(Signatures and addresses)

The signatures must be Full Members in good standing. The nominee must be a Full Member and the holder of an amateur license, and must have been a member of the League for a continuous term of at least four years at the time of his election. No person is eligible who is commercially engaged in the manufacture, sale or rental of radio apparatus capable of being used in radio communications, or is commercially engaged in the publication of radio literature intended in whole or in part for consumption by radio amateurs. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon EST of the 20th day of September, 1956. There is no limit to the number of petitions that may be filed on behalf of a given candidate but no member shall append his signature to more than one petition for the office of director and one petition for the office of vice-director. To be valid, a petition must have the signature of at least ten Full Members in good standing; that is to say, ten or more Full Members must join in executing a single document; a candidate is not nominated by the petition bearing six valid signatures and another bearing four. Petitioners are urged to have an ample number of signatures, since nominators are occasionally found not to be Full Members in good standing. It is not necessary that a petition name candidates both for director and for vice-director but members are urged to interest themselves equally in the two offices.

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

Voting by ballots mailed to each Full Member will take place between October 1st and November 20th, except that if on September 20th only one eligible candidate has been nominated, he will be declared elected.

Present directors and vice-directors for these divisions are as follows: Central: Harry M. Mathews, W6UEQ, and George E. Keith, W9QLZ; Hudson: George V. Cooks, Jr., W2CNY, and Thomas J. Ryan, Jr., W5NXY; New England: Philip S. Rand, W1DBM, and Clayton C. Gordon, W1HRC; Northwestern: R. Rex Roberts, W7CPY, and (no vice-director); Roanoke: P. Lariel Anderson, Jr., W4MWH, and Theodore P. Mathews, W4J; Rocky Mountain: Claude M. Maer, Jr., W5IC, and Walker M. Reed, W9WRO; Southwestern: Walter R. Jones, W6ERKM, and Robert E. Hopper, W6XUY; West Gulf: Robert E. Cowan, W5CF, and John F. Shelton, W5MA.

Full Members are urged to take the initiative and to file nominating petitions immediately.

For the Board of Directors:

A. L. BUDLONG
Secretary

July 1, 1956

Strays

Several years ago, as part of its long-time and continuing policy for gaining suitable newspaper publicity for amateur radio, the Headquarters wrote a publicity manual for amateurs and included therein a number of sample press releases. This material is distributed to the League’s 700-odd affiliated clubs, and reminders are sent out ahead of special events such as Field Day and the like.

Now, in order to avoid confusion, we had picked (we thought) a non-existent club name and some other individual and place names that seemed quite innocuous. Our sample (and supposedly fictitious) Field Day press release was built around a “Catalpa Amateur Radio Club” operating from “Bald Mountain” and with a secretary named “Smith.” But look what has happened this year! That press release caused considerable confusion in the Catalpa Amateur Radio Society (Michigan), because their president’s name is Smith, and they had almost decided to operate from a hill known as (you guessed it!) Bald Mountain.
THE MAIN PURPOSE of a QST department like this one is to report the goings-on in the field the column serves. It should be your monthly newspaper, in effect. To perform this service effectively the conductor of the department must be in constant touch with the hams who are making the news.

But some fellows simply will not write letters. And the reliable range of v.h.f. communication being what it is, regular on-the-air activity doesn’t give the reporter the coverage he needs, though it helps. If he is to be familiar enough with the v.h.f. picture in all parts of the country to report the news of the world above 50 Mc. with some degree of accuracy and geographical balance, he must travel around the country and meet v.h.f. men personally.

When this is being read your conductor will have just returned from several thousand miles of such travel that will have included the West Gulf Division Convention in Galveston, the National Convention in San Francisco, and dozens of stops along the way in the south and Southwest. A QST deadline will have passed somewhere about the middle of the jaunt, while W1HDQ was /5, 6 or 7.

So, as we have done on a few occasions in the past, we’ve been saving up some interesting v.h.f. ideas that fellows have sent in over the past several months. This issue won’t have dated news, but we hope that you will find it both interesting and useful. Our heartfelt thanks to the v.h.f. men whose brainchild they made it possible.

A 2-Meter Halo — W3SST

Though cross-polarization is not nearly so bad in mobile work as we once thought it would be, it is only natural that a horizontal mobile antenna will be more effective than a vertical whip in working with horizontally-polarized fixed stations. A simple way to build a horizontal antenna for the car is to adapt the W1MUX “Halo” that has been described in QST and the ARRL Antenna Book. The original was intended for 50-Mc. use, but adaptation to 144 Mc., sent in by W3SST, Dover, Penna., is very simple.

The halo is a folded dipole, bent around into a circle, so that its ends nearly touch. The 6-meter version had capacitor plates at the ends of the dipole, to reduce its size to convenient car-top proportions, but this loading is not needed on 144 Mc. A folded dipole 39 inches long makes up into a circle of about 12 inches diameter. This can be mounted in a variety of ways.

The experimental model shown in the photograph was made of No. 14 copperweld wire. Its sides are about a half inch apart, and the ends 1⅛ inches apart. These ends can be fastened to a piece of insulating material about 1½ inches long. The center of the folded portion need not be insulated from the metal support, but the fed portion must be. The horizontal cross member is a piece of tubing about ¼ inch in diameter, flattened and bent over at the left end, as shown in the photograph, to bolt to the insulating material separating the ends of the dipole. The right end of the support is also flattened and wrapped around the top portion of the dipole. The fed ends are supported on two small insulating blocks, though a single piece would serve just as well.

The 2-meter halo can be fed with 300-ohm Twin-Lead, or through a coaxial balun. The latter is to be preferred, as it permits grounding the outer conductor of the coax at any point in its run to the mobile rig. The vertical support for the antenna can be mounted in any convenient fashion, the primary consideration being that it be somewhat above the highest point on the car. Here it is shown slipped over the car broadcast whip.

The pattern of the antenna, mounted in this position, is slightly oval, like a race course, with the long sides more or less parallel to the direction of travel. Some interesting effects can be
observed by raising and lowering the telescoping whip. Stations more than 100 miles distant have been heard on many occasions, in the hilly country of Eastern Pennsylvania. Early in the use of the halo, W3SST was surprised to hear the signal of W2GLY, Glassboro, N. J., at about this distance. He was even more surprised when he got an S7 report from Ernie over a hop of this kind.

W3SST acknowledges, with thanks, the assistance rendered by W3s QEM EDO and OCI in the testing of the 2-meter halo.

**Two-Meter TVI Hints — WIVSE**

There's always something new on the TVI front. You think you know all the answers — and then along comes a new model with some special TVI features built in. Such is one of the 1950 RCA receivers. It has a top-tuning setup that requires long leads to the volume control — and, of course, they would turn out to be almost exactly a quarter-wavelength long at 144 Mc.

WIVSE, New Britain, Conn., ran into a hornet's nest with several of these receivers, the trouble being audio rectification. No picture interferences, but WIVSE and any other 2-meter station within a half mile or so came in S9 on all channels. The manufacturer shielded the volume control leads, but the length being what it is the shielding is ineffective at 144 Mc. The solution was twofold.

First, the bracket on which the tuner and volume control are mounted should be bonded to the chassis with a strip of copper or aluminum about one inch wide. Then the shielded volume control leads should be tied together to the strap in at least three places.

Another suggestion that works with all forms of 2-meter TVI where the interfering signal comes in on the TV antenna: Insert traps in each side of the 300-ohm antenna lead. These may have to go right at the point where the lead enters the tuner, if the field around the TV set itself is strong. The traps are made of three turns of No. 18 wire, about 1/4 inch diameter, tuned with a 3-30 μf. trimmer. These can be tuned up at home by putting them on your own TV set and resonating the traps with a grid-dip meter.

No grid-dip meter? No TV set? You can still do it. Put them in the antenna lead to your 2-meter receiver and null out a strong signal near your regular frequency. If your converter uses coaxial input, use a balun to provide a balanced line in which to insert the traps for adjustment purposes.

**Coaxial Antenna for 50-Mc Mobile — W6OJF**

After experimenting with several types of mobile antennas, W6OJF settled on the coaxial described herewith as the best of the lot, at least where vertical polarization is in general use. It also works out well when the band is open, as is demonstrated by a contact with Argentina during the spring openings, made with a 6-meter Communicator.

The antenna is made from a Master Mobile job with an 80-meter loading coil in the center, using the portion above the coil for the radiator. This should be about 50 inches long for use near the low end of the band. The first step is to disconnect the coil winding from the screw that made contact to the upper portion of the whip. If the winding is tapped firmly in place it can be reconnected at any time, and the antenna used for its intended purpose again.

The skirt of the coaxial antenna was made by slipping braided copper sleeving over RG-59/U coax, to a length of 59 inches. The top end of this sleeve is soldered to the outer conductor of the coax. Scotch electrical tape was then wrapped over the sleeve throughout its length.

The inner conductor should then be connected to the top section of the whip, using a soldering lug that can be inserted under the screw that was formerly connected to the coil winding. The taped-up skirt can then be taped to the bottom portion of the whip, and the whole works mounted in the same way as any whip normally used on lower bands.

As one can never be quite sure what the impedance of a car antenna will turn out to be, feed problems will be reduced if the coaxial line is held to some length that will be a multiple of a half wavelength. When the propagation factor of coax is taken into account, a half wavelength of line at 50 Mc. is about 77 inches long.
Using the T-23/ARC-5 on 220 Mc.

Hundreds of ARC-5 rigs are in use on 144 Mc., a frequency where they work without modification. It's not much of an operation to convert one of the channels to 220 Mc., according to K2GNJ, Moonachie, N. J. Here's how:

He converts Channel D to 220 Mc. The oscillator plate coil is changed to 11 turns No. 24 enamal, 5/8 inch long. The 1625 tripler plate winding requires 5 turns No. 20 enamal, 5/8 inch long. The 832A tripler grid circuit has 7 turns No. 22 enamal, 5/8 inch long. Its plate circuit has 1 1/4 turns No. 20 enamal, 5/8 inch long. The final plate circuit requires 2 1/2 turns of the original coil, 5/8 inch long.

Crystals between 8150 and 8200 kc. are used, providing operation between 220.05 and 221.4 Mc.

Shifting Frequency with Crystal Control

In v.h.f. work we've never worried much about QRN, but the way activity is growing on both 6 and 2 the days of the "private frequency" are at an end, for v.h.f. operators in populous areas. There's a lot of talk about going to v.f.o., and some action, but the results, especially on 144 Mc. and higher bands, are almost invariably awful to behold. Building a satisfactory v.f.o. for v.h.f. use is definitely not easy.

Actually, what we need is not the ability to swish across the whole band at will, but rather to be able to move the frequency slightly to avoid trouble when it does develop. This can be done with crystal control in innumerable ways. A variable-pressure crystal holder that you can rig up for some of your surplus crystals was described by W4RMU in February QST. A two-crystal trick that should be fine for v.h.f. work was shown by W6EI in the same issue.

Another idea that can be adapted to most crystal oscillators is to tune the crystal. W9KLR uses 4-Mc. crystals in his 2-meter rig. With a 30-pf. variable across the crystal he can get 15- to 30-ke. frequency change at 144 Mc. with little or no effect on the overall operation of the exciter. One of the old-style 1-inch square crystals shifts about 15 kc. An FT-243 surplus rock moves 30 kc.

Overtone crystals are more "rubbery" in their reaction to tuning capacitance. W3OFJU uses a 50-Mc. overtone crystal, but operates it on its fundamental frequency, followed by multipliers. With a variable capacitance across the crystal he can pull the frequency a considerable amount at 50 Mc. The degree of frequency change varies from one crystal to another, but it is always more than enough to slide out from under a heterodyne.

W4IKK uses the flexibility of an overtone crystal to advantage in his converters for 6 and 2. An 11-pf. variable across the crystal enables him to tune it so that the receiver frequency calibration works out precisely. Nice tip for one-dial receivers, especially.

Using the Viking II Modulator and Power Supply with Auxiliary Equipment — W9VZP

Possibly other Viking II owners would like to use their power supply and speech equipment to run transmitters for 6 or 2 meters. Here is how it was done at W9VZP. Modifications for remote control are also included. The basic idea is that the plate voltage is applied to both the Viking and the external transmitter r.f. section. You merely light the heaters in whichever unit you want to use at the moment. The meter on the Viking reads the same currents in the auxiliary rig, and all operating features apply on both r.f. sections. Keying in the Viking jack keys the oscillator of the external unit, so special keying arrangements may be desirable on the other rig if it is to be for v.h.f. use.

Remote Control Modifications

1) Remove transmitter from cabinet. Remove large filter capacitor and brackets.
2) Install 4-prong miniature socket on rear apron of chassis. Cut clearance hole for plug in back of cabinet. Connect Pin 1 to ground.
3) Install a 3-terminal tie-point strip on the chassis at a convenient point. Be sure it won't interfere with the filter capacitor when it is replaced.

4) There is a brown wire running to the tie-point near the v.f.o. socket. Run a wire from this terminal to the new tie strip, and connect a 4.7-ah. choke 1 from this point to Pin 2 of the socket. By-pass Pin 2 with a .005 disk ceramic.

5) Wind a choke of 15 turns No. 20 hookup wire, 1/4-inch diameter. Connect another tie point to the back end of the line filter choke, and run the new choke from this tie point to Pin 3. By-pass Pin 3 with .005.

6) Locate orange-and-blue wire on tie point near v.f.o. coax connector. Wire this to remaining tie point and install choke and by-pass between this point and Pin 4, as in previous step.

Check the operation of the Viking with remote control. A d.p.s.t. switch or relay is used to close the circuit between Pin 1 and 2, completing the 6AU6 oscillator cathode circuit to ground, and Pins 3 and 4 to apply the a.c. to the plate transformer primary.

Power Takeoff for V.H.F. Transmitter

7) See previous instructions. Install octal socket on rear apron. Cut clearance hole in cabinet. Install tie points near socket for 5 connections.
8) Remove 4 green wires (2 on each socket) from 6AU6 and 6AQ5 sockets. Twist together and tape. Remove green wires from back end of filament choke on 6146 socket. Twist, solder and tape.
9) Install s.p.d.t. toggle switch on Viking front panel 2 1/2 inches above bandswitch.
10) Run wire from center pole of toggle switch down through grommet above buffer capacitor to...

(Continued on page 128)

1 IRC Type CL-I
NEWCOMER TRENDS

53 South View St.
Waterbury, Conn.

Editor, QST:
The April "It Seems to Us" on "Newcomer Trends" sums up a situation which in part is one of your own making. How many articles in QST can the newcomer or Novice understand? Why not have a column in QST devoted to newcomers?

-- Peter J. Miller, W1AJJ

98 Euclid Avenue
Hastings-on-Hudson, N. Y.

Editor, QST:
In my opinion, W30LU (p. 78 June QST) and others are running their ham radio more as a business than as a hobby. His arguments seem pretty weak. As others have said, we seem to be devoting our skill with the a.c. plug rather than with the soldering iron. The League does a fine job in trying to promote more home construction. What do you think is in QST and the Handbook?

-- Thomas Smith, K4JYX

1519 Main St.
Lexington, Mo.

... Mr. Johnson says that the League has offered little in the way of halting the trend toward commercialization. Leading through my latest QST, I can find little that looks like an equipment catalog.

-- Bob Ball, ex-W7NOV

Bardiff Ave.
Chatham, Mass.

Editor, QST:
I find my feelings much the same as yours regarding the trend to manufactured equipment. When listening to the bands at times it seems as if the amateur bands are becoming citizen bands to a considerable extent.

However, I do think the League is partly responsible. For instance, how many transmitters have been designed by the League staff and published in QST in the last few years which are equivalent to some of the very popular commercial jobs? It almost appears intentional that the League has avoided designs in competition with the manufacturers. The units described in QST never seem to have all the features available in commercial equipment.

I also note that in your description of "Recent Equipment" you seldom publish a complete circuit diagram. Is this done to discourage us from copying some of the manufacturers new ideas?

Let's not blame it all on the manufacturers and newcomers.

-- William C. Ryder, W3JUM

Adams State College
Alamosa, Colorado

Editor, QST:
Help! Am I going to have to turn in my license because I am not a radio engineer? What's with these radio amateurs who look down their noses at those who use commercial gear? They say, "Whatever else it is, it is not amateur radio." Whose definition of "amateur radio" are they using? Does FCC think I'm not legal? ...

... Maybe we should be reminded that we do not all enter the field of amateur radio in our early teens and we do not all have several decades to spend on radio theory; we are not all radio engineers by temperament but that does not mean we cannot make a very solid contribution to the cause of amateur radio through willingness to accept operating in the ARRL field organization and through operating in the public interest. In other words — "FICONI!" Remember?

-- Irene H. Craft, W9KQD

THEY LIKE HIM

2314 Lake Shore Blvd.
Jacksonville, Florida

Editor, QST:
While reading your April article, "A Radical Approach to WFO Design," I found that an trend toward the less interested in radio could, at the first glance, see that it was a good article written for the enjoyment of amateurs. When I saw the letter written by K4WVN, I nearly blew the roof off of the house. I am a relatively new amateur, having had my ticket for less than a year, and I can find absolutely no fault in this article.

-- Stan Cooper, K4ADRD

610 Long Road
Pittsburgh 35, Pa.

... In days gone by, a much lighter vein prevailed in the pages of QST. It was a lot more fun to read it and the technical articles were just as good (but not as elegant) as they are now. And in those days you built almost all of it. I would recommend the Proceedings of the IRE to those who want their publications all dead serious.

But for the kids of the Southern Countries Radio Club — they are in more of a bad way than they know. They don’t even realize that the boys that grind out this mag every month were giving them credit for enough intelligence to know what they are reading. If they had read some of the articles by The Old Man they would pass a resolution condemning the whole bunch at HQ because they couldn’t run right out and lay their hands on a Woult-Hong. If they can’t do anything else, they should get somebody to explain Rapp’s articles to them — it’s first rate humor. At any rate, if I were a bona fide member of that bunch, the last thing in the world I would do is to let the world know what kind of shape we were in ...

-- J. D. Wells, W6EKA

IT’S STILL ROUGH

19 Abeling St.
Cansojohari, N. Y.

Editor, QST:
On page 70 of June QST a statement in the "Long Winded CQs" paragraph caught my eye and intrigued me.

As a teacher of secondary mathematics my viewpoint differs somewhat from others during a discussion of topics pertaining to mathematics.

In this article is found the sentence: Imagine 100,000 Ws calling Q DX with only 40,000 DX stations to answer them! Mathematically this means that there are a total of 100,000 trials going on with but 20,000 events that can be successful. The probability of being successful is $\frac{1}{4}$ and the probability of failure is $\frac{3}{4}$. It seems that the term probability gets mixed up quite often with the term odds! The odds in this case are 1 in 4 for a success but since the DX contact is treasured we would commonly state it in reverse, the odds are 4 in 1 against a success (for a failure).

You can see why this article caught my eye. It states that the odds are 5 in 1 against getting an answer.

I am sure that this information will not change the price of butter in Chicago but, as I have said, such things intrigue me.

-- Arthur H. Petley, W222G
Results—Armed Forces Day 1956

Receiving Competition

One hundred and ninety-one contestants have been mailed certificates of merit signed by the Honorable Charles E. Wilson, Secretary of Defense, in recognition of making perfect copy of the special Armed Forces Day message to radio amateurs. A total of two hundred and twenty-four individuals participated in this phase of the special activities conducted by the Army, Navy and Air Force. The message was transmitted at 25 w.p.m. by military stations at 1900 EST on May 19, 1956.

Voice, single sideband and military-to-amateur radioteletypewriter contacts were introduced for the first time during this year's Armed Forces Day activities. The large increase of contacts made with amateurs indicates that the new features were very successful. Certificate winners of the c.w. message are as follows:

W8s AJJ BD1 FZ HXI EGH LQD QMB URM WPR XGV ZR, WN1KFX, W2s ALD ALE AQC CIF COG CPA CVN EIR EQR FNN GEK GYO GWG GWW Hgy ICR JCA KAT KGB KTP LXY M2B PF PEG SAY SSCYR T6H WH YVC LWR NWL, W3s ADE BEZ C6W ECP FYZ JFW NRC OZY QLZ UYF VZ9 WG WHR WZL ZJ, W4s ASV AWK BCT B3A DBG DYT FYG QM0 URF ZTR ZTG, W5s CPE H8Z JET JPC LFE N0D RKS, W6s ASH BTO CFC CLB CUF DTY DU DUD DXY FP FYW FZC GK GYK HJK IAL JHT KTT MCY NAA NZD OGS ORY BHP WFI YDK ALE, W7s FJX FZB H8M JFU KCX LX MCX, W8s HBD FPR PLA QVI ENX QLJ

W9s AEP CXY HT0 M8O UBW, W8s ARO ECE KKL TDEH TXK.


Military-to-Amateur Contacts

Operating on military frequencies, AIR, NSS and WAR worked amateurs in the 80-, 40- and 20-meter hands using c.w., a.m., s.s.b. and RATT. The three military stations made a total of eight hundred and eighty-six QSOs with amateur stations during the six hour test. Special Armed Forces Day QSL cards have been mailed to all stations worked by AIR, NSS and WAR.

Radioteletypewriter Receiving Competition

The radioteletypewriter receiving competition featured a joint message from the Chief Signal Officer, U.S. Army Director, Naval Communications, and the Director of Communications, U.S. Air Force. A total of one hundred and fifty-eight entries were received with one hundred and four of these making perfect copy. A letter of

Text of Armed Forces Day Message From The Secretary Of Defense

Observance of Armed Forces Day emphasizes the basic principle that our national security and freedom depend upon power derived from American teamwork and unity. Public demonstrations and displays in hundreds of communities give evidence of the close working relationship and technological progress achieved by all components of our Armed Forces.

Radio amateurs through their productive efforts in the fields of auxiliary emergency communications, research and development, affiliation with Armed Forces training programs, and furtherance of international understanding, have made tangible contributions to the spirit of unity and preparedness which expands our resources for peace.

As Secretary of Defense I am pleased to acknowledge the accomplishments of radio amateurs working together throughout the free world, and to welcome your participation in Armed Forces Day Activities.

C. E. WILSON
Secretary of Defense

Radioteletypewriter Message to All Amateurs

On the occasion of this Armed Forces Day, the communications services of the Army, Navy and Air Force extend congratulations to Amateur Radio Operators for the excellent progress in radioteletype communications. This operational proficiency has provided an especially effective public service during emergencies such as hurricanes, floods, blizzards, and so on. The military services wish to express due compliment to your achievements and will give every possible support to this and other amateur radio operations.

GORDON A. BLAKE
Major General, USAF
Director of Communications-Electronics
J. D. O'CONNELL
Major General, USA
Chief Signal Officer
H. C. BRUTON
Rear Admiral, USN
Director of Naval Communications

August 1956 63
GANGING MULTISECTION CONDENSERS

Many devices requiring a variable capacitor of four or more sections are not built, or are functioning unsatisfactorily, because of the difficulty of ganging multisection variable capacitors of modern design. The rear capacitor bearing, usually a single ball, and the lack of a rear shaft extension, are not well suited for coupling to the shaft of another capacitor.

By removing the vertical rear section of the capacitor frame, the rear shaft is exposed, so that it can be coupled to the front shaft of another capacitor. This usually does not work very well, as “radio” couplings are not true enough, and chassis warp makes alignment difficult and impermanent.

These problems can be eliminated by mounting the capacitors to be ganged on a stiff subbase, such as a piece of 3/32-inch steel; and by using a machine-type shaft coupling (such as those made by Boston Gear Works) in place of the “radio” type coupling. With this arrangement, chassis warpage is eliminated as a cause of misalignment, and the coupling, being precision machined, runs true.

Fig. 1 — Satisfactory ganging of two three-section capacitors by use of precision shaft coupling and rigid subbase.

An example of this type of ganging is shown in Fig. 1, the capacitors used being two three-gang Miller F-M tuning capacitors.

DEMAGNETIZING TOOLS

Screwdrivers and other small tools which have accidentally become magnetized may be made to lose this undesirable property with the aid of soldering gun. After the trigger of the gun has been pulled to the on position, pass the tool to be demagnetized through the “hairpin”-shaped tip. One or two passes through the strong magnetic field that surrounds the tip will usually free the tool of bad habits such as clinging to iron filings, picking up steel wool, screw, etc.

— Leslie E. Downs, W0YSZ

RELAY-CONTROLLED SEND-RECEIVE CIRCUIT

The circuit shown in Fig. 2 was built into a small control box for use with a type BC-458-A transmitter. However, it may be used with any transmitter that uses a separate power supply for the oscillator.

In the arrangement, \( K_1 \) and \( K_2 \) are normally-open s.p.s.t. relays. \( K_3 \) is a normally-open d.p.d.t. antenna changeover relay. \( S_1 \) is a d.p.d.t. switch having a center-off position in addition to the momentary- and positive-contact positions. Of course, if this particular type of switch is unavailable, any d.p.d.t. switch having a neutral position will do the trick.

The circuit functions as follows: With \( S_1 \) in the “receive” or center position, all relays remain open and the contacts of \( K_4 \) connect the antenna to the receiver. For zero-beating or other adjustments involving only the oscillator section of the transmitter, \( S_1 \) is thrown to the momentary-contact position. This causes \( K_2 \) to apply plate voltage to the oscillator and \( K_3 \) to disconnect the antenna from the receiver. In the “transmit” or positive-contact position, \( S_1 \) feeds 115 volts a.c. to all three relays, thereby activating the entire transmitter.

— Bob Miller, W0YV

64 QST for
CENTER INSULATOR FOR FOLDED-DIPOLE ANTENNA

A simple and rugged center insulator for folded dipole antennas is shown in Fig. 3. The Mosley type 263S connectors are intended for coupling feedlines to TV antennas, but they heat egg insulators by a mile when used at the center of a ham-band folded dipole. One big advantage of the system is that each Twin-Lead member of the antenna is firmly clamped ahead of the point where the electrical connection is made. This relieves the strain and prevents snapping at the soldered junctions.

If high power is used, it may be advisable to solder the Twin-Lead to the metal bars. If soldering is not deemed essential, the ends of the conductors may be clamped under the screw-type terminals provided for the purpose.

The small amount of "fanning" caused at the junction of feedline and antenna does not appear to create an impedance problem. My antenna checks out with an s.w.r. of 1.2 to 1. And, best of all, it has stayed up under weather conditions which no other methods of construction — at least, those tried here at W1CSP — have been able to take.

— Norman Sheinold, W1CSP

"QUIK-DIP" CRYSTAL CLEANING

In the process of building a c.w. receiver using surplus crystals in Type PT 241 holders, the crystals were checked for oscillating activity in the Pierce circuit. I reasoned that a crystal that would oscillate would serve in the lattice filters. Several, however, did not oscillate. When these were opened, all showed heavy tarnish on the silver plate. These were dipped, as assembled, into "Quiik-Dip" (a liquid silverware cleaner) for several seconds, rinsed under running water, and then very carefully, so as not to break the fine wires, swabbed to remove the black loosened deposit. Of 8 inactive crystals dipped, 6 were reactivated by this method. Some silver is no doubt removed, so it is best to dunk them no longer than necessary; I used 7 to 12 seconds.

The average frequency of the batch of 6 was measured 330 cycles higher than the average frequency of 7 that were not dipped. "Quiik-Dip" is a drugstore item as is the "Q-Tip" medicinal cotton swabs used.

— W. A. Monahan, W6GTR

"MAGIC EYE" TUNING INDICATOR

Occasionally the need arises for a really low-cost transmitter, one such as might be built and paid for by an individual and then left to sit at the local civil defense station. Here is a suggestion that will help cut the cost. The author makes no claim of originality of the idea because it has been used in both amateur and commercial designs.

The idea is that of using an inexpensive "magic eye" tube as the tuning indicator for the output stage of the transmitter. If you can not steal a type 6E5 from an old broadcast receiver, a new one won't cost much more than a dollar. Properly installed, this simple indicator will serve the purpose just as well as its more expensive counterpart, the customary plate milliammeter.

A typical installation is shown in Fig. 4. In this case, the power-amplifier tube is a type 2E26 running at 16 watts input. For other values of power input, the resistance of Rs can be altered from that shown. Indicator tubes other than the type 6E5 will require appropriate changes in both R1 and Rs.

— John W. Wilder, W9KLJ

COIL WINDING HINT

The spacing between turns of homemade solenoid-type inductors can frequently be controlled by using ordinary sewing thread as a spacer. Naturally, the diameter of the thread should be equal to the desired spacing between turns. Usually, thread suitable for the purpose can be found either in the XYL's sewing cabinet or at the local dime store.

(Continued on page 134)
Our guess is that the youngest of the "Young Ladies" of amateur radio is Miss Leslie Brown, KN6RJ, who took her exam the day before her 6th birthday. Dad is W6EQH, Mom is KN6QWN and her 12-year-old brother is KN6QWE. There's a sister who sticks to the piano keys, leaving telegraph keys for the rest of the family. Here Leslie operates K6CXY, at Hamilton High School, where Dad teaches electronics.

Overheard at the recent Field Day site of the Bedford (Mass.) Radio Club. The lady visitor said, "My, these amateurs seem to be having a lot of fun! If the men are called hams, do they call the lady amateurs 'sows'?" — W1QJB.

Speaking of calls, KN6JMP was issued to John M. Porter, while Jim Rourke received GI3JIM.

The K4HEZ family is now fully equipped with A.C. D.C., following their recent birth announcement of a daughter named Adrienne Claire Don Carlos.

For those amateur wireless operators who are interested in getting QSLs from foreign stations (aren't we all?) the International Reply Postcard is of interest. First of all, don't confuse this item with the International Reply Coupon. The International Reply Postcard is a complete two-way exchange in itself, and all the DX station has to do is mark down the QSO details, sign his name, drop the card in the mail box, and there you are. The I.R. Postcard is much simpler than the I.R. Coupon because it is not necessary for the DX station to make a trip to his post office to obtain the equivalent in postage of his own country's issue. It will be less expensive, too.

These International Reply Postcards are two cards in one, folded just like the business reply card that is so common here in the States. By international agreement, the stamps of the country of origin are good at the office addressed for return to the sender.

Here's how you use them. On one half, write your message to the DX station and on the other side of that half carrying your message put down the address of the overseas station. On one side of the other half of the card, put your own name and address and leave the reverse side of that blank for use by the DX station. Then, on both halves of the card, affix either 3½ postage for surface mail or an appropriate amount for airmail. Do not staple or tape the open sides of the cards together. Away it goes.

The man on the receiving end of the card merely crosses out his own name and address, gives QSO details on the blank side, signs his name, reverses the fold (don't tear off the other half), and drops it back in the mail.

These International Reply Postcards are available at any post office. If not in stock, your postmaster can order them for you.

Our thanks to M. S. Brainard of Brookings, Ore., for calling these to our attention.

**Silent Keys**

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

W4LYR, Hazel I. Kempton, Presque Isle, Maine
W2FEG, Edward T. Curry, Plainsfield, N. J.
W4GTH, Calvin H. Burkhead, Southern Pines, N. C.
W4HBB, James P. Baker, Whites Creek, Tenn.
W5FWS, Robert W. Besty, Oklahoma City, Okla.
W6RGR, Sterling Gardner, Oakland, Calif.
W7PAG, Roy L. Weisman, Miescola, Mont.
W7IWO, James E. Wetchin, Tacoma, Wash.
W9DII, Oliver E. Zander, Milwaukee, Wis.
W9LXJ, James L. Dare, Macon, III.
W9QLY, Frank Maruna, Berwyn, Ill.
Good Things To Come

Every amateur is familiar with the heterodyne principle by which two frequencies are combined in a nonlinear impedance, usually a vacuum tube, to produce a third frequency. The most common example is the superheterodyne receiver where the incoming r.f. signal combines in the first detector with the output of a local oscillator to produce a third signal at the frequency of the i.f. amplifier. The same principle applies in a.m. transmitters where the carrier and the audio modulation combine in the Class C stage to produce sidebands. In s.s.b. transmitters, as frequency multipliers cannot be used to go to higher output frequencies, heterodyning must also be employed.

What many of us fail to remember is that whenever we combine two frequencies, or heterodyne, we do not get just the desired third frequency in the output of the nonlinear impedance; we actually get the two original frequencies, the sum of the originals, the difference of the originals, and the sums and differences of all these resultant frequencies and their harmonics combined in almost infinite variety. Normally these unwanted frequencies are all suppressed in tuned circuits following the mixer stage but sometimes they can be a real problem.

In an ordinary superheterodyne, the local oscillator is arranged to track 455 kc. above or below the incoming signal in order to produce the i.f. signal. It is evident that another incoming signal on the opposite side of the local oscillator and only 910 kc. from the desired signal will also come through. On the higher bands, especially ten meters, top quality receivers have long used two i.f. amplifier stages in front of the first detector to minimize this image. Of recent years a better method has come into use, namely double conversion which employs a high i.f. to place the image at least 3 Mc. away from the desired signal and a low 2nd i.f. with high Q for maximum selectivity. A modern receiver such as the SX-100 does not depend entirely on front end selectivity for image rejection—with double conversion the images are not just minimized, they are practically gone.

In SSB transmitters the problem is even more serious. The best way to eliminate the unwanted sideband is by means of a highly selective filter network. Up to the present such networks were not commercially practical above 500 kc. It has been necessary, therefore, to heterodyne the low frequency s.s.b. signal at least twice to reach the desired amateur band. This process introduces images just as in a receiver but in this case the images appear as additional signals one Mc. or less from the desired signal and almost always outside of an amateur band unless a number of tuned circuits are provided to suppress them.

Hallicrafters' laboratory has been working on this problem for over three years and we are happy to say that success has been achieved. The new Hallicrafters bridged Tee crystal network can be operated successfully to 10 Mc. instead of 500 kc. Using several crystals of the same characteristics it remains extremely stable in operation, provides a degree of sideband suppression not before possible, and because of its higher frequency, eliminates the need for a multiplicity of tuned circuits.

—Cy Read, W9AA

Bainbridge Jr. W. J. Healy, Jr. W9AC for hallicrafters
50 watts CW input...
bandswitching 80 through
10 meters!

VIKING “ADVENTURER” — An
ideal CW transmitter for the be-
ginning amateur... the perfect
standby transmitter for the experienced amateur. Effective-
ly TVI suppressed... built-in power supply. Professional
in appearance and design — easy to assemble and operate.
Packs enough power for world-wide contacts. Wide range
pi-network output tuning — no antenna tuner needed. Kit
is furnished complete with tubes, cabinet, wiring instruc-
tions and antenna suggestions, less crystal and key.
Cat. No. 240-181-1 Kit ......... $54.95 Amateur Net

75 watts CW input...
65 watts phone!
Bandswitching 160 through
10 meters!

VIKING “RANGER” — Effectively
TVI suppressed... completely
self-contained. Serves as a trans-
mitter or an RF and audio exciter for high power equi-
ment. Extremely stable built-in VFO or crystal control —
100% AM modulation — high gain audio. Pi-network an-
tenna matching from 50 to 500 ohms. Timed sequence,
brack-in keying. No internal changes required to switch
from transmitter to exciter operation. Complete with tubes,
less crystals, key and mikes.
Cat. No. 240-161 Kit ......... $214.50 Amateur Net
Cat. No. 240-161-2 Wired, tested $293.00 Amateur Net

90 watts CW and 55B [P.A.P.]
35 watts AM! Bandswitching
80 through 10 meters!

VIKING “PACEMAKER” — More
than just a single sideband ex-
citer... a completely self-con-
tained transmitter as well. Extremely stable, temperature
compensated built-in VFO. “Fool-proof” voice controlled
operation — effectively TVI suppressed — completely self-
contained. Pi-network antenna matching from 50 to 600
ohms... plenty of power to drive conventional or
grounded grid kilowatt power amplifiers. With tubes and
crystals, less key and mikes.
Cat. No. 240-301-2 Wired, tested $495.00 Amateur Net

150 watts CW input...
100 watts AM! For 6 and
2 meters!

VIKING “6NZ” — New for VHF!
Designed for use with the Viking
“Ranger,” Viking I, Viking II or
similar power supply/modulator combinations capable of
at least 6.3 VAC at 3.5 amp, 300 VDC at 70 ma, 300 to
750 VDC at 200 ma and 30 or more watts audio. Operates
by external VFO (with 8.9 mc output) or built-in crystal
control. All circuits metered. Complete with tubes, less
rystals, key and mikes.
Cat. No. 240-101 Kit ......... $99.50 Amateur Net
Cat. No. 240-101-2 Wired, tested $129.50 Amateur Net
(Prices subject to revision at time of delivery)

For more effective
AM power!

JOHNSON AUDIO AMPLIFIER
— A self-contained 10-watt speech
amplifier complete with power
supply. Speech clipping and filtering designed to raise
average modulated carrier level... improves the per-
formance and effectiveness of your AM transmitter. Inputs
provided for mike or line. Complete with tubes.
Cat. No. 250-33 Kit ......... $73.50 Amateur Net
Cat. No. 250-33-2 Wired, tested $99.50 Amateur Net

Pick your power
...choose your features

See your distributor

Johnson Amateur Equipment is sold
only through Authorized Johnson Dis-
tributors — most offer convenient time
payment plans. For complete infor-
mation see your distributor.
60 watts maximum PA input! Bandswitching 75 through 10 meters!

VIKING "MOBILE" — Designed for under-dash mounting — all controls readily accessible to operator. Coupling system engineered for maximum power transfer — all stages ganged to a single tuning knob. 3 separate ganged coupling links provide maximum power transfer to the antenna. Unit may be wired for either 6 or 12 volts — requires power supply delivering 300 volts (30 watts PA input) to 600 volts (60 watts PA input) at 200 ma.

Cat. No. 240-141 ... $99.50 Amateur Net

275 watts CW and SSB* ... 200 watts phone! Bandswitching 160 through 10 meters!

VIKING "VALIANT" — Designed for outstanding flexibility and performance. Built-in VFO or crystal control. PI-network antenna matching from 50 to 600 ohms — final tank coil is silver-plated. Timed sequence, break-in keying — TV1 suppressed — high gain push-to-talk audio system — low level audio clipping — built-in low pass audio filter. As an exciter, will drive any of the popular kilowatt level tubes. Complete with tubes, less crystals, key and mike.

Cat. No. 240-104  Kit ................ $349.50 Amateur Net
Cat. No. 240-104-2 Wired, tested $439.50 Amateur Net
*P.E.P. input with auxiliary SSB exciter.

1,000 watts AM, CW and SSB!

VIKING "KILOWATT" — Boldly styled — contains every conceivable feature for safety, operating convenience, and peak performance. Low power or maximum legal input with the flip of a switch. Continuous tuning 3.5 to 30 mc — no coil change necessary. Compact pedestal contains complete kilowatt — rolls out for adjustment and maintenance. Excitation requirements: 30 watts RF and 15 watts audio for AM; 2-3 watts peak for SSB. Completely wired and tested with tubes.

Cat. No. 240-1000 "Kilowatt" ... $1595.00 Amateur Net
Cat. No. 240-101-1 Matching accessory desk top and 3 drawer pedestal, FOB Cory, Pa. ..................... $123.50

600 watts CW ... 500 watts AM and SSB* Bandswitching 80 through 10 meters!

VIKING "FIVE HUNDRED" — A complete 500 watt transmitter ... VFO and all exciter stages ganged! Two compact units: RF unit is small enough to place on your operating desk beside your receiver ... power supply/modulator unit is compact enough to be placed in any convenient location. Built-in VFO or crystal control — effectively TV1 suppressed — high gain push-to-talk audio — timed sequence, break-in keying — low level audio clipping. Complete with tubes, less crystals, key, and mike.

Cat. No. 240-500  Kit ................ $649.50 Amateur Net
Cat. No. 240-500-2 Wired, tested $799.50 Amateur Net
*P.E.P. input with auxiliary SSB exciter
(Prices subject to revision at time of delivery)

from the complete Johnson transmitting line!
Hidden Transmitter Hunting. Transmitter hunting tournaments have long been a popular and engrossing radio club activity. We'll gladly dig out a copy of the early '70s club bulletin with details for any club new to this pastime that would like to get in the swim. HARCI News (Houston, Texas) reports that transmitter hunting has been a regular twice-a-month feature ever since the ARRL National Convention there in '53. Hunts really started in Houston back in the days when the six-meter band was known as five meters. "Hunts are well attended by both OMs and XYLs and even YLs. The gals make excellent navigators, being accustomed to telling the OM where to go. They make up in enthusiasm and instinct what they lack in experience and theoretical background. The occasions are always highlighted by refreshments and picnics."

Should You Get a Cooperative Notice. The Official Observer mission is to render a friendly service to brother amateurs. Should you receive a cooperative notice from an OO for some violation, off-frequency harmonic or other, don't ever take it in other than the spirit in which the system is set up. Remember, the Observer is going to quite a lot of trouble just to help you in particular, and ham radio in general, to keep our service reputation good, and especially to make it unnecessary for FCC to have to take disciplinary measures or enter complaints against you. Especially serious in recent months has been the large number of off-frequency harmonic-radiation reports.

Many Novices, either through lack of knowledge or extreme carelessness in tune-up, leaving a 3.7 Mc crystal in the transmitter, have resonated the output tank so that it doubles or triples. The correct dip must be used; checking output frequency with an absorption wave meter or grid-dip meter is important. Use of an antenna coupler, arrangement of antenna system to tune to just one proper band, elimination of pi-output networks that emphasize harmonics are remedies some have adopted. To make sure you are not radiating a harmonic, check with the ham across town who has a general coverage receiver. Log the point of correct dip. Take these proper precautions to protect your own interests and those of all amateurs.

Description Bulletin Names. Besides worthy "newsletters" and plain bulletins this is just a look at special club bulletin names. Our list shows the high degree to which the spirit of operating amateur radio and communications technique shines through the names of so many of the club bulletins. Current bulletin receipts only are represented, so this isn't by any means a complete listing.

Bulletin Name
Equipment:
Spark-Top
Gridleaks
JARS Beam
The Oscillator
Metro Modulator
Curascope
Omniograph

Club
St. Peterburg Amateur Radio Club
Jacksonville Amateur Radio Society
Harford County Amateur Radio Assn.
The Tri Town Radio Amateur Club, Inc.
Metro (Out.) Amateur Radio Club
Columbus Amateur Radio Assn.
Fayette County Radio Club

Operating Abbreviations:
QRC
QTX
QRM
QRM
QRM
QUTA
DARA QMN

Club
Wyoming Valley Amateur Radio Club
TSCA (Pomona, Calif.)
Kawawha (W. Va.) Radio Club
Quinte QRM
Quinte Amateur Radio Club
York Road Radio Club
The Springfield (O) Amateur Radio Club, Inc.

Radio Terms:
Ground Waves
Key Kiz
The Micro-Mike
SARC Spikes
Isotie
Side Band
Short Ship
Sparks
The Round Table
Richman Listening Post
Short Circuits
Key Kiz and
Fred Rock
Auto Dial
Ham Club
Ham-Pax
Hi-Mu
PARA Graphs
Ham Hum
Zero Beat
Zero Beat
Hamden County Amateur Radio Club
(Zest.)
Zero Beat
Kilowatt Harmonics
Dits and Dots
B-1
Other Ways
PARA Sarina Wraper
Splatter
The Blurb

Club
Joliet Amateur Radio Society
Santa Barbara Amateur Radio Club
Port Benningham Electronics Club
Sidney (N. Y.) Amateur Radio Club
Starved Rock Radio Club (Ill.)
St. Louis Amateur Radio Club, Inc.
Manchester Radio Club (Conn.)
The Brandon Amateur Radio Club
The Denver Radio Club
Ria Hands (Cal.) Radio Club, Inc.
Electric City Radio Club (Mont.)
Hocking Valley Radio Club (O)
Washington Mobile Radio Club, Inc.
Hamsters Radio Club, Inc.
South Bend Amateur Radio Club, Inc.
Framingham Radio Club
Palo Alto Amateur Radio Assn.
Ak-Sar-Ben Radio Club, Inc.
Victoria Sheet Wnna Club
Hamden County Amateur Radio Club
(Man.)
Providence Radio Assn. (R. L.)
The Steel City Amateur Radio Club
Camp Okeyo Radio Club
Albany Amateur Radio Assn.
Ohio Valley Radio Assn.
Tamesqua Amateur Radio Club
Minneapolis Radio Club
Phil-Mont Mobile Radio Club

For 100% QSLing. KNQDYJ writes to suggest an addition to "There ought to be a law." (April QST) on this subject of QSL. He sadly lists stations worked from whom a confirmation is needed. At the time he wrote he had but seven stations confirmed. Ham sentiments were even more clear on a recent card submitted for WAS. It had a little cartoon saying the words "people are no damn good — unless they QSL." Thousands of stations have excellent printed cards. But the typewritten or penciled postal card like

(Continued on page 78)
Why Mallory FP Capacitors
...with etched cathodes...
won't develop
"Middle Age Hum"

Ever notice how some electrolytic capacitors allow hum to develop after a few weeks of service? Even though they test out OK when installed, they let filter hum grow to an objectionable level in a relatively short time.

This is "middle age hum." It's caused not by capacitor leakage current, but by loss of capacitance. It's a common ailment of capacitors with plain foil anodes. And it won't happen with Mallory FP capacitors, because they are made with etched cathode construction.

Here's the explanation. Maybe it's something you never realized goes on inside a capacitor. Actually there are two capacitors in series inside every electrolytic; one at the anode, and one at the cathode. The anode capacitor is the one that is formed electrically during manufacture. The cathode "parasitic" capacitor is due to the naturally formed oxide coating on the cathode foil. In a new capacitor, this cathode film is so thin, and capacitance thus so high, that the net microfarad value you measure at the capacitor terminals is hardly affected.

In a circuit having heavy ripple currents, the cathode can be driven positive with respect to the electrolyte during reverse peaks of the cycle. This action causes the oxide film to increase in thickness...reducing cathode capacitance. The net series value goes down. And when the cathode capacitance gets comparable in size to the anode, the loss in filtering ability can be serious enough to cause considerable hum.

A capacitor with a plain anode has no built-in "safety factor" to protect against capacitance loss, because its available cathode area is limited.

An etched cathode—as you'll find in Mallory FP's—eliminates this source of trouble. Because etching produces so much greater capacitance per unit area, the cathode capacitance is extremely high when the component is new. And build-up of the film during service doesn't reduce capacitance to a magnitude that will cause appreciable change.

Etched cathode is standard at no extra cost in Mallory FP capacitors and in popular Mallory metal and cardboard tubulars. It's another of the premium features that you're always sure of getting from Mallory, to assure the best in performance in your amateur rig or in repair jobs that you do in your shop.

See your Mallory distributor soon. He has Mallory capacitors with etched cathodes in the ratings you need.

P. R. MALLORY & CO. Inc.
Distributor Division
P. O. Box 1558
INDIANAPOLIS 6 INDIANA
the one a new amateur sent in yesterday (humbly labeled "this is a QSL card") is just as welcome as the most elaborate. That is, of course, provided it has the vital statistics that prove the QSO. Call, date, time, frequency, mode signal report and the validating signature or characteristics that identify it as a genuine QSL of the originating station.

The first QSLs were created when certain early amateurs discovered that families and friends would not believe they had made contact by radio with the distant point. We should remember that the QSL is to prove something. It's really (or should be) regarded as an official document. We have gone on record as endorsing KN9DYJ's plea to QSL. Be sure that new stations worked are taken care of by this fraternal exchange: The QSL doesn't have to be a fancy job to become a ham's most prized position: It is indeed an old and a true saying that the final courtesy of a QSO is the QSL.

DX and WAS Suggestion. A letter from Ken Indart, CX2ZP, 28.4 Mc. (looking for a Utah-Uruguay QSO) points to the possible stepping up of the pace of USA DX QSOs. It is his notion that amateurs should give the names of their states more frequently when operating. He writes: "With the increasing interest shown now in WAS, I would suggest the advantage of U.S. hams mentioning their states at frequent intervals; this is especially true for the 14, 21 and 28 Mc. bands."

ARRL's Worked All States Award rules are detailed on page 6 of the League's booklet, Operating an Amateur Radio Station. Be sure in sending WAS cards to ARRL (1) to place the confirmations in alphabetical order by states; (2) to include the postage to finance their return.

---P.E.H.

**JUNE V.H.F. PARTY — FIRST RETURNS**

Following are some high claimed single-operator totals registered during the ARRL V.H.F. QSO Party of June 9th and 10th: WIFOS 3300, W1PZ/1 6572, W1KCS 3248, WIOOF 6090, W1UZ/1 15,064, W1YNH 4782, W2BYU/1 6341, W2FEE 2070, W2YUP 2850, K2HFP/2 2774, K2IEJ/2 2720, W3CGV 2737, W3IHY/3 2058, W3TDF 4792, W5OM 2169, W4DWH 1284, W4JC 1065, W4UCH 924, W4UMT 1059, W5LFQ 900, W6AFC 1575, W6AJP 2338, W6BAZ 2436, W7HL 611, W7UF E 972, W7VMP 1478, W8LAI 970, W8RMII 1368, W8SFW 1012, W8BRN 597, W9USB 325, W9LSP 201, W9QOG 2069, VE3DAR 1066. Outstanding multiplier scores reported include W1LHL/1 31,344, W1QAR/1 11,070, W1RPU 10,520, W2HHG/2 4374, W3KX/3 15,040, W5QED/6 10,933, K5OGE/6 11,520. Full details will appear in QST, BRIEF

A correction on the 1955 V/VE Contest Results (p. 67, February QST) comes from VE2BB of the Montreal Amateur Radio Club's Contest Committee. VE6AJ, listed in third position in Alberta with 4135 points, should have been shown as the section winner with 41,335 points.

**CODE PROFICIENCY PROGRAM**

Twice each month special transmissions are made to enable you to qualify for the ARRL Code Proficiency Certificate. The next qualifying run from W1AW will be made on August 10th at 2100 EDST. Identical texts will be sent simultaneously by automatic transmitters on 1855, 3555, 7090, 14,100, 21,010, 50,000 and 145,600 kc. The next qualifying run from W6QAO only will be transmitted on August 3rd at 2100 PDST on 3500 and 7128 kc.

Any person may apply; neither ARRL membership nor an amateur license is required. Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the six speeds transmitted, 10 through 36 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 36 w.p.m., you may try later for the corresponding speed.

Code-practice transmissions are made from W1AW each evening at 2130 EDST. Approximately 10 minutes' practice is given at each speed. References to texts used on several of the transmissions are given below. These make it possible to check your copy. For practice purposes, the order of words in each line of QST text sometimes is reversed. To get sending practice, hook up your own key and buzzer and attempt to send in unison with W1AW.

**Date** Subject of Practice Text from June QST
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Aug. 1st: Conventional Circuits, p. 17
Aug. 7th: Some Hints on Relay Operation, p. 21
Aug. 9th: The 10-10 Antenna, p. 30
Aug. 14th: The Tuning Circuit, p. 34
Aug. 20th: Modern Design of a High-Power Final, p. 42
Aug. 23rd: 2nd ARRL Sweepstakes Results, p. 48
Aug. 29th: Procuring Funds for RACES Gear, p. 54
Aug. 31st: The 8th National ARRL Convention, p. 58

(Continued on page 74) ---

The Swampscott (Mass.) High School Radio Club, under supervision of W1UNA (standing), recently conducted a presentation of amateur radio for the public at the school Science Fair. During the open house, each ham at the front table had a station on the air. From front to back, they are: W1BYB, an SWL, W1NHDK, W1NEIJ, W1NEJW, W1NEIU and W1EUT. (Photo by H II RK)
For low to medium powers, mobile or fixed station, the Eimac 4-65A is truly one of the most versatile tubes in amateur use today. The least expensive and smallest of the Eimac internal-anode tetrodes, this compact, rugged tube is ideal for all-band CW, AM, and SSB rigs.

Short, heavy leads and low interelectrode capacitances contribute to stable, efficient operation of the 4-65A at high frequencies. The tube operates over a wide range of plate voltages — 600 to 3000 volts with power inputs from 90 to 345 watts — and as with all Eimac tetrodes, it requires low driving power and simplifies transmitter construction.

For mobile use, the radiation-cooled 4-65A is a natural. Its instant heating filament eliminates battery drain during stand-by periods. And through application of filament and plate power simultaneously, no warm-up periods are required.

For further information on the 4-65A, write the Eimac Amateur Service Bureau or visit your Eimac distributor.
There are a number of ECs who feel that AREC administration and administrative procedures sometimes are not compatible with operational requirements of the service we are often called upon to render. This is true, but it is also inevitable. It happens in all large groupings and the purpose of AREC can be stated succinctly (i.e., service to the public), it is part of a large, multi-service organization. A legalistic requirement can be accomplished by the existing setup under the SCM, by sections with well-defined boundaries of jurisdiction. We realize as well as you that emergency requirements seldom are restricted to geographical or political boundaries. That's why the AREC organization has been made deliberately flexible, and has become more flexible through the years.

And it is flexible. The SCM normally has jurisdiction over a community but these jurisdictional areas can be changed at the discretion of the SEC, with the acquiescence of the SCM, to cover counties, groups of counties, or districts, "zones," "areas" (whatever you wish to call them) in other ways. The internal section organization is strictly subject to the wishes of the SCM, the SEC, and the appointed ECs within it. In some cases, if desired, one EC can have several others under his jurisdiction, as a county EC might have jurisdiction over an entire area served by a number of community ECs.

Where the need for emergency organization transcends section boundaries, there is seldom any jurisdictional dispute involved. AREC units, even if in different sections, can be administered by different SCM, can and should get together to work out their mutual problems, and in a great many instances, especially along natural river boundaries, this has been accomplished. Where the desirability for special representation or even representation, especially are formed under a control center or manager agreed upon by the ECs, SECs or/and SCMs involved, and net members are recruited from among the AREC units at desired points. All administration requires is that each appointee be appointed by the SCM of the section in which he happens to reside, and that appointees be limited to those designations which are official. For the purposes of administration, within the AREC the only appointed SCM, SEC, and SEC, other, we could set up new appointments, like County EC, Regional EC, Assistant EC, Assistant SEC, etc. ad infinitum. But, why? That would just tie things down, remove the flexibility we now have for each section to organize pretty much along the lines of its requirements and, at the same time increase the administrative overload at SCM and headquarters levels. An administrative setup, as one correspondent says, is for the purpose of serving an operational purpose and therefore should be subordinate to it. We agree with this. That's why we don't want to create additional or special appointments, but think the purpose is best served by preserving the utmost simplicity and flexibility in an overall administrative system which must serve all operational purposes.

The MARS Director at Holloman Air Force Base, N.M., has sent us, via the SCM, a detailed version of the Lincoln National Forest amateur net, which amateur we participated April 27th to April 29th (see July QST, this column). We list herewith additional calls of participating amateurs not previously reported: W9$ AGX ANB ARD A3J BMA BXG C3X CQ CPQ CTD DOWN EVY GEM GIO GIO HEP HEP HLP K3C KMC KWR KUW MMY OLE POC QKA QAQ RHI SEP UET VLT WPA YPN: K7$ AOQ AVZ CEV CTC CYV DAA DAB DBC E8T FAB FBR W3GC W3ZEB B.

When a tornado ripped through Berlin, Wis., on April 3rd, the Badger NET went into operation on 3950 ke. at 1500 and remained operative until 1800 April 4th. W9RRS go on the air from Berlin, while W9WTP acted as NCS. W9WFX formed the link to Madison and the American National Red Cross and state civil defense. W9FPC was active in Plainfield, another area hit by the storm, and W9MFO, EC for Fond du Lac and Green Lake Counties, drove to Berlin to offer the assistance of his operators, mobiles and emergency radio units. All operations were handled, official messages being given first priority.

A hundred miles west, at Tomah, a dodge broke flooding the city as a result of the storm. W9TJ handled emergency traffic from this point, putting it into BEN, and W9AAA provided communications for local operation.

Good publicity was received from radio and TV stations, as well as newspapers, and the BEN earned high praise from Red Cross officials. All operations were smoothly handled due to years of experience gained by operators in the state nets. — W9WTO, SEC Wisconsin.

Shortly after 2200 May 12th, the west side of Cleveland and the suburbs of Rocky River and Lakewood were struck by a severe windstorm. The West Park Radios Emergency Net immediately went into operation on 28,520 ke. with W9BNW as NCS. At 1300 the following day Westlake Civil Defense Station W92EZU commenced operations on 28,000 ke. and the West Park net joined for the operation. The amateurs, both fixed and mobile, cooperated with c.d. and police authorities so effectively that the n.d. director of Cuyahoga County paid them special tribute. Amateurs participating: W9S AEU AGA AJH A2Z BDZ BUQ FKS HFE HYO HXH JQ4 INW JUK KBW LEW LHu LQU LYM LTD MWE MWJ N7Y NOX N9X OX9 OXO FOQ QV4 QAV QVF QXW SNW TAJ TQL U4J YBT YLH ZET ZSK. K3ADY. K4IF/8: — W94AJW, SCM Ohio.

Members of the East Kentucky Amateur Radio Club of Kimberly, B.C., saw action on May 21st when Mark Creek overflowed and seriously threatened low lying areas. With a central station at the fire hall, mobiles patrolled the full length of the creek and were located at strategic points along the way as well as at two available sand pits. In this way, they were able to dispatch and barge efficiently to threatened spots. Much praise was given by the Kimberly civil defense officer for the operation. Amateurs participating: V77$ AMX ACR ADN AGB AILX and III. — V777.

The well-organized Winthrop (Mass.) Emergency Net went into action on March 23rd at 1115 when a sudden rain and storm wiped out telephone service at the community hospital. Within 15 minutes after notification radio communications was established between the hospital and telephone central to handle emergency calls. This system functioned for over an hour before service was restored. Quick action was due to planned preparedness for sudden emergencies. W9NQT was first to notify, and first on the air was W1DPN. Relay was established through W1BB, W1DELI and W1DLY. — W1BB, BC Winthrop, Mass.

(Continued on page 70)

ORS WITYQ, mainstay of Connecticut's Nutmeg c.w. Net, also savors contests and DXing. Vic grabbed Connecticut c.w. honors in the '55 Sweepstakes and '54 ARRL DX Contest, and consistently fares well in quarterly CD Parties. Now and then, however, his novel vocation causes Vic to forego hamming — to earn his daily bread, WITYQ flies a DC-6B to Saudi Arabia 20 times a year!
THE NEW FO-6
Oscillator Assembly!

6 METER and 2 METER

the Sure-Fire way to achieve . . .

STABLE CRYSTAL CONTROL with High Frequency Crystals

IT'S A 3-WAY UNIT!...

1. MIDGET 6 METER TRANSMITTER—Provisions are made for separate B+ connections to the buffer stage for modulation.

2. DRIVER UNIT for a higher power 6 meter transmitter. Will work into 5763 tube which will provide ample drive for a 6146 final. For 2 meter operation the pentode section of the 6U8 tube may be used as a tripler, or the unit can operate straight through on 48 MC and drive a 5763 tube as a tripler.

3. RECEIVER LOCAL OSCILLATOR FOR 2 METERS. By using the pentode section of the FO-6 as a tripler, this unit will provide injection voltage for 2 meter converters.

6U8 Tube
Crystal Oscillator Range 48 MC to 54 MC
Output 50-54 MC or 144-148 MC (Specify When Ordering)
Crystal Required—3rd Overtone
Type FA-5
Plate Voltage—230 volts @ 20mA

HOW TO ORDER: For fastest possible service, crystals and Oscillator Assemblies are sold direct. When cash accompanies order, International pre-pays postage. Otherwise, shipment made C. O. D.

Oscillator Multiplier
Buffer
OUTPUT

Filament Voltage—6.3 volts @ 450 ma
Size—2" x 2 3/4" x 2 3/4"

Kit (less tube and crystal) 5.95
Complete wired and tested with tube (less Crystal) 9.95
Crystal Type FA-5 48-54 MC (Specify frequency when ordering) 3.90

International CRYSTAL MFG. CO. Inc.
18 N. LEE PHONE FO 5-1165 OKLAHOMA CITY, OKLA.
During the tornadoes in Ottawa and Kent Counties, Mich., last spring, amateurs set up emergency communication facilities to handle official official traffic. Shown at the temporary operating position are, left to right, W8CEK (EC, Ottawa County), W8IQQ and his N4L, and W8SWN (seated).

On May 26th the National Search and Rescue Council was called out to find a girl skier lost on Mt. Hood, Ore. In accordance with prearranged plans, W7NQW was notified and asked for help. He asked W7KQ to contact W7OUS and W7WNN, who were contacted and started for the scene. W7PPQ, rescue headquarters was in communication with W7WPO, and later W7ENU took over. W7ENU put a QST on the Oregon Emergency Net at 1800 asking for a clear frequency from 0100 until the search was over. W7RVM/M and W7OUS/M left for the mountain at 0200 and were stationed at search headquarters at Twin Bridges and at the Forest Service Hq., at Zig Zag respectively. W7ENU acted as relay station at Portland. W7RCL backed up W7ENU as NCS. W7BLN checked in at 0600. The girl was found shortly after 0700, May 27th, and quick relay of the information by the mobiles enabled the rescue group to call off the additional help that had been requested. The information was also relayed to local radio stations for spot announcements. — W7RCL, BC Multnomah Co., Ore.

The Marion County (Ind.) AERC was activated May 27th to furnish communications for flood stricken areas in and around Indianapolis. Continuous watch was maintained on 3910 kc from 0800 May 28th to 0600 May 30th. An information link was maintained throughout Indiana to the Indiana Flood Control Commission and the U. S. Weather Bureau. The net on 147.3 Mc. was activated May 30th and mobiles were stationed at various airports around the city to furnish communication between the Weather Bureau and the various fields to get weather reports for planes before taking off. IFN manager W2EQO reports the following participants on 3910 kc: W7e JYO JVF SWD IQP VVX/m MWR EQQ OUD ZXK NTA JFW PRL ZTD/m AUN DOK ELR EGV HST AMC/0 AMM, KGW DBH AIO/m, W7SEE/9, W9FY.

Idaho had a state civil defense alert on January 16th in which some 70 amateurs throughout the state took part, making contact with 25 of Idaho's 44 counties. Outlets were used on 75 meter phone, 80 c.w. and 160 meters, using established net frequencies of 3935, 3638 and 1935 kc. The test started at 1830 and lasted until 2130 MST. Local communication was also established on two meters, mostly mobile. A critique of the test revealed that the weakest point was availability of emergency power facilities. — W7ITU, SCM Idaho.

On February 19th at 0830 a drill was conducted involving the Dade County Sheriff's Department, Florida Highway Patrol, American Red Cross and the local AERC simulating a super airliner crash at Miami International Airport. Temporary headquarters were set up at Tamiami Airport where a portable mobile station swung into operation with a ground plane antenna atop the administration building. The Dade Emergency Net was alerted and mobiles pro-

needed to temporary headquarters for assignment. One aeronautical mobile was in operation on ten meters. Five other mobiles participated, with a total of sixteen operators. The sheriff was very much impressed with the efficiency of the AERC and personally thanked them for participating. — W4RTY, SEC Eastern Florida.

Fifteen SECs reported April activities for 4253 AERC members. This is an increase of one in number of reports over last April, but a decrease in number of AERC members represented. Sections reported: Mobile, S. Florida, Tenn., E. Fla., New Mexico, Minn., Los Angeles, Ky., Santa Clara Valley, NYC-LI, E. Pa., Ore., Ala., Wis. and Ontario.

RACES News

FCDA now has on hand receiving and transmitting equipment at regional control centers of all seven FCDA regions, following their plans to activate each regional control center for closer liaison with RACES groups within the region. The equipment will not be used for contact between FCDA National Headquarters in Battle Creek and its regional offices. The regional setups will be used only as deemed desirable to provide radio backup of c.d. communications channels to the regional level, not to make use of RACES frequencies to conduct communications between federal government offices. —

FCDA is looking for qualified electronics engineers to work in the national offices in Battle Creek. Several openings are available for people with formal college training in electrical engineering, or an E.E. degree, or equivalent in experience are desired. If interested, it is suggested you apply to Warming Communications Office, Federal Civil Defense Administration, Battle Creek, Mich.

How goes the RACES in your area, fellow? Each month we hit up FCDA for material for this column, but we also want some input from you, the readers, too. Drop us a line once in a while to let us know how things are going; we will want to summarize any items of general interest.

BRIEFS

According to the Halifax Amateur Radio Club Bulletin, edited by W6IFQ, Nova Scotia can receive call-letter plates to attach to their car license plates. A QSL to the Canadian Assemblies, Ltd., Amherst, N. S., will bring the plate, free of charge.

Our apologies to WSPRZ for not listing his 94,924 points as top W in the SS phone results in June QST.

TRAFFIC TOPICS

We get quite a few requests for ARRRL "recognition" of nets, and publicity of various types, but we can't do anything to include any such material when we can. The League supports and encourages all traffic activities, a policy of many years standing, and will continue to do so; but most of our material has to be general so that it can apply to and be about all traffic nets.

There is a difference between recognition and sponsorship. The League sponsors only the National Traffic System, a nationally-integrated system of nets specifically designed for participation by all amateurs interested. Its net managers are appointed by ARLRL officials. Complete details of how the system works are available from headquarters on request, and all amateurs are invited and encouraged to take part in a boy's own scheme of communications. The League funds are spent on their operating ability and time availability. Naturally, being the official ARRRL system, the NTS gets more QST publicity than independently-sponsored nets, but this does not mean

(Continued on page 78)
56-SERIES COMMERCIAL-GRADE ARRAYS -at amateur prices!

HIGHEST SIGNAL-TO-NOISE, SIGNAL-TO-INTERFERENCE RATIO EVER!

- Gusset plate mounting
- Hair-pin resonated
- Wind drag reduced 55%
- Rugged, lightweight aluminum construction
- All stainless steel hardware

ASK THE AMATEUR WHO OWNS ONE!

Whether you are limited for space or money, or whether money is no problem, Telrex has the best suitable array for you. Every Telrex array is fully integrated mechanically and electrically to provide outstanding performance per element. The unsurpassed superiority of Telrex arrays is why the most outstanding radio amateurs, including the world's champion DX'er, use Telrex.

Replete with features never before available! All elements are insulated from the boom by a sturdy molded phenolic element support. Each element is taper-swaged and hair-pin resonated. Every model equipped with the famous Telrex balun match for balanced pattern and minimum TVI. All models are precision tuned and matched, then calibrated for easy assembly and duplication of our laboratory specifications at your site. No experimenting required!

Arrays come fully equipped with an extra heavy-duty gusset-plate mounting for easy attachment to a 2-inch OD support mast. No masting holes are required. The reduced wind drag and gusset-plate mounting make multi-band "Christmas Tree" installations (best, for outstanding, clean cut patterns on more than one band) much more practical and less costly!

The variety of models available in this series enable the amateur to dominate one or more bands from 3/4 meters through 80 meters. In fact, Telrex "Big Bertha" rotating masts can be equipped with arrays with gains exceeding many commercial service installations.

In service in all 48 states, on every continent and 78 foreign countries! Call or write for new illustrated bulletins.

ASBURY PARK 44
NEW JERSEY, U.S.A.
Telephone: Prospect 5-7252

ORIGINATORS AND MANUFACTURERS OF THE WORLD'S FINEST TV AND COMMUNICATION ANTENNAS
BRASS POUNDERS LEAGUE

Winners of BPL Certificates for May traffic:

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Summary: Total 1200 17854 EAN 12.5

More Than One-Operator Stations

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Central TCC goes 100% with the able tutelage of W8QKJ. Twelve stations participated, to wit: W8Q ADB BPT WPW TFQ TD9 ZRI YHM K6DXY (Continued on page 60)
a neat package....

A neat, tidy package, the Gonset Communicator, long ago set the pace for commercial-built VHF amateur and emergency equipment. This practical, resourceful set-down of a complete VHF station into "Package" form serves as the basis for Gonset's well known Communicator slogan, "Compactness without compromise."

Communicators—"Packages"—for 2 and 6 meters. For ground-to-air. For industrial. For C.D. Now a special new model for C.A.P. Pace setters—winners—all.

Today, thousands of 2 meter Communicators are in use. The demand for the comparatively new, but already performance-proved, 6 meter models increases daily.


Available RF power amplifiers increase output; power on told!
Gigedo. This group of islands is located approximately 420 miles west of Colima, Mexico, in the Pacific Ocean and includes the islands of San Beniderto, Socorro, Clarion and Rosa Partida.

DXCC credit will be given for Revilla Gigedo starting October 1, 1956, for confirmations dated on or after November 15, 1945. This will permit foreign amateurs to start receiving credit at the same time as those in the U.S.A. Do not submit Revilla Gigedo contacts before October 1, 1956. Revilla Gigedo confirmations submitted before October 1 will be returned without credit.

From May 15 to June 15, 1956, DXCC certificates and endorsements based on postcard contacts with 1000 or more countries have been issued by the ARRL Administrative Department to the amateurs listed below.

**NEW MEMBERS**

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**ENDORSEMENTS**

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**DX CENTURY CLUB AWARDS**

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**DXCC NOTE**

Announcement is hereby made of the following addition to the ARRL Countries List. The addition will be Revilla

80
If it's worth Engineers' time...

...It's worth Engineered Cable

Belden
INTERCOMMUNICATING
AND
SOUND SYSTEM CABLES

Indoor-outdoor, phones or speakers—there is a Belden engineered cable to meet your needs for a permanent, trouble-free installation.

"Items from the Complete Belden Line"

The TV station, the systems for music, paging, and intercommunication in the new Prudential Insurance Company of America's Building in Chicago have been—wired by Belden.

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WIRED FOR INDUSTRY
SINCE 1902
CHICAGO

Magnet Wire • Lead and Fixture Wire • Power Supply Cords, Cord Sets and Portable Cord • Aircraft Wires
Welding Cable • Electrical Household Cords • Electronic Wires • Automotive Wire and Cable
ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Clarence Snyder, W3WFT — SEC: NNT, PAM: TEJ, RM: AXA. EPA notes: 3400, 3050 kHz. With the summer months upon us, the EPA CW Net has ceased operation on its usual time, but the AN Net invites all interested c.w. operators to call in on legal frequency for AN activities. Plans for the C.W. AN and P.F.N. joint picnic at Hershey Park on Aug. 12th are going ahead. Mail your $1.00 registration to GW8X, HCC Radio Club, through its public service Committee, "Resistor Circuit," is planning a transmitter-receiver as a club project in order to participate in CD nets. Another club project was the construction and installation of an antenna for the Big Brother Camp, Central High School, in Philadelphia, has a new radio club called the 507 Society of C.W. Operators, best of all, the members of the H.W. DQK is conducting code and theory classes and officers include W1HI, pres.; YXX, vice-pres.; FIT, sec'y; and YXX is now operating from Phila. and is on 20 meters a.m. and in meters. EAN made 82 QSOs while operating portable from the Philadelphia Electric Company after Hurricane Beryl hit. ZGB, and Bob BUR won the WAS Contest sponsored by the NPARC. AMC and OWG are now on 2 meters in Carbon County. There is a new club on the air in Carbon County. UEO is now for Carbon County. YGK enters Villanova working for his B.E. degree. New General Class licensees include C.F. and ZGB, and John ZGB, and Roy BUR won the WAS Contest sponsored by the NPARC. AMC and OWG are now on 2 meters in Carbon County. UEO is now for Carbon County. YGK enters Villanova working for his B.E. degree. New General Class licensees include C.F. and ZGB, and John

SOUTHERN NEW JERSEY — SCM, Herbert C. Brooks, K2BQ — SEC: YR, PAM: ZI. Please note the appointment of the YR, Haddleton, as SEC. All EAs are required to report their QSL cards to the SCM and regret losing Z1V because of the adjustment of the section boundaries which added four counties to the New Jersey section. New sections are: Camden County, Salem County, Gloucester County. The Camden County And Salem County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham County and Racine County the net reports QST using a BC-457. PYF will be operating mobile and fixed portable on the Jersey shore throughout the month of August. Under the leadership of Ray, WA2IVB, Buck, W2NLX, and others, the Ingham Count
GREATER SELECTIVITY
"13 tubes, and what do you get?
The power and performance of a 20-tube set!"

Advanced Morrow circuitry gives the MBR-5 amazing performance in a rugged, compact unit offering more features and more value for your money.

HIGHLY SENSITIVE (1/2 microvolt on all bands) 100 kc. Crystal Standard built in.

EXCLUSIVE SQUELCH CIRCUIT eliminates interstation noise, but opens on the weakest signal.

SSB, CW, AM RECEPTION. Separate AVC switch.

ILLUMINATED "S" METER measures incoming signals, doubles as field strength meter for tuning transmitter.

COMPACT AND HANDSOME. 4" high, 11 3/4" long, 6 1/2" deep. Hammertone case matches MB-560.

MBR-5 Amateur net, $224.50

Matched Accessory Equipment

MB-560 TRANSMITTER
"More talk power" on all bands. 90-watt CW, 60-watt Phone. 
Amateur net .................. $214.50

RVP-250 POWER SUPPLY
Mobile vibrator pack for MBR-5 and exciter of MB-560. 
Amateur net .................. $39.50

SH-7 SPEAKER
5"x7" speaker in sturdy hammertone case. Amateur net ............... $11.50

MLV-50 INDUCTOR
Motor driven for remote control tuning of whip. Amateur net .... $24.95

FS-1 FIELD STRENGTH METER
Measures field intensity. Amateur net .................. $19.50

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from Finland, E.A. Neal, of G.E. addressed the SARA of the Oshkosh Hams. It was scheduled for Sept. 20th. K2RTK has worked 18 countries with 10 watts on 20-meter c.w. K2ITN is experimenting with 2,725 K2RSA and LAD c.w. K2NKJ and LAD c.w. are using the surplus gear to 220 MHz. GHU and CYD are now ECC. Anyone interested in a Western New York QSO party and DX contest should write to the W21FZ or W2YX to see what is happening.

SHR, YGG, MAF, UBI, and SIM/9. Items for this column must reach us by the first of the month.

Traffic: (May 3) has worked on 20 meters. (May 4) has worked on 20 meters.

The Radio Club of America will hold its annual convention in Detroit on the 9th. The ARRL will hold its annual convention in Chicago on the 9th.


domestic. Additional calls heard in the section are K5J's DXL, KQ8N/6, K5NS, DNN, and K5GK. The new General Class license is GJB, who is burning the midnight oil to complete his DX-100. KO9ABQ also is staying busy, and in the DX contest he has made a number of contacts.

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FIRST TIME EVER! BUY DIRECT & SAVE!

3 BANDER 20-15-10 Meters

- 16 ft. boom
- 28 ft. elements
- 38 lbs.
- 52 ohm match
- 61 ST 6 aluminum elements

- 20 meter spacing
  .15 and .1
- 15 meter spacing
  .15 and .225
- 10 meter spacing
  .3 and .2

Measured S.W.R.:
(a) 14200 — 1.3:1  (b) 21300 — 1.4:1  (c) 28750 — 1.3:1

Measured front-to-back:
(a) 14200—30 DB  (b) 21300—25 DB  (c) 28750—30 DB

Measured forward gain over full size Reference Dipole:
(a) 14200—7.8 DB  (b) 21300—7.9 DB  (c) 28750—8.1 DB

Direct to you — Reg. 139.95

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NOW! WORK 3 BANDS...

—with Radio Specialties new 3 Bander. Most T.V. rotators can be used. Band switch in seconds. Tune your transmitter and receiver to either 20-15 or 10 meters and you are ready to operate. Swing-A-Boom permits rotation of the boom and elements in vertical or horizontal planes so tuning adjustments are made possible from the tower.

Convert Your Present 20 Meter Beam

To A 3 Bander

RADIO SPECIALTIES INC.
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Please send me the following:

2 element beam kit — 28.00
3 element beam kit — 44.00
4 element beam kit — 54.00
5 element beam kit — 74.00
All prices F.O.B. New York City

FREE! Catalogue F-1 for 3 Bander or Conversion Kit.

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 Enclosed find check or money order in full
 Enclosed find $10 deposit—balance C.O.D.

NAME

STREET

CITY

STATE

85
formulas 79, high 11, low 0, average 2.55. The South Dakota C.W. Net: SMV (NCS), QNI 63, high 7, low 2, average 4.8; QTC 33, high 8, low 0, average 2.6. The net will be held for the number of the beneficiarys in the SFARC are KN6EEY and KN6GFJ. The club has produced 8 Novice who are now studying their Novice Class theory course. Other DX is also being discussed.

The SFARC now publishes a monthly bulletin called Feedback. ZWL has been on vacation. DTH has returned home with a motorl noise. FCA is the son of John DTH, a long-time member. FCA was born in VIM. His mother received her First Class license in April. She dropped the first of May.

The youngest son of DTH, is a 10-year-old boy named John DTH. He is a member of the amateur radio club. Officers of the Mitchell ARC are WCN, pres.; WUL, vice-pres.; WCT, sec.; and WCR, treas. The club meets every other month. The next meeting is May 10, WSBG 170, MWS 25, GWS 27, QN 18, BGS 16, FSE 12, (May) WSBG 203.

KXW MUX - Asst. SCMC: Vince Smythe, BGCQ, SEC: GTC, RMs: KLG and DQL. PAMS: JIE, LUX, and UCV. The YL Convention was a huge success, and only with the hard work of the North Shore YL Club and the various committees who worked so hard for its success. There were 35 licensed YLS on the Centennial books. Their attendance at the convention was about 165. OMs and YLS, QXII won the main prize, which is a National receiver.

The license committee for the FCC will hold its annual meeting in Detroit, Mich. The St. Paul Radio Club, Inc., will sponsor a Dakota Division Convention in St. Paul sometime in 1957. The next meeting is scheduled for July 10.

The FCC has announced that the ex-serviceman, who was selected as the best new ham license, will be held in this issue. The TPO, QCT, GKL, and HGF attended a meeting of the QCT, which met at 1100.

More of us should strive for this coveted certificate. It is the mark of an excellent operator. ALH, the new certificate holder, has earned his QNX and QXII certificate. He has erected a 45-foot tower for the 10- and 15-meter band. OMC is installing a 6-meter rig and plans to be on the air this winter. The affiliate of the Atlantic Advertiser, 1070, at the YL Convention, has received his WTQ (worked Toledo, Ohio) certificate.

GREAT LAKES DIVISION

ARKANSAS — Owen G. Mahaffey, WS6FP, - BZX renewed his EC appointment and reports a complete civil defense emergency radio unit at the City Hall, a patrol car and two trucks radio-equipped, and one of the finest and best-trained radio南山军团. All of these departments are interested in emergency work and have had a thorough course in emergency first aid. TID is the new OM at Centway. KN5QCF is a new ham in Warren. KRO soon will have a new 500-watt all-band on the air. KN5EUG, QMY, and OHE are active amateurs in Pine Bluff. KBHOC has moved to Fort Worth, Tex. I wish to remind all Arkansas hams to start thinking about a new SCM and get in line and sign up as soon as possible before the month of October and won't permit me to accept the nomination next time. Traffic: W5KRO 11, KBHOC 10, DJT 10, DJT 10.

MICHIGAN — SCMC, Thomas J. Morgavi, WS6FP — The Baton Rouge ARC reports activity on 6 and 2 meters is picking up; also there is mobile activity on 10 meters. The YL is E5566. K5AJG reports TQ is president of the Jefferson ARC. Recent grades of Jefferson ARC are the new OM at K5AJG, and the K5AJG. SFEI reports an increase in the number of licensed hams. FCA reports an increase in the number of licensed hams.

Great Lakes Division

KENTUCKY — SCMC, Robert E. Fields, W4BHI — SEC; CDA, PAM: YII, RMs: ZDA and TZA. Traffic on all bands is slowing down because of the warm weather and the fact that a large number of ham antennas are being used for other purposes. Bugs and dryness may be a factor, but the local club is well and may have to return to the hospital. The SEC, CDA, and other clubs to contact their ECs and ask for help if they need it. The club is well organized and the communication needs, KMM, manager of 9RM, says conditions have been very bad because of rain and storms. KG5C is a new 10-meter operator and KG5C is doing a good job. S.L. reports that his parcel service is used by a lot of people and he is going to set up an old ham radio and have some fresh air with the family. To all the fellows who expected to see "LAM" at the Mammoth Cave in Kentucky, on that day I was on my way to New York and will be back in time for the ham radio contest. KG5C has just tuned in on 20 and 15 meters.

The annual meeting of the club is held on the first Monday of each month at 8 PM. The club is well organized and the communication needs, KMM, manager of 9RM, says conditions have been very bad because of rain and storms. KG5C is a new 10-meter operator and KG5C is doing a good job. S.L. reports that his parcel service is used by a lot of people and he is going to set up an old ham radio and have some fresh air with the family. To all the fellows who expected to see "LAM" at the Mammoth Cave in Kentucky, on that day I was on my way to New York and will be back in time for the ham radio contest. KG5C has just tuned in on 20 and 15 meters.
INTRODUCING...
SSB-1000
Table Top Kilowatt Linear Amplifier

Amateur Net Kit $625.
Factory Wired & Tested $745.

Check these Features
Exclusive with ELDICO

☑️ LOW DRIVE REQUIREMENT
3 Watts PEP will drive the unit to full kilowatt

☑️ BUILT-IN OSCILLOSCOPE
Provides constant monitoring on the air and assures proper linearity and clear signal

☑️ COMPACT DESIGN
Table Top receiver-type cabinet complete with built-in heavy duty power supply. Size: 10¼" x 17" x 15"

☑️ PI-NETWORK OUTPUT
Single knob bandswitch and high-efficiency silver-plated Pi-network output circuit. Matches wide range of antenna-impedances

☑️ QUIET OPERATION
Potted and Vacuum—impregnated chokes and transformers, shock-mounted relays, low-velocity high-volume blower for extremely quiet operation

☑️ FOOL-PROOF OPERATION AND SAFETY
Interlocked hinge-cover, tune-operate switch and overload relay for tube and circuit protection, independently metered screen and cathode-circuits

☑️ HIGH HARMONIC ATTENUATION
High-Q plate and grid circuits and Pi-network output circuit provide maximum harmonic-attenuation

☑️ ATTRACTIVE STYLING
Black wrinkle finish table top cabinet that matches other modern communication equipment in size and appearance

☑️ POWER RATING
DC Input  CW - 1000 Watts
AM - 700 Watts
Peak Envelope Power Input SSB-1000 Watts
Peak Envelope Power Output SSB-625 Watts

☑️ FREQUENCY RANGE
5 Bands: 80m  3,500 to 4,000 Mc.
40m  7,000 to 7,300 Mc.
20m  14,000 to 14,350 Mc.
15m  21,000 to 21,450 Mc.
10m  28,000 to 30,000 Mc.

FEATURING: EIMAC 4X250B
Revolutionary new power tetrodes

See it at your
Distributor
Today!!
EASY BILL. I'VE GOT A GOTHAM BEAM. I'M WORKING STATIONS I NEVER HEARD BEFORE. DX IS A LOT NOW.

THAT SETS IT, JIM. I'M GOING TO GET A GOTHAM BEAM TOO. ARE THEY EASY TO INSTALL AND OPERATE?

VERY EASY BILL AND THEY'RE FLEXIBLE AND TROUBLE-FREE. LICKS YOUR NOISE AND CVQ PROBLEM TOO. IF GOTHAM BEAM IS THE BEST I'VE EVER MADE.

Study these specifications—compare them—and you too will agree, along with thousands of hams, that GOTHAM beams are best!

TYPE OF BEAM. All Gotham beams are of the full half-wave plumber's delight type; i.e., all metal and grounded at the center. No wood, tuning stubs, baluns, coils, or any other devices are used.

GAIN. Gotham beams give the maximum gain obtainable. Our 2-element beams give a power gain of four (equivalent to 6 db); our 3-element beams give a power gain of seven (8.1 db); and our 4-element beams give a power gain of nine (9.6 db).

FRONT-TO-BACK RATIO. We guarantee a minimum F/B Ratio of 19 db for any of our 2-element beams; 29 db for any of our 3-element beams; 35 db for 4-element beams.

MATCHING. Matching of the transmission line to the beam is extremely simple and quick. Everything is furnished and the matching is automatic. No electronic equipment or measuring devices are required.

ASSEMBLY AND INSTALLATION. No special tools are required for assembly and installation. Entire job can be done by one man in less than an hour. Full instructions are included with each beam.

MAST. Any Gotham beam can be mounted on a simple pipe mast. Diameter of the pipe should be between 3/4" and 1 1/4".

STANDING WAVE RATIO. A very low SWR of approximately 1.5 to 1 will result from following the instruction sheet, depending on the height above ground and the surrounding area. If an SWR indicator is available, Gotham beams can be easily and quickly adjusted to 1:1.

STANDARD AND DELUXE BEAMS. Standard beams in the 6, 10 and 15 meter bands use 7/8" and 3 1/2" tubing elements; the deluxe models for these bands use 7/8" and 1". In 20 meter beams, the standard has a single boom, while the deluxe uses twin booms.

NEW VERTICAL ANTENNAS engineered vertical antennas for 40 meters, 80 meters, 160 meters. Gotham proudly announces three vertical antennas for operation on 40 meters, 80 meters, and 160 meters. Each antenna is absolutely complete with 2-12 foot lengths of tubing and a loading coil, can be assembled in less than two minutes, and requires no special tools or electronic instruments for adjustment and operation. Radiation is omnidirectional, with maximum radiation at the very low angles necessary for DX operation. These three vertical antennas have been developed over a period of three years in response to requests by hams for efficient, foot-proof, small-space, low-cost antennas for 40, 80, and 160 meters. Literature available.

#40 vertical for 40, 20, 15 and 10 M. $14.95
#80 vertical for 80, 40, 20, 15 and 10 M. $16.95
#160 vertical for 160, 80, 40, 20, 15 and 10 M. $18.95

HOW TO ORDER: Send coupon with check or money order directly to GOTHAM, or visit your local distributor. Immediate shipment by Railway Express, charges collect. Foreign orders, accepted.

GOTHAM Dept. QST
107 E. 126th St. NEW YORK 35, N. Y.
Enclosed find check or money-order for:

2 METER BEAMS
- Deluxe 6-Element $9.95
- Deluxe 6-Element $12-El 16.95

6 METER BEAMS
- Std. 3-El Gamma match 12.95
- Deluxe 3-El Gamma match 21.95
- Std. 4-El Gamma match 16.95
- Deluxe 4-El Gamma match 25.95

10 METER BEAMS
- Std. 2-El Gamma match 11.95
- Deluxe 2-El Gamma match 18.95
- Std. 3-El Gamma match 16.95
- Deluxe 3-El Gamma match 22.95
- Std. 4-El Gamma match 21.95
- Deluxe 4-El Gamma match 27.95

15 METER BEAMS
- Std. 2-El Gamma match 19.95
- Deluxe 2-El Gamma match 29.95
- Std. 3-El Gamma match 26.95
- Deluxe 3-El Gamma match 36.95

20 METER BEAMS
- Std. 2-El Gamma match 21.95
- Deluxe 2-El Gamma match 31.95
- Std. 3-El Gamma match 34.95
- Deluxe 3-El Gamma match 46.95

NEW! RUGGEDIZED HI-GAIN 6, 10, 13 METER BEAMS
Each has a TWIN boom, extra heavy beam mount castings, extra hardware and everything needed. Guaranteed high gain, simple installation and all-weather resistant. For 52, 72 or 300 ohm transmission line. Specify which transmission line you will use.

Name
Address
City Zone State

98

This Full Size Gotham Cost Only $21.95 And Brought In 87 Foreign Countries, All Continents And 30 Zones On 35 Watts!
is greatly appreciated. Many thanks to SCM Brookes, K2B9G, We consider this added territory to Northern New Jersey the big news of the month and it all came about through efforts of Directors of SCM, with the assistance of the other Board members. FPL kept K2NR active in the amateur bands during his tour of duty as HMS. While he was there his band was being used by the American Radio Relay League for operation of the station on a regular basis. He returned to the New Jersey State Fair in East Orange, New Jersey on September 10th, as a sign of the return of K2NR to the airwaves.

The New Jersey State Fair in East Orange, New Jersey is a popular event for radio enthusiasts. During the fair, K2NR returned to the airwaves on September 10th, showcasing the return of Amateur Radio operations to the station.

**NEBRASKA — SCM — Floyd B. Campbell, W3BCH — As director of the Nebraska State Fair, W3BCH has been involved in organizing and promoting Amateur Radio activities at the fair. The station on the Nebraska State Fair band, the Nebraska State Fair Board, and the Nebraska State Fair Authority have all been involved in promoting Amateur Radio activities at the fair.

**MIDWEST DIVISION**

IOWA — SCM, Russell B. Maurer, W3BBR — The Iowa State Fair in Des Moines was held this past week, with SCM Russell B. Maurer, W3BBR, attending. LGS was elected the manager and has received an AM appointment. The present and all four past managers of the station are now attending. Iowa 75-meter phone Net is being held in Marshalltown on August 11th. The Central States Net is held on 148.325. The Iowa Radio Club furnished communications for a local 60-mile motorcycle run. Mobiles reported time checks from several points south of the state.

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**NEW ENGLAND DIVISION**


The monthly meeting of the New England Division, SEC: LFK, RM: KYQ, PAM: YBH, Traffic Net: MGN. Monthly meeting on Thursday, June 11th, at 7:30 p.m., at the Farmington Canal Club in Meriden, Connecticut.

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FLIGHTCOM

MODEL 400-12/24 SERIES
VHF-FM for AIRCRAFT

Provides communications between ground
FM systems and executive, patrolling
and utility aircraft. Used by fishing
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line helicopters, State police,
Conservation departments,
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All FLIGHTCOM models are on
FCC "List of equipment acceptable
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FEATURES:

• COMPACT ... Case size 14"
x11 1/2"x6 1/2"
• LIGHT ... 22 lbs. (without
antenna and speaker)
• POWERFUL ... 25 watts output
• UNIVERSAL ... instantly
changed from 12 volt to 24
volt operation
• EFFICIENT ... low battery
drain; on 12 volt—total stand-
by. 4.5 amps, transmitting 10
amps. on 24 volt—total stand-
by 2.5 amps, transmitting 5
amps.
• LOUD ... 1 watt minimum
with less than 8% distortion.
• PERFORMANCE ... identical
with ground systems.
• QUALITY ... exceptional
value/price ratio.

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Write for available territories.

DESIGNERS AND MANUFACTURERS OF
COMMUNICATIONS COMPANY, INC.
FORTUNE 1238
CORAL GABLES, MIAMI 34, FLORIDA
1½, 2, or 6 METERS

Tecraft

Tecraft Transmitters • 220, 144 or 50 Mc.
Hi-Level Plate Modulation • Hi-Impedance Mike
Provisions for Metering All Stages • Tuned Antenna Output System to 52/72 Ohm Line • RF Output-Inductor • Power Requirement 6.3 v AC @ 4 amps & 250 v DC @ 250 ma. • Tubes: 6AU6 osc.; 5763 8uf/Dblr; 6360 Buf/Mult; 6360 final amp; 12AX7 speech amp. & driver; 2-6AQ5 modulators • Power Input to Final, 20 Watts.

Complete with tubes, crystal and plugs. $95.95
Matching Power Supply. $39.95

Amateur Net $42.50

Complete with crystal and tubes.

Tecraft converters may be had with IF output frequencies to suit the tuning range of your receiver, and provide the ideal system, in terms of extreme sensitivity, maximum stability, low noise, high gain and selectivity.

LOW NOISE FIGURE: Approximately 4 db. 1 microvolt of signal will provide better than 20 db. thermal noise quieting.

SENSITIVITY: Approximately 1/10 microvolt input will provide a signal 6 db. over noise level.

GAIN: Better than 30 db.

National NC-300, Specify IF 30-35 Mc.

MODEL: CC5-50 and CC5-144. For General Coverage receivers. Choose either 6-7, 10-11, 12-13, 14-15. Any of above in kit form, $29.75.

CC5-220. For 14-19 Mc. only. Wired only.

AT YOUR DEALER, OR WRITE

The Equipment Crafters, Inc.

RIVER EDGE, NEW JERSEY, COLfax 2-0159

saddened at the untimely passing of Hazel Kempton.

WILFR, June 8th, 84BU/1BRU is back from the Southeast and says he's been doing all he can to please your box and gall this summer. This is more and more apparent on 2 meters. Congrats to the new Novice and General Class boys and gals. Tactical calls are being issued for RACES use in the c.d. More and more county patchs are getting approvals. Your SCM is Radio Officer and has his in for Cumberland County. WV7 is trying to get transferred back to Maine. Are WTC and WBE going to move on 3 meters this winter? South Angles is that: "Kilowiatt City," progressing on Heart Break Ridge has enough tryst r.f. to light the streets. We are sorry to hear about LBJ. For your bath at the Ducker on the 19th, your SEC also will be there. Traffic: WILEP 184, WTC 141, CEV 74, NXX 28, UDD 16, BCD 12, B2MYP 12.

EASTERN MASSACHUSETTS — Frank L. Baker, Jr., WIALP — Appointments endorsed: ALP Radio Officer for Everett 1-B, JSM Valkom, BWJ Frankbon, DWY Reeves, WWJ North Reading, ICU Amesbury, WVZ Newburyport, WYX Area 1 Radio Officer, WYJ Topsfield, CLF Norfolk, WBC Boston, WHS Brookline, PJ Everett, SS Lincoln, LQ Manchester, LMG Newburyport, JOMecs; JSM as OSE; QM and as OSEs; AWA and LQO as OSEs; UGO, DJ, LQQ and as OSEs; LAG, AJO, and RWM. FMQ as QM. LQQ as LQQ.

ADL, IVF, FUR, FB, FJH, KCO, IAO, KFG, BYV, LXR, PZA, QAA, 2BRG, and 3KX, GBD, and 3KX, GBD, are heard on 75 meters; LI, YX, ATD, ZUS, EUI, WLY, ELT, EMZ, ACC, LVI, HWE, PCE, GZ, UGC, OGO, QIA, DEL, and ZUS, KGD, by QGY. A new RACES license, XXQ, is now received in Quincy. K7Ey is now General Class. IAP has moved to California. QTZ now is in Braintree. HSK had his license taken by the post office. HELPED with auto races in New Hampshire supplying transmitters. BGW says the East Coast RTTY Net is on 3952 kc. The Braintree Radio Club held its annual banquest and installed the following new officers: MME, press.; CTR, vice-press.; Donald Russell, secy.-treas. CT9 is back on 2 and 10 meters. WNIKLA is in Holland, W810 is in Cranston, and the new 60-Y, 10-meter ground plane. JOT is moving to Needham. DM5 is working at WB3, Brockton. YAG has a 20-watt module. NF is on 20-meter c.w. Area 1 Radio Club held a meeting with KTP, TQG, LLY, QKL, ALP, and 2YX present. Radio Amateur Open House held two meetings. BFV is teaching at Medford High. The South Shore Club held a meeting. BFV is working DX. SG7 made a call again. WZ7, who has been operating KIAI, will be the new President of the Air Force and will be on from Harris. CDU has been helping out and DNF and 7MBF/1 will be on at KIAI. BER is on 100 meters and is a member of the AFI, 7890 kc. Mon, at 5, CSS has a new DX, CDU has a 60-Y, tower and beam on 10 and 20 meters. ALP and his XYL had their 25th wedding anniversary. AUY says there is not as many Novice out-of-band harmonics as there were. SMO took part in the Red Cross drill in Belmont with 5 other mobiles. He has a DX-100 and an SX-8. The Twelve Hundred Radio Club, JXQ secy., is now affiliated with ARRL. VHI is going to college. New officers of the T-9 Radio Club are MVQ, press.; TQG, vice-press.; KON, KIT, and ISX, treas. The Cape Cod & Islands Amateur Radio Assn. held its picnic in the USO Hall in Falmouth because of wet weather and had over 100 members. On 10 meters the benefit of SGL, FGL and W3RF are in the RTTY Net. JFS has a ground-plane antenna for 10 meters. NWS has a four-elements beam on 10 meters. JRS has a new 2-meter beam. LUS is in Hospital. The Minute Man Net is now on 3970 kc. at 0730. AZU is learning Spanish by working the LUS. SFE has a V.O. for the TRS. JZ5 has a JZ5-GW5's rotor on the beam is bothering him. JH5Z has a Heath-36 transmitter. MAM is having local noise QRM. U1F is going to California. DIR has a vertical coax antenna on 10 meters. MUM is recovering slowly from his injury. OHT-2iners in New Bedford still active are AOQ, AVY, AWD, and AFQ. The QRA held a meeting with a movie on "Texas Towers" by TVD. IKG has a new daughter. AWO is on 2, 10, 15, and 75 meters. The Morgantown Amateur Radio Association has been holding clays for code and theory. ZG0, K6O, K9G, ENS, and ZDN are helping out. MJ is on 10 meters with a low-power rig. SSO has a DX-100. OOO is a 2-meter convertor. CPU is rebuilding the receiver. ADL is on 6 meters. PFW is working on TVU. CUG and VYS are on 6 meters. EK is equipping the ARC-5 for 2 meters. CM3 is building the N9F for 2 and 6 meters. AGR is in New Jersey. BL has an NC-183. LRU is on 2 meters again. The Whtopd drill led the following on: DXL, OIA, OGB, GBL, MQB, IRR, SAM (ex-2KCC), TTH, TEO, EHZ, UOC, NMM, and I0O. They also had an unexpected emergency at the hospital with a car accident. Two phones and TQG, DPN, BB, DEL, and DFL in the area; communications. UOC rescued three boys from an overturned sailboat of the Boston America. Traffic: W8DWC, W1EMG 619, KIAI 237, WIEPE 218, NUP 71, UO1 K5I, GPNX 48, AYV 47, DFY 44, CJU 30, AUS 28, JPS 16, YD 16, ARU 17, 3KX 11, GWT 11, LQR 8, BEI, DUO 3, BY 3, (Ary) WIBQ 18, AGQ 11.

WESTERN MASSACHUSETTS — SCM, Osborne R. Merkensagen, WHHR, - SEC, XW, and BYR. AMX, WBF, and NRS, DXE, WV, W8, and ZN. LQMs: DZV and ZUU, PAM-QWJ. The WMCW Net meets on 3560 kc. Mon. through Sat. at 1900 EDT. The Net (Continued on page 24)
6 & 10 M. BEAMS AT NEW LOW PRICE

Skyssweeper

5-Element 6-Meter Beam
Complete Ready-to-Assemble
$21.95 NET

3-Element 10-Meter Beam
Complete Ready-to-Assemble
$24.95 NET

IN STOCK AT THESE DISTRIBUTORS AND OTHERS

California: Burbank: Valley Elect., Sup. Co., 1302 W. Magnolia
Los Angeles: Radio Prada, Sales, 1501 S. Hill St.
Long Beach: South Radio Supply Co., 266 Alamitos Ave.
San Bernadino: Klenfield Elect., 390 South Mt. Vernon
San Diego: Western Radio & TV Sup., 1415 India St.
San Francisco: Orehonk & Bellingham Co., 1554 Market St.
San Francisco: Television-Radio Supply Co., 1231 Mission St.
Santa Barbara: Channel Radio Supply, 529 Anapamu St.
South Gate: Mac's Radio Supply, 8000-22 Long Beach Blvd.
Florida, Fort Lauderdale: Certified Elect., Dist., 2606 S. 4th Hwy.
Champaign: Chicago Radio Appliance Co., 415 S. Dearborn St.
Chicago: Green Mill Radio Supply, 145 W. 111th St.
Chicago: Grove Electron Supply, 4103 W. Belmont
Chicago: Premier, 329 W. North Ave.
Chicago: Tryco, 5247 Belmont Ave.
Peoria: Sales Electronic Supplies, Inc., 303 South Adams St.
Rockford: H & H Electronic Supply, 519 Kishwaukee St.
Rockford: J J M Radio & TV Supplies, 713 Railroad Ave.
Indiana, Evansville: Catenon's Radio Supplies, 1014 W. Franklin St.
Fort Wayne: Van Sicklo Radio Supply Co., 1320 S. Calhoun St.
Hammond: Nation Wide Radio, 2015 Calumet Road
Indianapolis: Graham Electric, Inc., 102 S. Pennsylvania St.
South Bend: Radio Distributing Co., 1212 High St.
Iowa, Council Bluffs: World Radio Labs, 3415 W. Broadway
Massachusetts, New Bedford: E A Ross & Co., 1663 Purchase St.
Cambridge: Seidman Distributing Co., 800 Massachusetts Ave.
Michigan, Ann Arbor: Parker Radio Supply, 603 Church St.
Grand Rapids: Radio Parts Inc., 442 Division Ave., S.
Jackson: Mattson Electronics, 1647 East Michigan Ave.
Kalamazoo: Ralph M. Bolton Co., Park at Water Streets
Kalamazoo: Warren Radio Company, 713 Portage Street
Minnesota, Minneapolis: Electronic Center, Inc., 107 N. Third Ave.
Missouri, Buffalo: Henry Radio
New Hampshire, Concord: Evans Radio, P.O. Box 312
New Jersey, Newark: Variety Elect., Co., 468 Broad St.
Newport, Somerset: Masters TV Supply Co., 96 N. Gason St.
Toanley: Homer M. Ross Elect. Dist., 367 Guest Ave Rd.
New York, Buffalo: Genesse Radio, 2350 Delaware
Hamptop, L. L.: Standard Parts Corp., 277 North Franklin St.
New York, Rochester, 65 Courtland Ave.
New York, City: Hervey Radio Co., 103 West 43rd St.
Ohio, Cincinnati: Steinberg's Inc., 633 Walnut St.
Dayton: Snappco Inc., 314 Lee St.
Winston, Salem: D & J Electronic Supply Co., 207 Elm Road, S.E.
South Dakota, Watertown: Berghardt Radio Supply, P.O. Box 746
Texas, Fort Worth: Electronic Equipment Co., 919 Florence St.
Bremerton: C & G Radio Supply Company, 2002 Jefferson Ave
Seattle: Amateur Radio Sales Co., 224 Cedar St.
Wisconsin, Janesville: Thompson Electronics, 110 N. Academy St.
Milwaukee: A. and F. Electric-Mart, 7033 W. Greenfield

Model HM6-5AK 5-Element 6-Meter Beam

Matches 52-ohm cable. 5-element 6-meter beam can be rotated with HD TV rotator. No cutting, trimming or tuning necessary.

SWR at resonance is 1.2 or less. Sufficiently broadband for low SWR at band ends. All interconnecting harness is 1 KW 72-ohm twin lead, terminating in SO-239 coaxial socket mounted in weather-resistant connector box. Can be fed from any length of 52-ohm coaxial cable. Other impedances on special order. Easily assembled with screwdriver, wrench, and pipe pliers. Constructed of drawn aluminum tubing, hot-dipped steel structures, nickel and cadmium plated hardware, and stainless steel "T"-straps. No cutting, no trimming, no tuning necessary. Just set up and connect according to instructions. Lower resonance can be obtained by use of special Element Extender Kit available at small extra cost.

AVAILABLE NOW! ALL YAGI TYPES

(15-20-40 Meter Beams are on the way)

6-Meters — Cut to 52 mc. Covers 50-54 mc.
(Featuring Skyssweeper exclusive Tri-Boom and Quad-Boom Construction)
Model HM6-3AK 3-element, full size Net $12.95
Model HM6-5AK 5-element, full size 21.95
Model HM6-10AK 5-over-3 35.25

10-Meters — Cut to 29 mc. Covers 28.5-29.7 mc.
(Featuring Skyssweeper exclusive Quad-Boom)
Model HM10-3AK 3-element, full size Net $24.95
Model HM10-4AK 4-element, full size 29.95
Also available with Rollins at slight extra cost.

2-Meters — Cut to 146 mc. covers 144-148 mc.
Model HM2-3AK 3-element Net $4.95
Model HM2-5AK 5-element 8.95
Model HM2-7AK 7-element 13.60
Model HM2-12AK 7-over-3 13.95
Model HM2-14AK 7-over-7 18.95

NEW—2 motors
Model HCR2-1AK Corner Reflector Net $27.95

NEW 220 and 440 mc. Yagi Beams
Model HM22-7AK (220 mc.) 7-element Net $5.10
Model HM44-7AK (440 mc.) 7-element 4.20

All prices slightly higher for West and Southwest

Special antennas for Police Point-to-Point, Civil Air Patrol, Civil Defense and Commercial Communications on special order.

Skyssweeper inc.
MCHENY, ILLINOIS
93
15's the DX band... and it's terrific!

Now! A 15 element, 15 meter beam engineered to give you all the DX you have ever dreamed about!

Design features of the "Super 15" assure you peak performance...always!

- Full length parasitic reflector and director elements are teamed up with a driven element shortened to permit use of a coupling transformer. This provides perfect match to 52 ohm coax line and an exceptionally efficient and convenient coupling.

- Mosley high standard of construction has the acclaim of hams the world over...true beam performance at a low-low price.

- 7.9 db or better
- 1/2 or better at resonant freq.
- Max. Element length 23' 11"' Wt. assembled 22 lbs.
- Wind surface area 8.5 sq. ft.
- Wind load 170 lbs.

Model — 153: less mast & rotor
Amateur Net — $45.28

You name it.. the Super 15 got IT!

VERMONT — SCM, Robert L. Scott, W1RN — SEC: SIO, RM: OAK. I suppose the biggest news of the month is that OAK is on phone! Y'all got good old GBM back and he's been raving about how the new FM station is handling. And he says he's doing fine. We're all looking forward to the QRP Field Day.

NORTHWESTERN DIVISION

ALASKA — SCM, Dave A. Fulton, KL7AGU — A1Z is now running two transmitters, one on 75 and one on 15.
NOW!
world’s first and only
TRANSISTORIZED
Amateur Band Converter

Regency
ATC-1

a tiny self-powered
converter that connects
INSTANTLY
to any receiver

4¼" x 3¼" x 4¼" — weighs only 30 ounces

- No other converter like it! REGENCY’s new ATC-1 is truly portable. Hooks up in seconds to any receiver (including car radios) — only connections are to an antenna and to receiver’s antenna input.

The ATC-1 takes no power from the receiver. It is self-powered by three tiny Penlight cells which have a current drain of only 450 to 600 micro-amperes.

World’s Smallest Converter. Use of transistors instead of bulky vacuum tubes makes this remarkable unit as easy to carry as a candid camera — it’s actually less than half the size of this page!

The ATC-1 provides AM, CW and SSB reception on the 80, 40, 20, 15 and 10 meter amateur bands. Sensitivity is 5 to 10 mv for 6 db signal-noise ratio. A modified “Q” multiplier circuit improves sensitivity and selectivity for phone operation. Smartly styled aluminum cabinet is covered in dark grey tweed with satin finished aluminum front.

With features that can’t be duplicated at any price, the transistorized REGENCY ATC-1 is available now at just . . . . $79.50 amateur net.

See and hear this miniature marvel at your local distributor.
Bulletin giving complete details and specifications yours on request.

REGENCY Division - I.D.E.A., Incorporated
Dept. Q, 7900 Pendleton Pike, Indianapolis 26, Indiana
Here's where the fun begins!

Centralab Ampec®
3-stage P.F.C.*
Audio Amplifiers

You can use them to build all sorts of exciting, miniature projects — pocket radios, mike preamplifiers, signal tracers, portable megaphones, phonograph pick-ups, hearing aids, model controls—even stethoscopes

Yes, sir, you can really have a "picnic" with Ampec. It's the highest form of Printed Electronic Circuit and provides complete electrical service from input to output. Wiring, capacitors, resistor, and tube sockets are bonded to a single, master plate.

Even with tubes, Model 2 Ampec is smaller than a book of matches. Model 3 is smaller than a postage stamp—and it has a tone circuit, besides!

Ask your Centralab distributor to tell you more about Ampec.

And send coupon for Booklet 42-142 with specifications and applications.

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Here's where the fun begins!

Centralab Ampec®
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Audio Amplifiers

You can use them to build all sorts of exciting, miniature projects — pocket radios, mike preamplifiers, signal tracers, portable megaphones, phonograph pick-ups, hearing aids, model controls—even stethoscopes

Yes, sir, you can really have a "picnic" with Ampec. It's the highest form of Printed Electronic Circuit and provides complete electrical service from input to output. Wiring, capacitors, resistor, and tube sockets are bonded to a single, master plate.

Even with tubes, Model 2 Ampec is smaller than a book of matches. Model 3 is smaller than a postage stamp—and it has a tone circuit, besides!

Ask your Centralab distributor to tell you more about Ampec.

And send coupon for Booklet 42-142 with specifications and applications.

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Cat. No. PC-500 $9.00 without tubes (suggested net price)

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PACIFIC DIVISION

HAWAI'I — SCM, Samuel H. Lewbel, KH6AED — KH6ABI has accepted appointment as Section Emergency Coordinator. Leon will handle all of the AREC activities in addition to the ARCS operation for the Island of Oahu, K6GAVO and his XYL, KH6AGL, Dick and Violet Hoyt, have left Kona on the big island for the States. Dickis AW, A0X, and BH9 are converging on XYL three using a Collins KWS-1, KH6BCA, George Dixon, and BMT, George Jr., are leaving the Islands. This military transfer follows BMT's Montgomery, and the level-ward Club will miss these boys. Hana visiting the Islands and bringing portable 5-meter gear should carry a crystal on 147.0 Mc, the local calling frequency.

NEVADA — SCM, Ray T. Warner, W7JU — KRG, the only ham in Storey County, is on 40-meter c.w. CCA, who is a 40-meter c.w. has moved from Bev, in Las Vegas, WN7CWEY, of Henderson, is active on 40 and 15 meters with an AT-1. BRX was elected president of the Southern Nevada Amateur Club. A grid-block keying modification on his Viking II which

(Continued on page 98)
HARVEY ALWAYS HAS IT...IN STOCK FOR IMMEDIATE DELIVERY

COLLINS 75A-4 RECEIVER
New Production

with FINE TUNING KNOB — Designed for AM, CW and selectable SSB reception. 10, 12, 14, 15, 16, 17, 18 and 10-meter bands. Features include double conversion, permeability tuned, hermetically sealed VFO, mechanical filter, separate detectors for SSB and AM, band-pass tuning, new noise limiter, bridged-T rejection notch filter, built-in crystal calibrator, provision for 3 Collins plug-in mechanical filters. PLUS — new gear reduction tuning knob for better tuning. 4 to 1 ratio eliminates 'dial drag'...has no detectable backlash...adds unsurpassed rejection over SSB, CW and AM tuning. Complete with new tuning knob (less speaker)...

New Tuning Knob, separately... 15.00
Model 270 G speaker for above in matching cabinet... 20.00

BRAND NEW
PE 135 AX DYNAMOTORS
12 or 24-VDC input; 500-v-voltage @ 200 ma (continuous) or 400 ma (terminal) bus...Built-in self-starting relay. Will power any mobile ham transmitter. In original unopened wooden crates with spare brushes and fuses $24.95

The W3DZZ Antenna
Model FT-200
SET OF TRAPS
For 5-Band Wire Antenna
10,15,20,40 and 75/80 Meters • 75 Ohm Twin-Lead or Coax Feed Line • Concentric Coil and Condenser Completely Potted in Polyester Resin • High Voltage Polyethylene Insulation on Concentric Condenser

ANTENNA KIT for FT-200 Traps
150° 212 Copper-Weld Wire • Special Center Insulator • 2 End Insulators • 2 additional Fea-Type Insulators $6.90

RG11/U Coax $0.13 per ft.
RG59/U Coax $0.06 per ft.

Model FT-100 BEAM ANTENNA
3-Band Parasitic Array for 10, 15 & 20 Meters
Light weight—only 55 lbs. • Total length of elements less than 24 ft. • Clean design with shortened elements gives low wind resistance • Uses ROG8 as feed line • Trap capacitor insulation is of highest quality polyethylene.

Complete...

GONSET G-66 Mobile Receiver
Here is the mobile receiver answering every possible requirement, with performance comparable to that of a top-quality communications receiver and of equal quality on 115-volt AC power lines or 6 and 12-volt DC battery power. Covers broadcast band up to 100 meters, plus the 20, 40, 20, 15 and 10 meter bands. Each amateur band individually calibrated and spread across the easy-to-read slide-rule dial scale. Design includes double conversion, beat frequency oscillator and other top features.

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| Single Size CF-500 | Double Size CF-400
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ROANOKE DIVISION
NORTH CAROLINA—SCM: R. Ridley Fowler, W4RRH; SEC: 2G, PAN: DRC. Your SCM is very happy that 2G on the report on 2.26.2002 made the most complete report received. Congratulations to the Winston-Salem group, DRE sent a complete report of the Havelock meeting. The First Aid has been a success in every way. As a matter of general interest to the amateurs in the section we have registered for ARRL the following full members and 22 supporting: 18 local nets that conducted 50 tests last month; 25 Assistant ECs; 106 official mobile units and 46 emergency power units. This is an excellent report in many ways. We have 25 Emergency Coordinators who are working and at least 25 Assistant Coordinators who are really getting this done. Thanks so much, fellows. During the month we had two conferences with the SEC and plans are shaping up for a complete coverage of the State in case of a Stationing through emergency. Your SEC visited the Winchester Radio Club and your SCM attended the Forest City meeting. Emergency Coordinators should secure a copy of the Emergency Plan for the Winston-Salem area. SCM and 2G would be happy to send you a copy. Groups interested in forming a RACES organization should communicate with 2G or the State civil defense director. Traffic: W4DIT 77.

(Continued on page 108)
BECAUSE—

Here, at Harrison's, in the World's Largest Trading Center, is where you get the most for your money! — The newest equipment, the best friendly service, the greatest values, the easiest terms, the "hottest" trade-in deals!

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TRIAD's new series of Swiniging and Smoothing Filter Reactors are designed for high voltage operation at reasonable price. Leads through porcelain grommets out the side of the case.

SWINGING CHOICES

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Write for Catalog TR-560, listing TRIAD's Complete line of transformers for amateur use.

K4DZJ 71, W4VBO 44, FDP 42, DSO 35, DRC 23, K4ARP 31, W4WZ 31, R3X 25, CX2 20

WASHINGTON, DC - SCM: Bryan L. McGraw, WH4BMG - Welcome as new ECC, ZGP, E8K, E4V, E4F, TPE, CCB/4, and VN, with 2ZH, our SEC, reporting more to follow. New KEVC members are W4TSW, USF, E4E, TPE, and K4a, CSB, G4K, A4H, C4N, and A4Q, KL8/B/L/4, and A4U/4, SOY, a new ORS, is doing a great job. K4VZ is a brand-new Official Observer. KE4FRS was on the ball and chum Aug. 18th. FFH is authorizing an FB article in the LH bulletin. The Spartanburg Club is active in the Ansell Bellson Golf Tournament, with W4BAW, K4B, and K4G taking part. The Shaw-Sumter Club has a new club house and its own club newspaper with G4E as editor as well as its 10-meter net with W4B ED CQ on 29.620 Mc. C4X and the e.w. nets nightly on 3790 kc for good listening and learning how good c.w. men can handle a job. FFH using the phone net are growing in strength. Traffic: W4AK LC 180, Z1Z 176, FFH 104, H4G 36, C4L 4, V4NIG RH - SCM: John Harsh Morgan, W4KX - This was a pretty, fast turn-out for the Virginia QSO Party despite atrocious propagation conditions and the fact that the Roanoke 'Fest took place the same day. Top scorers were K4RUH first; K4ASU second; H3 third. Novices: K41B1 first; K41HKL second. Only 10 logs were received at deadline, including two Novices, although at least 150 stations were known to have participated. Including a couple of dozen KN4, full details will appear in the Virginia Section Bulletin. LBS reports 74 were known to have participated in the Richmond Spring Tune-up. Top scorers go to K4DIF, with JHR runner-up. There was a fine turn-out at the V.F.N. picnic held at the QV/BB in Farmville County, K4AET was elected VFN mayor, and K4DIF was re-elected asst. mer. and ONV was re-elected sec.-treas. 3WP, K4MC, took over FFU's akedas. K4DIF AK, the hard way. The CQBP call was issued by the Annual Shenandoah Valley Hamfest to be held Sat. Aug. 5th at Diecky Ridge. K4BUI announces the formation of the Old Dominion ARC at Sq. Easton. Fine horns and a good QSO earned K4 and AAD for the Peninsula and Petersburg Clubs, respectively. IA had his DXCC certificate on the wall, and son TFX, home from O.W.P., is close by on the deck. HLI has a rack of 256 plates since December and keeps busy with OH work. JHU really makes a career of contests, the latest the Delaware and Vermont QSO Parties. Speaking of existence, K41BY's hams can't answer out of 88 CQ (Any station, Bally?) LW's building a 1600-meter rig for K41N when he gets it. K4DIF and W4F4 WPZ and HMK operated a station at the High School PTA Achievement Night, WUSW was in position with not a sign of existence at night, N4C, State. FXW has orders to go to Okinawa. VQZ is completing the portable/mobile v.h.f. rig he plans to use in the Q.H.P. Contest. VON has (the) summer bug and continues unabated, as does course DFN. Traffic: K4MC 804, W4IA 261, K4RR 172, K4DIA 187, ASA AU104, W4FPK 88, K4FPO, K4DIB 49, E4Q 41, W4A 41, H4B 33, UMC 18 TYC 15, ZCB 13, C51Z 10, K4ZCB 6, W4VQZ 4, L1Q.

WEST VIRGINIA - SCM: Albert H. Hill, W8PPQ - The Princeton Club is to be congratulated on the fine picnic which it sponsored recently. ETF and W2FP have been appointed Deputy Radio Officers for use in the future amateur operations for West Virginia. Let's all get behind H2A, ETF, and W2FP and assist them in their efforts to provide an adequate emergency communication system. NNYS attended the Roanoke, Princeton, and Forest City, N.C. hamfests recently. Frank rarely misses a ham get-together. HWK renewed ORS appointment. KRTF became an ORS and is K4111. The No. Panhandle Radio Club is sponsoring a TV program called "Have I Got You," to acquaint the public with amateur radio. Officers of the club (Willing Area) are K4AK, W4KZ, and K4K, W4B, W4W, and W4E. K4AK is a new Novice in ERISA. In less than two months he has worked 51 states, which is an excellent record. K41H and K4BAG are working in Ohio temporarily. K41H is quite active on all bands, K4A and K4PQ are doing their rig in Science Open House Demonstration at Union High School recently. VMH is a new Conditional Class licensee. He formerly was a Novice. PHD and G8Q are two new Novice and Conditional Class licensees. Both plan RACES activities. KN8B and K4BB are new Novices in Arkansas. He is on 50 watts and an HQ-132X (Continued on page 116)
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103
DX-MINDED?

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, James B. Simpson, W0HEM — SEC: NITJ, RM; KQD and MYX, PAM; IUP. At the request of SCM, our local BC stations, the BC Club put on an emergency drill, which was recorded by the station, and was used on its public interest program. In a surprising short time, 12 mobiles answered the call. KQD was control from the QTH of CVM. Mobiles were Bill, SRM; Harold, HHR; Jim, HEM; Jim, ANX; Cecil, TH, CAUDE; WNR; Bill, C; Charlie, VLAN; and WDXV, 8. Things moved along smoothly and all concerned were pleased. Because of the success of other business, TV has resumed operation for this area. The newly appointed EC for the Colorado Springs section is James Merrill, ANX, 1508 Edith Lane, Colorado Springs. IUP is operating s.a.b. now, and his mobile rig is well on its way to being ready. HXX reports 2-meter activity in and near Aurora but none on 6 meters. He and SHAK/ are testing the knife-edge club out in the mountain area on 430 Mc. Warning: Be careful of your equipment. W7NE had his car stripped of his mobile equipment. Traffic: KWMR 59, W9QZ 931, W9QZ 250, W9U 134, TVI 91, SWX 85, K9DMW 75, W6AGU 51, HOP 93, TUF 19, UIP 15, DOP 13, NWJ 10, VSN 10, J9TB — SCM, James L. Dixon, W7DQ — OCX is now OBS and OZS, working 40 and 15 meters and teaching a ARES class with LQE. EHV is on 75-meter phone with a Globe Scout. NLH has a new 6-meter-Converse Communicator. RPY is on 8 through 10 meters with a ka. to a 301. Q5G has a new 120-meter beam and is building a module. JID is installing EJ in the MARS station at Ft. Douglas, and is working 40 and 20-meter phone. LQD, VYO, VYO, VTC, VLS, and YVO gave talks and a demonstration of ham radio for the Boulder Valley Radio Club. BBV is ragchewing on 10-meter phone. NMR is rebuiding antennas. The salt Lake Club offers an open mic.; ACR, vice-pres.; WNDJQ, secy.-treas.; VEL, executive vice-pres. The Ogden Club has incorporated. YSS is on 300 watts phone and 300 watts cw. W7CRZ has 60 watts and 40 meters, and is the son of TAP. W7MAAN is moving and is putting up antennas. W7TCP is in the dial of VSS. Traffic: W7JMR 8, LQE 2, OX 2, UTM 2.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Joe A. Shannon, W6MI — Teenagers are invited to join the AENP daily at 1320 to 3010 kc. We have had some good hamfests at Birmingham, Montgomery, Mobile, and Huntsville. K4ANB now is a member of all three sections and is OBS on 10. Those with new DX-38s are VRO, K4AJJ, K4ANB, and K4SMQ. The Muscogee County Club has a new DX-380. V0G has a new 810-meter job running 4000 watts. WDG is OBS except for the cards. K4NLH, new in Tuscaloosa, is the N4H of K4HQO. DXL is mobile with a 2200 rig in the Tri-Cities area. K4JV, K4UL, and K4XIT, YFN, Huntsville EC, had a successful AEC drill and reports the fellows did a good job. K4AAN is going in place of the old three-element. PRM sprained his arm when he stepped off the top of a ladder. VAX and LAA are building a new shack. W9JTH has a basic 20-meter job under way while recuperating from an operation. What's going on around your shack? Give us the dope each month so the word can be spread. Traffic: (May 4, W4WOG 476, RLG 153, KAX 146, K4AOZ 78, W4AVX 57, LIV 57, K4AJJ 40, W4YD 45, YRO 33, EJZ 32, K4ACO 25, W4XO 21, K4ANB 17, W4GHI 17, HON 17, GLV 15, TKS 10, CBY 9, EQC 7, HHH 6, WBW 5, K4APF 4, W4WQ 4, CNN 2, VFN 2, (Apr) K4ANB 27, W4EZJ 25, ZLB 19, W4WQ 8, K4AL 6, K4XIT 6. EASTERN FLORIDA — SCM, Arthur H. Benne, W4PE — Asst. SCM: John F. Porter, K4KM, SEC: YPT. DVR in a 4-band doublet with good success and has been reappointed Coordinator of all Florida nets on the Coastal Emergency Net. PJU won the primary election as County Commissioner, CSH with W4 in Hendry County. W7OM, OBS for 75-meter phone, Z1Z is a 10-meter ground plane up for 40 feet. Dade County: There are now four FCC-sponsored TVI Committees. LDI has a 4-band beam. The SCN is having a county zoning ordinance favorable to hams. DVR is in committee chairman. ES is operating from Cuba. MVR is on 2 meters. Miami: IRC is now W6EQA. W6A has a DX-100. SKC has been up with a bad leg. DEN has 12 NOCs trained, with others in training. IYT ran 40 one-hour code sessions on 28.7 Mc., with good results. JGCE-4 went off smoothly, with 13 ECs participating in 20 counties. Interest is high on 6 and 40 meters with GCO, UTH, ANW, FHL, LXX, PBS, RNV, and others. K4WPT is ARCARS Red Cross Headquarters with new antennas on all bands. Broward County: AB, the IRC station, is on the air at D, Headquarters with new antenna layout. BMR was in Cuba. Fishing, Dave? FNR (Continued on page 106)
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24 HR. SERVICE on stock items
is on 2 and 6 meters with an 826A final. IEC is on a.b.b. and second contact was KI4EF, who was in a hail storm. VCO has a new mobile rig and bought a Naah to fit it. K4CXR is on 6 meters with a three-element beam. Lake County: The LARA is publishing a new bulletin, YOT is editor; AXV is publisher. Traffe: W4FYB 103, W8 102, Y7Y 58, R7J 45, GQG 37, ZER 45, K4AEW 26, Z2R 20, EMD 22, F5H 09, KX 19, GCB 12, YMM 12.

WESTERN FLORIDA — SCM: Edward J. Collins, W4ME/KC — SEC: P.E. Roberts, K4FX and MTX. RAO is on 6 meters and K4AKP. K4AEK is now in charge of the Coast Amateur Radio Club station, NBF. K4EBF sends a nice report from Panama City. HJA is now operating K4FXP at a new location. K4LFD is starting a state list on 50 mc. EQR dug the 30-Mc. rig out of the attic. NXL is on with 10 watts. K4EKA is doing FB mobile work and is going to install a three-element job on 10 meters. K4BZ is chopping a hole in 10 meters. We see NOX but never hear that swell last anymore. TPE has a single cabinet and gets his own callsign. NWI spends his time shooting fish, and PAA is heard fooling around with the NC-290. K4AI is changing his QTH and walking towers. Lots of the gang made sure that mobile Hamfest but we were interested where CCY was. UCY had his first failure in the transceiver in a long time. He's been getting his license from Penay High, K4AP, the Pensy High club station, will be really going this fall as all equipment is on hand. QK stuck to 75 meters. KM5 is up from F4U, and another after the 15-meter JX and building beams. K4NVE is heard working 40 meters. K4MYJ is after his General Class license already, ZPN works his new phone. 6FT is another West Flor. a.b.b. station. NJB is building an all-band receiver. FQF quietly keeps 40 meters hot and is heard by W7. J2M will be more active now that he has a new station. College teaching causes him some trouble. MUX enjoys ragchews with his old Navy pals. MS is working on a mobile a.b.b. rig and an antenna farm. PCW has been in the TPT shack. MZC has a new 30-mc. transceiver. DAIQ enjoys the Ranger on 75 meters. W7S now sports Florida call letter plates. CE6 keeps Blountstown on the map. Let's send you a card from postcard to the ARRL to bring activity report cards for your convenience. Traffe: K4ECF 41, DKG 18.

GEORGIA — SCM: WM4MLJ. W4KFCF — SEC: K4AUM, PAMAWS, XUW, and EWE. PIM: Neta, GCEN, 3096 kc., 1800 EST on Tues. and Thurs.; 0800 EST on Sun. ATC/CW 7150 kc., 2100 EST Sun. 3090 kc.; 1900 EST Mon. through Fri. PIM is NC. The 15-meter phone mobile net meets each Sun., at 1300 3096 kc. UTH is NC. The 10-meter net meets each Sun. at 2300 on 29.6 kc. VWH is NC. Newly-appointed ECs are K4AIQ, UFD, W4QV, K4AIK, PHJ, and DNO. Your newly-appointed SEC is K4AUM, in Pelham, Fla. He sent in a report as OO, FEZ, president of the Dublin Amateur Radio Club, and his 6X and 4X groups are doing a good job building up the club. AAY is doing a nice job as EC and working with the c.d. in Augusta. The Warner Robins Amateur Radio Club is a very active group and big plans have been made for a mobile emergency net. The Atlanta Radio Club again turned out a very successful hangout. NS, activity manager, did an FB job of arranging the hamfest along with his fine hard-working committees. The Atlanta Teenager Club is increasing in membership. MA reports work is being given by W4X for an all-band antenna, FZ8 has a new receiver, transmitter and VFO, K4IAW’s QTH now is College Park. W4EH now has his own console and alarm system operating. The Atlanta Radio Club is increasing in membership. W7YI says he’s doing an FB job on nets. K4BRA reports new hams are K4COK and K4TVG. DDF did an FB job on traffic-handling this month. At its regular monthly meeting, the Confederate Signal Corps had as guest speaker Capt. John L. Reinsch, K0BJ, who spoke on “Sounding in the Harsh Shack.” Will see all at the Georgia Cracker Field Day net meeting this month. The Georgia Radio Club station is a challenge to a picnic at Macon on Aug. 19th. AREC members are reminded to watch the expiration dates on their cards, and send them in for renewal when required. Traffe: W4PIM 201, DXY 254, K4AI 220, W4IAP 40, VR 39, CEF 16, ZD 13, OE 16, K4AIW 3, CPO 2.

WEST INDIES — SCM: William Werner, KP4DJ — SEC: K4AIK. The following are on four and one members of AREC: CBCC, CBCC, CI, CO DJ, DJ, MG, PZ, PW, QA, QS, RA, RD, RM, TI, WT, AAA, ABN, and AKF. DL is mobile on 3925 kc. with 20 watts using a 20/20 null. ABX have new NC-300 receivers. ES has a new KW-1 for a.b.b. Stations participating in civil defense "Operation Preventive 100%" May 28th and 29th were: DC, DJ, DL, DJ, DJ, HN, HN, HN, PZ, PZ, QA, QM, RA, RE, RE, YR, WT, YM, and K4ABA DL. PZ and QM also operated mobile during the disaster. K4ANA is using a 20/20 null plane, contacted KP4DC using 15-watt v.h.f. transmitters at both ends. The c.d. directed to amateurs on 3925 kc. from control at Guanica on v.h.f., which was relayed by the c.d. station at Rio Piedras Control on v.h.f. to KP4DJ, who transmitted on 3925 kc. by holding the microphone in front of the v.h.f. receiver speaker. The defense communications officer, advises the c.d. now has

(Continued on page 108)
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v.h.f. stations in 15 towns of the Island. KV4B is Acting NCB of the Antilles Amateur Weather Net at 5:30 p.m. UTC on 3815 kc. Stations reporting KV4A9, KB, K, YD, YV, WX, ZW, VP2A, VB, BF, KF, DN, DA, DJ, DG, GE, GX, LA, P5A0, KV4BD, and KV4A, WSSE, USWB Supervisor of Hurricanes Research, will visit these stations preparatory to setting up observer stations. W7P received a Spanish edition of the ARRL Handbook as a gift from DeWitt Putnam of W7P. W7WJ/34, now KB, will be on 505 KHz. W7WJ/P64 and KP4AAB received a printed circuit 6-meter converter. The KP4B QSL Bureau will be closed from June 1 until after the convention. W7WJ/P64 will be in the States for a week during the convention. The States, ABA has a cubical quad on 28 Mc. ZW is handling mostly phone patch traffic, UH, Junior SSB, phone switchboard, and traffic to the USWB in San Juan from the Antilles Weather Net. Traffic: KP4WT 138, ZW 28, DC 19.

CANAL ZONE -- SCM: SMCM, JSRM -- Many of the KZ5 gang are State-side on their vacations. Among those absent are AC, BD, DW, PL, ML, HA, RV, and VL. DJ is acting station manager of the CBARA. Ten, ex-KZSTB, and NIA are acting manager of KBIGB: the A-1 Operators Club. Congrats. TOS has a new traffic source. LDR lost his tower in a recent wind. URY also made the A-1 Operators Club. KGBA is doing lots of patch work for station stations. KN00ZI is doing a nice job on the 2040X6 Net. GJB is rebuilding the shack. LIP is very QSOUL the local organization. UED makes a good job on traffic. K6DA is skedding east for traffic. MEP is working hard on the 2040X6 Net. K6LYV is doing QSOUL for three nets. LIN is qing LMC, K6OHC has a nice contact, MI is in the net. K6QJI is C.O. RO for the Dist. 17, Los Angeles. K6NiA is busy with the YLRL. K6MBD is CW. R3S can have lots of nice skyping in the help of about twenty of the gang. K6, KUB is back from vacation and is OQ again. W6SL/3 has moved right into the local traffic activity. Welcome, OZ, K6CL to the new net. K6KUW is DXing these days. K6KQZ has been in 3D - W6XAS. K6KQG is QSOUL school. Many amateurs are reporting too late to make my monthly report. How about a bit of help, gang? Get them to me before the third. Now the GM is going on his own trip for a month at the end of June. Traffic: (May) W6HTN, W6HTL, K6A, K6FCY 328, W6LYQ 229, B6H 205, T6D 200, W6K 180, K6QDA 164, K6OJS 167, W6QIP 189, L6P 189, RNY 112, K6KON 108, W6D 97, W6QOA 90, K6EQA 74, KV6J 58, W6MPE 58, Y6H 50, W6H 48, W6KQZ 45, W6KOH 24, K6KCRN 19, W4KHY 18, W6KCI 16, W6MCI 15, K6EIA 10, W6KOH 10, K6MEQ 9, W6C 8, W6SVO 8, W6BMR 8, K6KCP 4, W6CL 2, (Apr.) K6CVO 200, W6ACO 140, K6C 131, K6YNO 120, K6OHO 42, W6KIP 22, K6LIV 20., ARIZONA -- SCM: Cameron A. Allen, W7012 -- Asst. SCM: Fred W. Wines, 7LMN, SEC. VHF, 7LMN, K6NE, A67, RM. PKW, The AKN meets Sure. and Thura, at 7 p.m. MIST on 3905 kc.; the Arizona C. W. Net Tue. and Thu., at 8 p.m. MIST on 3000 kc. and daily Mon. through Thu., at 4 p.m. MIST on 3152 kc.; the Grand Canyon Net Sun., at 9 a.m. MIST on 3152 kc. A very fine time was had by all at the Ghost Town of Jerome in May. Hosts were SWI, YLF, LRC and ZVA. A visit to the old mine was highly of the week end. Among those present were NEL, UZ, BE, QF, OCA, RJ, KJ, MIE, MA, PLW, MDA, OAS, TNY, TBR, SNI, YLF, LRC, ZVA, UZ, WKM, YVF, W4TDAW, W6WUN, EAW, MIE, MWD, DJ, and 12. The Micropolis Club is now one year old. New officers are QNO, pres.; ZIA, vice-pres.; SUL, secy.-treas.; TWD, pub. and LLD, liaison officer for c.d. The club hosts regular transmitter hunts the
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2nd Sat. of each month. An invitation to participate is extended to all QRP and VLN, of the V.H.F. Club, provided emergency communications on very short notice for a girl scout camping trip in the Sierra Nevada, Phoenix contact was SUJ, JYH, KYE and LED took part, also LVR is setting up a QRP station to work in both his new cars. TNY, with the help of JYH, has moved his mobile to a new car. K0ISM and KWPT have moved to Phoenix. New calls are W6PTP, ARRL, K70VE, W7DLF, WKJ has gone to Boston for awhile. Skin diving and chasing wild burros for a boys’ camp has WYY off the air. Margie Hahnerman, RCI of the all-ham family of Tucson, received a nice write-up in the Arizona Daily Star about her hobby. Traffic: W7LVR 15, OIF 5.

SAN DIEGO—SCM, Don Stansifer, W0JEU—JVA traveled to Ohio and Kentucky for his vacation. K0SLA is a new license in Vista, NAT and KVB are working on their VHF equipment for 144 Mc. The Chula Vista Club plans an ARRL affiliation. New officers are IFJ, pres., K6ACY, vice-pres., FEM, treas., K6QCY, secy.; K6BCC, coro. secy. The Concord Club was active during the May Day from Silver Strand. GBG was given a royal send-off by the DX Club, K6ayM and L1RJ are proud fathers of boys born recently. K2FFK enjoys a busy off-air QSO. F. D. Roosevelt. Silvergate members graduated from high school were K6CTQ, K6DNO, K6KXY, and K6QIY. STZ is the new news-treas. of the Upper Ten Club. K0ATS has left for the East. VFT is spending 15 weeks in training at Ft. Sill, Oklahoma. K6BEC is working for the Continental home front. M.I.T. this summer. The local DX gang all worked XE4A in jig time. ZWJ has a new three-element 15-Mc, beam on 70 feet. CWM has a new ham antenna. SNQ is now a Class HI QO, EB, FVA, and L7000 announced a good DX on 21-Mc, phone as late as 11 p.m., local time. K6ZC needs 9 cards for DXCC. K6DAM and L1RJ were awarded their Masters Degrees from San Diego State College in June. BDX has a new kHz and a 75A receiver. HBD leases the local DX gang with 221 countries worked. CHV has built a new double conversion super for c.w. work that is worth hearing. FMJ vacationed into the Northwest via the coast route. Traffic: W6JAB 2502, YKD 2450, W6DQP 176, K6BIP 134, DBG 130, JYQ 50, W6CRT 32, K6DXA 7.

SANTA BARBARA—SCM, William B. Farwell, W6JCV—New appointments: KCD, EC for Onondaga, PWK, EC for Lompoc; K6CQV, EC for Ojai; K6NF, EC for San Luis Obispo. A new ham is K6OSDE, of Santa Barbara. KBELR has a new harmonic, a boy. The boys of the Robertes Radio Club had a Memorial Day pot-luck supper at BRY’s house. After the food, ACO opened a package bearing a BRY and assembled a Heathkit in 15 minutes, and put it into operation within one hour. BRY received an Armed Forces Day message on RTTY and FDV contacted NSS on s.w. Mr. Short Wave (K6JW) has just completed a successful trip to Texas, keeping the folks at home posted via his mobile. New Ventura Club officers are W6EJ, pres.; K6OJ, secy.; K6EL, Treas.; K6JRT, t.r.; and K6WBF, pub. IGH flew to New York to attend a musicians’ convention. Traffic: W6QIJ 14, FYW 5, K6IFU 4.

WEST GULF DIVISION

NORTHERN TEXAS—Acting SCM, Ray A. Thacker, W6WPP—SECO, FYL, PAM; TFF and IWQ, RMS: K5EAB and PCN. WRZ won a cool five bucks for the winning name, Sparks from the Dark, the monthly paper published by LX for the Dallas Club. DTA/5 has assumed the NCS post of the Yankee Net’s a.m. call. SCM is visiting his father, CF, AHC reports NTX traffic is on the upswing. UBW has 107 countries on 15 meters. AOC reports 75 per cent attendance on NETEN for May. K6BBY is now a General Class licensee. RAB is broken out mobile, operating all his equipment, JXU still is working 6-meter DX and reports LW, GO, and IXE during May. SWV is now OES and keeps a daily sked with Ohio on 2 meters. There has been a terrific increase on 3- and 6-meter activity, AF MARS sure is helping to further this movement with the issuance of equipment. BTH’s OO report indicates that Novices are not the only cause of second harmonic trouble. Better check, fellow VIEZ has become the most popular vendor of mobile antenna coils in the Ft. Worth-Dallas Areas. SCM, via N6T—K6A the new Novice and NT-0, KVA is finishing up the new shack and probably will get with the new kHz, grounded grid final. JFX is springing a whopping signal with a new JFX final. The North Texas Storm Warning Net has been very active. REL is a new mobile in the Dallas area. TFF is now a Delaware county and a Collins engineer. K6MCR, radio operator, Otto, Ist is the deadline for applying for Texas mobile call license tickets. Let’s add a 100 per cent Traffic: W6DBA/5 R1250, K6PF 1355, W6DBU 305, W6WPP work, AHC 125, NEW/5 116, RP 88, FIB 82, VHF 65, EFCX/5 5, 4TT 49, BKH 44, YKT 10, JFX 5, ZTQ 6, LGY 5, CF4, SWY 4.

OKLAHOMA—SCM, Ewing Canaday, W50IO—Asst. SCM, James R. Cooker, LADC, SEC, KY, PAC, R7, K6DLO, MEX, RM; QVB. The Northfork Radio Club held at Quartz Mountain on May 19 through 20 was well attended by hams from Oklahoma, Texas, New Mexico, and Missouri. The
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'foot coincided with the formal opening of the new lodge and Governor Gary, on hand for the ceremonies, took time out to visit with the ham radio enthusiasts present. A new license plate legislation, SYR won the grand prize of an Elme mobile transmitter, New officers of the Pinellas County Amateur Radio Club are now members of the club at the Aeronautical Center in Oklahoma City. They will be getting a new call: W9DL. LDM gave an interesting demonstration at the ARRL June 12th meeting of a device for connecting blind persons to tune a transmitter. VAX has been on the sick list after a minor operation. WTB has received a card from Uncle Sam's Navy Yard: "This is not the St Louis town a few months because of his duties as a painting contractor. K5GCD is operating his station at the Civil Defense facilities in Okmulgee. Traball: K2AYO 4A, W5GEM 139, LTP 112, PNG 40, FEC 39, GIQ 36, KY 34, CCK 28, VAX 27, MPX 26, RST 22, ADC 20, ERC 9, UCT 3, QZ 2.

SOUTHERN TEXAS — SCM, Morley Bartholomew, W5QDX — SEC; GEM, STEN members enjoyed another successful convention at Kerrville. A fine reception and the trimmings got the program under way. New officers of the SEC are: FMN, NCS, KZ, alt. NCS; KSC, Sec.; N. G. Morris, pro; RLM, c.w. NCS; LFS, NCS; LER, pro; NKB, Zone 1 ZC; LOW, alt.; DLV, pro; ZDP, Zone 2 ZC; GSS, alt.; VSS, pro; GOP, Zone 3 ZC; PNG, alt.; EXU YNM, pro; RSO, Zone 4 ZC; KNY, alt.; KEB, pro; YN2, pro; QVS, operating 2-meter mobile. LFS and his XYL, TSB, are back in San Antonio for a short visit. PDE worked 15 states. KNS 56CK and GHE are new Novices in Freez, AQN visited ALTW while in Dallas. UPV has worked 47 Texas YLs. The Corpus Christi Red Cross Disaster Committee called a surprise scheduled meeting May 9th. The first mobile was there in four minutes and the first fixed rig was operating in forty-five minutes. Fifteen mobiles and five fixed stations participated. If you haven't been through the Houston ARC clubhouse, by all means do so at your first opportunity. The group, which planned it, did itself proud. FER publishes the Hare News, GMT, AMQ, DDQ, and members of the Corpus Christi ARC will be conducting communications again this year during the 110-mile walkathon from Padre Island to Corpus Christi. QRM visited in Elm. Traball: W2ZWR 60, RSL 3, HSC 2.

NEW MEXICO — SCM, Elmar H. Morten, W5FPB — SEC; FHP, RM: RKS, PAM: DVA. The NMREI meets on 3885 kc. Tues., and Thurs., at 1800 MST, Sun., at 1800 MST. The NM ARRL Breakfast meets on 3885 kc. daily except Tues., at 0700-0800 MST. The NM C.W. Net meets on 3885 kc. daily at 1900 MST. Sixteen states were worked. Congratulations to NSJ and his XYL, LGF, in the SWL and his OM, and KSCXN and his XYL; all had daughters. VQI is moving into a new shack. ARCO and family are spending the summer in Ohio. ZU and his XYL are spending the summer in England and France. The AMQ, in the Journal, had a picture, and article above about JRA and KH6TT. Fifty-seven amateurs were registered at the picnic held at Portal in May 18th, including one from Oklahoma and another from Colorado. The VZL, in the White River, took a trip to White Rock, near Los Alamos. WPR moved to California. How about some of the clubs in the news for this column.

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CANADIAN DIVISION

MARITIME — SCM, D. E. Weeks, VE21BB — Asst. Sec., Bob Webber, 1DB, and Aaron Solomon, 1OB. IEO, SEC. RR. Considerable public interest has been aroused by the daily schedules between the Maritime Net and Expedition Raft, L'Iglo Du Nord, via the Atlantic crossing. New operators of DX-100s are YM, VO1L and W5LKY/VO. NHS is using a 32V-3 on 20 meters. The Moncton Club's new officers are YM, pro; ACX, vice-president; OL, 1st vice; SQ, 2nd vice; and DX with a new mobile set-up. AEB and DB have remodelled their stacks. Late delivery of ACO's log by the Postal Dept. caused a revision of the VQI's Quarterly Bulletin. All communications go to Mel on his winning score. The Bathurst Club is hard at work on preparations for the Maritime Handout to be held during Labor Day weekend. Announcements are scheduled for June. Congratulations to VO1J and his XYL on the arrival of a new Jr. operator. VO1J on his DX-100 certificate as well as the Newfoundland Radio Club on its first new bulletin. New calls in the VO district are VO1AQ, KA6PB, K5A6MO, and W5RXR. WE has his phone endorsement. W5QZ and KE6MR. WE has installed a vertical ground plane. Traball (May) VE21Q 57, AV 84, YO 84, PX 78, OC 57, WP 46, UI 38, UO 71, DL 16, BL 15, ME 15, OM 11, YB 9, DB 8, BN 4. (Apr.) VE6XY 8, BN 4.

ALBERTA — SCM, Sydney T. Jones, VE6M7 — PAM: OJ, OX: Ray, XG: WE reports that his YL Put Kirby, VO6R, has moved to greater pastures in British Columbia. RE and FC, along with RW, are heard almost nightly on 3.8-Mc, mobile. LIM and his XYL are visiting in England. YC and his XYL are visiting San Francisco. The Alberta report was missing last month because your SCM was in Armbrust, Ontario, attending the civil defense

(Continued on page 114)
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forum on communications. Of the 38 attending the forum, 28 were amateurs. The Federal Civil Defense authorities expressed their appreciation for the interest shown by the amateurs in the communications field. Traffic: (May) VE3HBN 16½, VE2 27, (Apr.) VE3HMI 14½, VE2 26, OD 18.

BRITISH COLUMBIA — SCM, Peter M. McIntyre, VE7J — We are sorry to report that DH has resigned as Section Emergency Coordinator. We want to thank Bill for a job well done and for his tireless efforts on behalf of the AREC and the amateurs. Thanks to RS for his positive outlook on the column lately in QST. Instead of bemoaning what the SCM was doing, he and the other editor was to make a column. Thanks, Ron, The Chillicothe Amateur Radio Club was formed in May with AFA and RS participating in the effort, and AFA the charter president. From the Dawson Creek Grid Leak we learn that the boys just scraping the bottom of the money bag on the recent hamfest held there. ADM is fooling the gang with a fake auto so they can't hear him coming from a mile away. ADR is moving to Camp Borden and EV, with new antennas, is complaining because the band conditions are so poor. Hope you all had good fun on Field Day. Thanks to RS and the Dawson Creek gang, through the Grid Leak, for the basis of this column and to AIO, who religiously reports even though he is off the air at the time of this writing. We wish more of you, instead of thinking about sending in reports, would follow RS's idea and send in reports on your activities. For once I would like to have too much to report in the space allotted. Try it!

Development of Yagis
(Continued from page 17)

Gain vs. Tuning

This leads us finally to the most decisive element in connection with the gain bandwidth of Yagi arrays. Fig. 11 illustrates the point that over a range of from approximately 0.75λ/2 to 0.92λ/2 (p = λ/500) the director will exhibit gain. We take the 5.0-db. point as the gain available without a director. Between the 5.0-db. points on the curve defines the range in director length over which it adds gain. It is this tuning range and the variation of gain in this interval which will determine the gain bandwidth of the array. It will be noted from this curve that a variation in length of 0.115λ/2 occurs before the gain varies by 1 db. This corresponds to a change of approximately 6 per cent in frequency and we would therefore estimate that for the conditions stated, namely a 3-element array with the spacing between elements of 0.2λ and an element thickness (radius) of λ/500, the variation in gain due to tuning changes in the director would be approximately 1 db. It will be noted that in the design of small director lengths (low-frequency operation) the gain of the director asymptotically approaches a value of approximately 5.0 db., which is the gain available without the director. In other words, by the time the director is 0.705λ/2 long it is contributing practically zero gain. It is obvious that operation at a frequency at which the length of the director were greater than 0.96λ/2 would cause the gain to decrease rapidly below what it would be without the director at all. Thus, a frequency at which the length of director is 0.96λ/2 represents the upper frequency limit of operation and, as we noted before, 0.705λ/2 represents the lower limit.

Relating Fig. 11 to Fig. 6, we see that the reactance variation in the director gain region is from approximately 175 ohms to 20 ohms, with

(Continued on page 116)
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the peak gain at approximately 30 ohms. We have extrapolated between the $\rho = \lambda/200$ and $\rho = \lambda/1000$ to obtain the $\rho = \lambda/500$. From Fig. 6, we can readily see that the slope of the thicker elements is considerably flatter than for the thinner elements. This means that the change in reactance with frequency (corresponding to changes in electrical length) will be smaller than for the thinner elements. On Fig. 11 we have drawn in dotted lines the change in gain for a considerably thicker element $\rho = \lambda/50$, to show the effect on the gain bandwidth. As expected, the slope on the short length side of maximum gain is considerably steeper for the thinner-diameter elements.

Compensated parasitic elements may be used to extend the frequency range over which parasitic action may be obtained. For example, a director may be constructed as in Fig. 13. In such a case the upper frequency limit is set at that frequency at which the reactance becomes positive. If in Fig. 13 the coil-capacitor combination is resonant at the upper frequency limit of operation, it will effectively disconnect the ends of the element leaving $L$ in the circuit only and since $L$ is short it results in a negative reactance and thus continues to operate as a director. This is only one very simple example of a compensated parasitic element, there being a very large number of types which may be employed to extend the over-all bandwidth of operation.

**Fig. 13** — An example of a compensated parasitic element.

(Continued from page 19)

connect it to the contacts of the keying relay, plug the key back in the jack, and warm up Tattoo. Sending a string of dots, the ohmmeter should hover around the same spot as before. This indicates that your keying relay is following your dots, and you can stop worrying. If you have used a different relay than specified, you will probably require a different value at $R_2$ to give you the necessary amount of overdrive.²

But you have probably left checking the keying relay to last, and by now you have observed that your first dot closes $K_3$ and holds it in for a time determined by the setting of $R_1$. That's all there is to it. You can check the limits of operation by connecting the keying contacts, and the closing contacts on $K_2$, and the ohmmeter in series. Then, by backing off on $R_1$ and making single short
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dots, you can see on the ohmmeter when $K_1$ is closing without $K_2$ closing. This is the bottom limit of operation, and you really don't have to go to all the trouble just mentioned; watching the relays and changing the setting of $R_1$ will give you most of the information and confidence you need.

How you control your transmitter, receiver and antenna relay through $K_2$ is up to you. If your antenna relay has auxiliary contacts, as some of them do, the relay can be controlled by $K_2$ and the auxiliary contacts can handle the transmitter and receiver. Lacking either of these possibilities, a versatile system can be made by using a Potter & Brumfield LM11 d.p.d.t. relay for $K_2$ and modifying the construction to provide additional terminals in the output.

Simple Voice Control

(Continued from page 33)

The sensitivity-control setting dictates the voice level necessary to key the system. Close talking will require less sensitivity, while more sensitivity will increase the tendency of the unit to key from background noise. To a slight extent the sensitivity will also affect the turn-on time delay. It will, therefore, require a little practice to determine the best setting for any particular location, the optimum being the highest sensitivity point that exhibits no tendency toward keying from background or loudspeaker noise.

In practice we have found that, with a little discretion in placement of the loudspeaker and operation of the gain control (plus close-talking in exceptionally noisy locations), no antitrip circuit is needed; it would in fact be more trouble than it was worth.

The delay control varies only the cut-off time (from 0 to approximately $2\frac{1}{2}$ seconds) and can be adjusted as desired for fast or slow break-in work.

Simple LC Filters

(Continued from page 77)

Turns of the filter coils are wound tightly over the filter coils at the grounded ends. The antenna should connect to the 14-Mc. coil as shown. No values are given for $R_1$ and $R_2$ because they will vary with the antenna and the coupling of $L_1$ and $L_2$. This method of antenna coupling is acknowledged to be a compromise, but it is satisfactory for use with a non-resonant length of wire. The values of $R_1$ and $R_2$ will be higher than 62,000 and 150,000 ohms.

Some of the constructional details can be seen in the photograph. The 6AH6 is a hot little tube, and careful shielding must be used between grid and plate at these frequencies if all of the tube's capabilities are to be utilized. A shield

(Continued on page 180)
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was used across the sockets, with arched open-ings just large enough to clear the socket contacts. The shield runs across contacts 3 and 7 because crescent tapped straps with ground lugs were used to secure the sockets, and it seemed desirable to have the lugs (they come in the space between Pins 1 and 7) out from under the arch. Grounds were made directly to the chassis and the cross shield — not all to one place. When a shield of this kind is used, all connections (including grounds) concerned with plate and screen are made on the output side. The screen by-pass capacitors are mounted right at the sockets.

The relay shown in Fig. 4 plugs into the octal socket shown in the photograph — the relay is for break-in operation. When the coil is energ-ized, the antenna coils are shorted and 22.5 volts is applied to the r.f. stage grids. This is a part of the break-in system that has been in the Handbook for a number of years.

This two-band amplifier was built to go with the double-conversion 5-tube receiver now in the Handbook. I am grateful to Mr. Robert Price for this assistance in getting the design steps into a form which, it is hoped, others will find useful.

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DX-100 Keying

(Continued from page 84)
terminal of the key jack. Connect either of the other wires to the same key jack terminal to which the line choke is connected. Connect the remaining wire to terminal 8 of the PHONE-CW switch. Connect a jumper between terminals 7 and 9 of this switch.

Behind the 12BY7 stage mount a three-lug terminal strip using the screw that holds the octagonal loading capacitor. This must be the type of terminal strip that has the center lug grounded, or a two-lug ungrounded strip and a solder lug may be used. The 100K resistor is supported on its leads between the 12BY7 socket and the lug nearest the chassis deck. The 10K resistor and the 0.005-µf ceramic capacitor mount on the three-lug terminal strip. Then run a wire from the terminal strip (junction of 100K, 10K and capacitor) over to Pin 7 of the 5V4 socket in the adjacent compartment. Dress this wire close to the chassis, to minimize r.f. pickup.

The 22K resistor can be mounted between Pins 1 and 7 on the 5V4 socket, and C1 is connected between Pin 7 on the 5V4 socket and an unused ground terminal on the nearby electrolytic capacitor. The job is completed by running a wire from Pin 1 on the 5V4 socket over to Pin 1 on the tie-point DD, to pick up the -- 70 volts.

The value of C1 is a matter of individual pre-frence. A value of 0.1 µf will give hard keying. A value of 0.25 µf will result in much softer keying, for slower speeds. The author used 0.15-µf., which seems to offer a happy medium.
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How's DX?
(Continued from page 84)

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Silence from GB, Netherlands, and Scandinavia is expected for the next few weeks, then

EUROPE.

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MODEL 130 FOR 120 TO 130 WATTS — $199.50

6SN7 xtal, 2 807's final, 6N7 xtal mike amp., 807 AF driver, 3 807's mod., 2 860A's rect., 0.16 clamp, 20, 30, 40 meter coils $2.91 per band, 160 meter coils $1.00.

MODEL 242 FOR 6 METERS OR 2 METERS — 45 WATTS INPUT — 6L46 FINAL. Complete with mobile connections. A.C. power supply, tubes, xtal, xtal input. Uses 8 mc. xtal or Lettine VFO, winding link matches 52 — 300 ohm antennas. Same cab. as 240. $179.95.

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fever relay... V3EBN (ex-V3BN) and CM5SBS, brothers, continue regular schedules around 14,050 kc. W9WHM is interested in the present call of V3BN's ex-operator Bernard; also, information on the current whereabouts of ex-KG6SB personnel. This year's meeting of the W9-EXCC Club, W9EU president, is slated for September 8th at Chicago's Hotel Sherman.

K2EQD visited Cuba while performing summer duties aboard a U.S. Navy destroyer and reports the CM/CO gang embarked by TFL. "The Miramar and Manila sections of Havana are loaded with rotary beamers—almost bunted my neck counting them from a moving taxi." K2EQD brought back a six-inch stack of Cuban QSLs which he dispatched to W3K destinations via bureau. As far as to my recollection our local reports about Swan Island, W9DQC comes up with K1AIV/1849, active this summer on 49 through 10 but due for an early Swan swan song.

Ten Years Ago In "How's DX?" — DQers eagerly dust off their 20-30 meter coils for pursuit of rare pre-fixes on 7150-7300 and 14,100-14,300 kc., frequency ranges newly opened to amateurs. — — — Meanwhile, 28L6VM logs all U.S. call areas except W7 on 20-meter phone. Other DX reports: QSL of Lisbon, EA1D, W6LZK/NY4 and W8QEN/C772. — — — Ten-meter statements hourly pursued are A6YV (Tokyo), E8NN, EZ9X, OD2AC, PK6V, P1ATC/PK9, W6CJR/X8U and X2A4Q — — — W1JPE closes the column on a DX terminological note, reporting that the kilowatt is rapidly giving way to the "gallon" on 28-Mc. phone.

I.A.R.U. News
(Continued from page 65)

by several societies to the Administrative Committee on the systems in use in their countries. The European Band plan was hailed as a fine example of international cooperation, and the only change voted was to move the limit for exclusive c.w. operation in the 20-meter band from 14,125 to 14,100 kc.

The conference encouraged the growth of s.s.b. after reports on progress to date were heard at the Technical Committee sessions. It was further recommended that more use be made of transistors, especially in emergency gear. To foster exchange of technical information, and thus speed up technical progress, it was agreed that each editor of a society magazine will send English abstracts of the main articles in every issue to the other societies in the region.

Mr. Budlong, in his capacity as Secretary of the IARU, was invited to speak on the problems of amateur representation at International Telecommunications Conferences. Pointing out that only governments have voting rights at these gatherings and that the main business is to arrive at compromises of plans formulated long before the actual conference by each government, he urged that amateur groups start to work with their administrations a couple of years in advance so that the government's recommendations in each case will be as favorable as possible toward amateurs.

A budget of 1200 pounds sterling per annum was adopted, with each society contributing an amount in proportion to its membership. A permanent v.h.f. committee was set up, with DL8FM as chairman and ON4BK as secretary; membership is open to the societies of the following were elected to serve on the Executive Committee for three years: HB20A Chairmen; G2MI, Secretary; F9DW, Treasurer; DL1KX, H1XX, SM2ZD, and YU1AA.

The 75A-4

Designed Expressly for Amateur Operation on the 7 HF bands

The Collins 75A-4 receiver retains time-proved features of earlier 75A series, plus AVC on SSB and CW, separate detectors for AM and SSB. Pass band tuning, rejection tuning, superior selectivity. Many other outstanding features.

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A surface of full length glass fibers surrounds the conductor metal in Shakespeare’s exclusive Howard Process to give greater strength to slim diameter. Wonderod withstands sharp impacts, is extremely flexible. Never takes a set . . . cannot rust or corrode.

Prices (—amateur net) for standard whips 54”-60”, 5.75; 61”-90”, 6.95. For base extensions 18” — 250 dia, 3.95. 500 dia, 4.80. 36” — 350 dia, 4.70. 500 dia, 5.82. Fittings are 3/8” — 24 tdl, chrome plated brass. Inquire about custom antennas and industrial applications.

Look for the spiral markings, trademark of Shakespeare Howard Process Wonderods.

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F9DW, Treasurer; DL1KY, I1XX, SM2ZD, and YU1AA.

The delegates commended the Associazione Radiotecnica Italiana on its excellent preparations for the conference, under the supervision of Secretary Schiff, I1AXD. Simultaneous translations of all the speeches were made in English and French; clerical arrangements were well-planned; and the personal arrangements for the delegates were of the best.

The next conference of the Region 1 Division will be held in 1959, at a place to be decided. The Deutscher Amateur Radio Club is considering sponsorship.

Those present were: SM2ZD, G2MI, G6CCL, FA6DD, G2IG, and HB9GA, Executive Committee members 1953-1956; DL1WA, DL1KV, D3FM, and DL1JB of DAR; G6QY of RSGB; ZS5KL of SARL; ON4BK and ON4QZ of UBA; OZ2NU of EDR; EA2CA and EA2CQ of URE; OH2TK of SARL; F9DW and F8GB of REF; PA6LR and PA6NP of VERON; I1FO, I1BDV, I1BEY, I1ABB, and I1BBE of ARI; CN8MM of AAEM; SM5MN and SM6SA of SSA; HH9J, HH9FF, HH9RS, and HH9FF of USKA; YU1A, YU1AC, YU1AA, and YU2CP of SRJ; W1BU and W1LVQ of ARRL; and HB9SI of United Nations.

Socorro Island

(Continued from page 48)

the medics returned to the Malibu with information gleaned from a passing tuna fishing boat that a violent chubasco had formed and was rapidly approaching Socorro from a position 150 miles to the south. This bit of bad news was a grave disappointment to all because operation had been planned for several more days. However, prudence and impending weather would brook no procrastination. Therefore, with regret that the DXpedition should come to such an untimely and abrupt halt, XE4A was dismantled. In one hour all the gear was again safely transported from the beach to the Malibu in the skiff. A hoisting cable parted when the two motorized launches were raised aboard ship; this further delayed leaving. However, by 4 p.m. on June 9, all phases of fixed station operation of XE4A were at an end. Later weather reports stated that the chubasco responsible for the exodus struck the island at 11 o’clock the night of departure.

San Diego was finally reached six long and stormy days after leaving Socorro. The entire San Diego DX Club was on hand to meet the Malibu and a wonderful evening was spent rehashing the DXpedition. The trip home to Kansas City was then an anticlimax.

In summary, the DXpedition was an adventure which none of the participants will ever forget. All continents and 48 countries were worked in less than three days of operating time, with a total of 2007 contacts. The operating proficiency and courtesy of the amateur fraternity will not be forgotten.

QSLs? They’re on the way!!!
New! TRIPLE PURPOSE SLIM CRYSTAL MICROPHONE
- May be hand-held, stand mounted or suspended by lavallier cord!
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A (tremendous value) Unique design, only 4¾" L x 1¾" diam. Comes complete with a swivel adapter to fit all standard mike stands, and lavallier cord adaptor. Comes in plastic or leather. Both hands free. Smooth wide range control. Using type on-off slide switch. Detachable 5' cable and connector. Shipping weight 2 lbs. PA-31 Each in lots of 6...5.60 Single...6.95

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R/C Receiver is completely assembled and wired, with tube and ready to operate on same frequency. 27.550 MC remote control band. Size: 1½" x 1½" x 3½". Complete with 1.5 volt and one 45 volt battery.

R/C Transmitter is completely assembled, tested and guaranteed, and includes tube and 27.550 MC remote control telescoping antenna. Size: 4½" x 4½" x 12½". Less batteries. Shpg. wt. 7 lbs.

R/C ESCAPEMENT ASSEMBLED AND WIRER. INCLUDES TUBES
- READY TO OPERATE!

R/C TRANSMITTER

TRANISTOR CODE PRACTICE OSCILLATOR KIT
For those interested in mastering the international code, an audio tone oscillator is available. A feedback oscillator has the simplicity of the vacuum tube oscillator and the reliability of a transistor, and requires only one pentode for operation. It may be used for solo practice, or by two, in close proximity, for sending and receiving with the same unit. Kit complete with Transistor, Telegraph Key, Oscillator, Compens. Board, Schematic Diagram.

2 TRANSISTOR POCKET RADIO KIT
Packed into a 2½"x2½"x1½" plastic case. This is a complete two transistor plus musical circuit radio kit offers many surprises, utilizing a regeneration detector. This kit is equipped with transformer coupled audio stages, gives you high gain and excellent selectivity. Full in distant stations, with a more than ample earphone volume. Kit comes complete with two transistors, transformer, musical circuit, radio transformer, batteries, earphones, phono plug, etc., including schematic and instructions. Complete kit less earphone.

LAFAYETTE SIGNAL GENERATOR NEVER BEFORE HAS A COMPLETELY WIRED AND TESTED INSTRUMENT OF SUCH ACCURACY AND QUALITY BEEN OFFERED AT SUCH A PRICE!
- FREQUENCY 120 KC to 260 MC
- 120 KC to 130 MC ON FUNDAMENTALS
- LABORATORY ACCURACY AND QUALITY
A completely wired and tested instrument not to be confused with units sold in kit form at almost the same price, but with a quality and accuracy of instruments 5 to 4 times the price. Six overlapping ranges generate signals of 120 KC, 210 KC, 290 KC, 190 KC, 130 KC, 320 MC, 11 MC, 11 MC, 36 MC, and 37 MC. 1100 MC on fundamentals with calibrated harmonics from 120 MC to 260 MC. Selector switch gives instant choice of ranges. Switch gives choice of internal modulation of 400 CPS or use of any external source at other frequencies. For audio testing the 400 cycle signal can be used separately. Outputs are unmodulated RF, modulated RF, and 400 CPS audio. RF output is in excess of 100,000 microvolts and is provided for choice of either high or low RF output. Stability is insured by special circuit design. Has a 1.5 volt AF control. AF output is 2½ volts, AF input is 2 volts across 1 megohm. Large clear 5 inch staked plate and pointier are protected by transparent plastic. Common AF terminals for EMT-MOD input and INT-1/F for audio tests eliminate need for special AF output connectors. Machine engraved panel, lettered, easy circuit identification, complete with a handle. Measures 6½" x 10" x 4½". Comes complete with power cord and plug. Operates on 105-125V 50-60 cycle AC. Shpg. wt. 8 lbs. LAFAYETTE 16G-10 SIGNAL GENERATOR...

R/C Receiver is completely assembled and wired, with tube and ready to operate on same frequency. 27.550 MC remote control band. Size: 1½" x 1½" x 3½". Complete with 1.5 volt and one 45 volt battery.

R/C Transmitter is completely assembled, tested and guaranteed, and includes tube and 27.550 MC remote control telescoping antenna. Size: 4½" x 4½" x 12½". 4½" x 4½" x 4½". Less batteries. Include the following:
- 1 Burgess, 2D or RCA Y0569 Net, Ea. .45
- BATTERIES: 2 Burgess XX45 or RCA Y01016 Net, Ea. .28
- R/C Escapement is completely wired, sturdy and self-neutralizing. Weighs ½ oz. Low current drain. Size: 1½" L x 1½" W. Shpg. wt. 6 oz.

TRANSMITTER 1 Burgess 2D or RCA Y0569 Net, Ea. .45
- BATTERIES: 2 Burgess XX45 or RCA Y01016 Net, Ea. .28
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FIVE BAND ANTENNA COILS  
Tunes 80 - 40 - 20 - 15 - 10 Meters

Change bands with your transmitter in 20 seconds. Coils weigh 7 oz. each, are weatherproof, and tested for 400 lb. tensile strength.

Specify phone or CW.

No. 5BC-F Coils for phone $12.50 postpaid
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Complete antennas with 88 ft. of KW twinlead, 12 inch insulators, and high strength wire.

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Manufacturers of quartz crystals for all applications

World Above 50 Mc.
(Continued from page 61)

green wires on tie point at rear of chassis near v.f.o. socket.

11) Run wire from one pole of toggle switch through same grommet to Pin 6 of 6AU6 socket, Pin 6 of 6AQ5 socket, and back end of filament choke on 6146 socket.

12) Run wire from other pole through grommet to new tie point near the octal socket, and connect choke from there to Pin 1 of the socket and by-pass as noted in Step 5. (6.3 volts a.c.)

13) There is a tie-point strip near the large wire-wound resistor. Run a wire from the terminal nearest the front panel to a terminal on the new tie strip. Connect to Pin 2 of the octal socket through a 4.7-µh. r.f. choke. By-pass Pin 2 with .005, (75 volts bias.)

14) Connect red wires on tie point near v.f.o. socket to new tie point and through choke 1 to Pin 3 and by-pass, as in Step 13. (Plus 300 volts.)

15) Connect brown wires to Pin 4 through tie point and choke 1 and by-pass, as in Step 14. (Cathode lead of oscillator and doubler of external rig.)

16) Locate wire-wound resistor on phone-c.w. switch. Run wire from end nearest buffer capacitors to tie point, and through choke 1 to Pin 6. By-pass with .005-µf. 1000-volt ceramic. (Plus 600 volts.)

17) Connect Pin 8 to ground.

18) Replace filter capacitor and brackets. Be sure it does not short out any of added wiring or terminals. Replace chassis in cabinet.

This modification allows all voltages to be applied simultaneously to both transmitters, but only the one in which the heaters are energized will function. The newly-installed heater switch on the front panel selects transmitter to be used. The modulator, speech amplifier and rectifiers operate in the same manner for either rig.

A safety precaution: Be sure to enclose the high-voltage circuits of the external transmitter. They will have lethal voltages on them whenever the Viking itself is in operation.

The transmitter used with the Viking at W9VZP is a 50-Mc. rig with an 829B in the final, but a wide choice of r.f. lineups can be used with the Viking power equipment.

Using the 20A as a V.H.F. Exciter — W0BJV

When single sidetone began to take hold some years ago, it made quite a hole in the v.h.f. activity picture. Seems that s.s.b. and v.h.f. both appeal to the same sort of ham. So, fellows who have wandered from the v.h.f. fold may be interested to know that the Central Electronics 20A exciter can be used as a source of excitation for a v.h.f. rig. The setup can be operated phase-modulated, if one so desires. The trick is to get 24-Mc. output from the 20A. Here is how W0BJV does it.

He uses the 20A in conjunction with a BC-458 v.f.o. With the v.f.o. dial clockwise practically all the way the frequency is approximately 5 Mc.,

(Continued on page 150)
FIELD ENGINEERING
WITH A FUTURE
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Your opportunity: Raytheon needs men qualified for field engineering who are interested in building a future in electronics. Field experience has enabled many of our engineers to become Raytheon executives. Here’s a partial list of former field engineer-hams who are now executives at Raytheon:

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**W1EZ** —C. C. Rodimon, Mgr., Field Requirements, Gov’t. Relations Div.
**W1GWD**—O. L. Dewey, Mgr., Gov’t. Service Dept.
**W1EEO**—E. K. Doherr, Asst. Mgr., Gov’t. Service Dept.
**W1CMU**—G. E. Dodge, Supervisor, Field Engineering
**W1PAW**—W. R. Burrows, Supervisor, Technical Section

Unlimited opportunities are open to you in these programs:

- MISSILES—air-to-air, ground-to-air
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For the past 30 years Raytheon has designed and built advanced electronic equipment. One of its present projects is the world’s most publicized radar—the Arctic DEW LINE radar.

You’ll rate preference if you have a college degree. However, if you have an extensive electronic background, send in your application. Hams make fine field engineers. Valuable special training prepares you for your assignments.

Attractive salaries, benefits, allowances. Interesting domestic and overseas assignments. Write to Ed Doherr for information.

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which is multiplied by 3 to give 15-Mc. injection to the 20A. This is mixed with 9 Mc. in the 20A to give 21-Mc. output, which is then multiplied to 144 Mc. in conventional fashion. The 20A is tuned as follows: The bandswitch is placed in the 10-meter position and the mixer and amplifier are peaked at approximately 14 Mc. on the roughly calibrated dial. The frequency can be shifted to 25 Mc. for use with 50-Mc. exciters readily.

Since W9BJV sent this information in to us he has also put on s.a.b. on 50 Mc. What was probably the first two-way s.a.b. DX contact on 50 Mc. was made May 20th, when Stan worked W1CLS, Weston, Mass. It should be understood that the above method does not permit the use of s.a.b. on the v.h.f. bands, however. The only way to change the frequency to a higher band with s.a.b. is by heterodyning.

Those States-Worked Boxes

The intense activity of summer and the influx of many new operators are causing some major changes in our activity boxes these days. We had 35 requests for changes in standings last month alone! Please check the 6- and 2-meter boxes in July QST carefully. If your listing is not correct, please send us the full information at once.

For the 50-Mc. box, all you need is the number of states you have worked. Confirmations are not required until you apply for WAS. (There is a special award, remember, for the lucky and persistent fellows who can nail down all 48 on 6.) To make the 2-meter box, send us the total number of states and U. S. call areas you have worked, plus the call and location of the most distant station you have contacted. He can be in any country.

There were many new calls in the standings last month, and we hope to have more. Don't feel that you have to be an old-timer to get into the listings. If you're active regularly on either 6 or 2, and your record is equal to or better than the ones listed for your vicinity, send it in. The boxes are intended to reflect current accomplishments, not ancient history. Anyone who don't hear from at reasonable intervals will be dropped from the listings any time new claimants appear with meritorious records.

Once you've sent in a listing, keep it up to date. And if you know of any calls now in the boxes that do not represent active stations, please let us know that, too, so we can weed out any deadwood that may still be in there. Quite a few came out last month; we hope none of them unjustly. Those boxes are supposed to be news. Please help us to keep them that way!

W9KLR threw us a hot one recently by suggesting that we use bold-face listings for the 2-meter stations that can confirm their claims with cards. W5AJG likes that idea. We might go to it; what do you think?

For those who want to know when we'll start a box for 220- and 430-Mc. work, we report that this will happen as soon as we get enough listings. We're collecting them — how about yours?
**MOBILE POWER**

**NEW SAFETY FUSING**

- 500 V.D.C. at 225 MA. Perfectly filtered.
- Instant Start. No waiting.
- No battery drain when on standby.
- Low current — low voltage switching.
- Heavy duty components for dependable, long life operation.
- Small, compact, rugged. Only 4 1/2" x 10 1/4" x 6 1/2".
- No ventilation problems. Mount on firewall near battery.

**Model 600 — 6 V.D.C. Kit, $32.50**

**Model 612 — 12 V.D.C. Kit, $38.50**

**FACTORY WIRED, either model, $7.50 extra**

**Combination 6 and 12 V.D.C. — 115 V, AC.**

Model also available. We can supply power cables of any required length.

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**HERE 'TIS!**

**The PALCO BANTAM 65**

The PALCO BANTAM 65 is only 1 1/2" high, 8 1/2" wide, 8 1/5" deep — leaves you lots of leg room. The separate modulator section on a 2 3/4" x 2 3/4" x 11" chassis may be mounted in any convenient location. The exclusive new "tune up" meter was designed with highway safety in mind. No more stooping, no more squinting — you'll like this new idea!

**OTHER OUTSTANDING FEATURES**

- Built-in VFO with 2 axial positions.
- Either 6 or 12 volt filament supply plate supply 550-600 volts 8 250 MA.
- Complete band switching 10 thru 80 meters.
- Gang tuned VFO and exciter stages.

**NEW CONCEPT! Use the BANTAM 65 as a fixed rig now — as a mobile when you set your "General."**

**BANTAM 65** complete with tubes and power connectors, $139.50

For additional information, see your distributor, or write to

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W1, K1 — D. W. Waterman, W1FPQ, 99 Flat Rock Rd., Easton, Conn.
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W4, K4 — Thomas H. Moss, W4HYW, Box 644, Municipal Airport Branch, Atlanta, Ga.
W5, K5 — Robert Stark, W5OGH, P.O. Box 261, Grapevine, Texas.
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W8, K8 — Walter E. Musgrave, W8NGW, 1204 E. 188th St., Cleveland 10, Ohio.
W9, K9 — John F. Schneider, W9CFT, 311 W. Ross Ave., Wausau, Wis.
W0, K9 — Alva A. Smith, W9DMA, 238 East Main St., Caledonia, Minn.
VE1, K1 — L. J. Fader, VE1PQ, 125 Henry St., Halifax, N. S.
VE2, K2 — Harry J. Mahon, VE2APH, 122 Regent Ave., Beaconsfield West, Que.
VE3, K3 — Leslie A. Whetstone, VE3QM, 32 Sylvan Crescent, Hamilton, Ont.
VE4, K4 — Len Cuff, VE4LC, 286 Rutland St., St. James, Man.
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Hints & Kinks

(Continued from page 66)

When employing this old construction hint, first coat the coil form with a thin layer of coil dope. Allow the dope to dry until "tacky" and then wind the required turns of wire. Space the turns with a winding of thread. Carefully remove the layer of thread after the dope is completely dry.

The inductor may then be covered with a light coating of dope. Avoid using an excessive amount of dope because a heavy, slow-drying application may cause the turns of wire to slip out of position.

— J. Herrick Rickerman II, K2HXP

Results

(Continued from page 68)

acknowledgement was sent to each amateur participant who submitted a copy made from the radioteletypewriter transmission of this message. Perfect copies were submitted by the following participants:

W1s BDI(2) RBF(2) WEW WPR ZQM, W2s DOB DXD GHG HHI JAI(2) JAV OBM RMB, W3s CRO FY(2) LWG MHD SSL YMA, W4s AIV PHL, W5s DZV EVO JBD TIC(2) W6s AEE ASY BRY HYS CAP CBF CBY CG CLW CQJ DNT DMX DOV EER EGZ(2) EJM EKC FZC HQX ILW IZJ(3) JAV JJP MSG NAA NR NSS OGG OUR QVZ OWF PFM RM5 RJC VFC WFC WCG YDK ZOC, W7s KWB KQX, W8s BNL HWP SWZ, W9s HIO OCV YCF YVG YVF BK BWH.


IS YOURS ON FILE

WITH YOUR QSL MGR?

SEE PAGE 132 FOR A COMPLETE LIST OF A.R.L. QSL MANAGERS

OUR COVER

Our cover this month shows one of the polar diagrams from next month's conclusion to the article on Yagi antennas. That beam direction indicator that you see behind the diagram is controlled by the conventional selsyn arrangement, and has a specially-prepared translucent map based on the ARRL Map. The indicator box was supplied by Middletown Mfg. Co., Middletown, Conn. Elbow grease expended in making the indicator was supplied by WIVG.
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79z each—10 for only $6.50

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---

**HEATHKIT antenna impedance meter KIT**

Used with an RF signal source, the AM-1 will enable you to match your antenna-receiver-transmitter system for optimum operation. Will double as a phone monitor or relative field strength meter. Uses 100 ua meter, and covers 0 to 600 ohms. Frequency to 150 mc.

**MODEL AM-1**

$14.50

Shpg. Wt. 2 Lbs.
HEATHKIT

communications-type all band receiver KIT

Slide-rule dial — electrical bandspread — ham bands marked. Slug-tuned coils and efficient IF transformers for good sensitivity and selectivity. Transformer-operated power supply for safety and high efficiency.

The Model AR-3 receiver features new high-Q slug-tuned coils, new layout, and new-type IF transformers. The result is high sensitivity and selectivity and better image rejection on all bands.

Transformer-type power supply, electrical bandspread, RF and AF gain controls, antenna trimmer, AGC, BFO, headphone jacks, socket for Q multiplier, 5½" PM speaker and illuminated dial.

**SPECIFICATIONS:**
- Frequency Range: 550 kc to 30 mc on four bands.
- Tube Complement: 1-12BE6 oscillator and mixer, 1-12BA6 IF amplifier, 1-12AB6 second detector, AVC, first audio amplifier and reflex BFO, 1-12A6 beam power output, 1-5Y5 full wave rectifier.

$27.95 (Less Cabinet) . MODEL AR-3
Shpg. Wt. 12 Lbs.

HEATHKIT

CW amateur transmitter KIT

Single-knob band-switching for 80, 40, 20, 15, 11, and 10 meters.

Panel meter monitors final grid or plate current.

Plate power input:
- 25-30 watts.
- Best dollar-per-watt buy on the market.

The AT-1 is complete with its own power supply, and covers 80, 40, 20, 15, 11, and 10 meters with single-knob bandswitching. Designed for crystal or external VFO excitation. Incorporates key-click filter, line filter, copper plated chassis, pre-wound coils, 52-ohm coaxial output, panel meter, and high-quality components throughout. Easy to build, even for the beginner. Employs 6AG7 oscillator and 6L6 final. Up to 30 watts power input.

**SPECIFICATIONS:**
- RF Amplifier Power input: . . . 25-30 watts
- Output Connection: . . . . . 52 ohms
- Band Coverage: . . . . . . . . 80, 40, 20, 15, 11, 10 Meters
- Tube Complement: 15, 11, 10 Meters
- SU45 Rectifier
- 6AG7 Oscillator — Multiplier — Amplifier — Doubler

$29.50 . MODEL AT-1
Shpg. Wt. 15 Lbs.

HEATHKIT vfo KIT

The Model VF-1 features illuminated and pre-calibrated dial scale. Cable and plug provided to fit the crystal socket of any modern transmitter. Covers 160-80-40-20-15-11 and 10 meters with 3 basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Derives operating power from transmitter power supply. Has VR tube for stability. Go VFO for more operating enjoyment.

**SPECIFICATIONS:**
- Tube Complement: 6AU6 oscillator, 6AV2 voltage regulator, Power Requirements: 250-350 VDC @ 15-25 ma and 6.3 VAC @ .45A.

$19.50 . MODEL VF-1
Shpg. Wt. 2 Lbs.

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6-meter 5-el., comp., 14.95 prepaid

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CONCORD, N. H.

He saw the price UNBEATABLE!

THE NEW HAMMARLUND

HQ- (Shhhhh—censored till September)
HEATHKIT DX-35 phone and cw transmitter KIT

- Built-in modulator for phone operation.
- Bandswitching on 80, 40, 20, 15, 11 and 10 meters. Pi network output coupling.
- Switch selection of three crystals—provision for external VFO excitation.
- Attractive and functional physical design.

This brand new transmitter model provides phone and CW operation on 80, 40, 20, 15, 11, and 10 meters. Plate power input to 65 watts on CW and controlled carrier modulation peaks to 50 watts on phone. Completely bandswitching.

Employs two-stage 12AX7 speech amplifier, 12AU7 modulator, 12BY7 oscillator, 12BY7 buffer, and 6146 final. The buffer stage assures plenty of drive to the final on all bands. Pi network output coupling employed for easy antenna loading. Switch selection of crystals. Crystals changed without removing transmitter cabinet. Husky power transformer and choke are potted, and the circuit is well shielded. Meter indicates final grid or plate current.

Truly a remarkable transmitter package for the price. Ideal both for the novice and for the more experienced operator.

HEATHKIT "Q" multiplier KIT

Provides extra selectivity for separating signals, or will reject one signal to eliminate heterodyne. Effective Q of 4,000 for sharp "peak" or "null." Tunes any signal within receiver IF. Operates with 450 to 600 kc IF. Will not function with AC-DC type receivers. Requires 6.3 VAC at 300 ma, and 150-250 VDC at 2 ma.

PREMAX GROUND PLANE ANTENNAS
FULLY ADJUSTABLE 20 to 60 M.C.

Ragged but light in weight, these all aluminum antennas maintain sensitive transmission and reception in all weather and wear. Adjustable arms lock securely. Waterproof housing protects cable connections and seals coax. Standard threaded sleeve mounts on ½ inch pipe, set screws included.

STYLE GP-430 adjusts for 20 to 40 M.C.
STYLE GP-450 adjusts for 40 to 60 M.C.

PREMAX designs and builds many of the antennas used by U. S. Government. Ask your dealer for Premax, or write:

PREMAX PRODUCTS
5638 Highland Avenue

GP-430

He wants to be first in line for a new HAMMARLUND HQ-—(Shhhhh—censored till September)
Viking II, in excellent condition, one year old, first $215 takes it. Used in delivery, 250 miles, otherwise via express colonel. John Soohey, W5JDJ, 807 Cuthbert, Midland, Texas.

SOLD: Or trade: New Goedeker Neagel 2-meter Communicator in original box, $180 cash or will trade and pay cash difference for B & W or Collins transmitter, L. M. Newberry, W4UDJ, 3553 Princeton Road, Hadestead, N. J.

TRADE: Tower P2 camera, 35 mm Nikkor lenses, synchronized for flash and strobe, with leather carrying case. Also wide angle Nikkor lenses with view finder for all lenses. Norwood light, meter, polaroid, and other filters. Self-timer. In perfect condition. Worth $300. Will trade 35A1, -1, or 5 or 6 receiver. R. Leaveshult, M.D., 514 Laurel, San Diego, I. C.

NOVITCE: Excellent Hallicrafters SX-90 recvr. $125; Heathkit AT-1 smittor and AC-1 ast. econ., $40. KD2QJ, E. Schollman, 917 Clinton St., Hoboken, N. J.

FL: L Audio filters, 2 for $2.00 prepaid in U. S.; Brush BK401 true recorder, dual track, in good condition $65.00; RM-16024 preselector, like new $35.00; BC-103A Anadaptor, perfect condition with instruction book and extra C.E.A., $25.00; L-177 transmitter, in good condition $20.00; Precision F-200C Signal generator, in good condition $35.00; 300-600 MHz frequency meter, perfect $7.50; BC-160B doubler mounted $1.00; Heath O-38 Sore $15.00; 250W conv. 110W DC to 110V AC, $10.00. Wanted mobile equipment, 8-15 meter bandspread coils for IRO 501. M. D. Haines, W5QCB, Naval Air Station, Mill Valley, Calif.

FOR SALE: Two units of Model 8 TVX-3 complete radio equipment, used very little. Write: Sophia Prager, Garrett, Wyoming.

Would like to contact ham who takes trip around the USA in a house trailer, using your trailer or arent, sharing expenses. Harry L. Rogers, 1424 Burton St., Whitestone, L. I., N. Y.

FOR SALE: 1965 w/low and manual, in exc. cond., $125. W2DTH, Tel. LO 7-3474, 231 Sherman, New York 14, N. Y.


WANTED: Back issues of CQ magazine by years. L. N. Chambers, 401 Jefferson, Davenport, Iowa.

TRANSMITTER, Lysco 600, $49.50. KCCHY, Seches, 1352 Vista Grande, Millbrae, Calif.

SOLD: LL-10 freq. meter with AC 220 volt plug, and case, $40; LM-14 freq. meter without AC 220 volt plug and case, $40, both with original calibration weights and LM-14 milliammeter. Set of 4 Milliammeter calibrations, 1.5 Kc to 40 Mc, in perfect cond. $10. Zimmerman, K4HFF, 4240 Columbia Pike, Arlington, Va.


FOR SALE: Heathkit AT-1 Transmitter, $25; Heathkit AC-1 Am. condenser blower, $6.20 and 80-meter motor. " ranger" mobile transceiver, complete. All in good condition. No C. O. D.'s. Craig Hummel, WNNCHF, 2510 Ralph Ave., Cleveland 9, Ohio.


SOLD: 250 watts, 3-band transmitter, ome or c.w.; home built complete. Delivered within 300 miles. $150. Bob Wright, WSBY, Bolen, New Mex.

WANTED: 75A3 or 75A4 for cash. Give details and best price. William Mitchell, 7560 Hired, St., Albuquerque, N. M.


FOR SALE: "Lumsbury Beams." Completely assembled, 9-meter 5-element, $14.95; 2-meter 6-element, $6.95. Rugged seamless aluminized tubing, cable, etc. to make all types of antennas. We pay shipping charges. Wholesale Supply Co., Lumsbury, Mass.

SOLD: Complete 12 volt mobile rig in a like-new cond. AF67, 5BR 2-meter Match, 600 D. Young All-Bnder and whip, Dynamotor, and 5000 c.p.s. All will sell for $275. Will bring $475 for this $400 value. Gary Reids, Scottsboro, Ala.

WANT: Good receiver. Will trade portable mill and NRI Multi- meter, 94 Westfield Rd., Holyoke, Mass.

SOLD: VFO, Melleser Signal Shifter, 5 watts output on 10, 15, 20, 40 and 80, $20; UTC S 50 3000W, 300 Ma., $20; Communications portable type writer, and comb. $17.50. Need: $44. 4-250A, trans- former 2500V - 400 + Ma. WA2EVE, Jones, 14 Carol Rd., Beth- persa, N. Y.


CHEAPER BY the pair. New tubes, 81A, $12.50; 81X, $12.50; 6EP6, $8.00; 5584, $8.00; 807, $6.00; 807C, $4.00. Also new Bendix TA-12D transmitter, 25 watts for a Novice, $25; 100W fixed modulation unit, $10. 140/438/11 kHz transmitter, $20 new makes a 35-watt 5-meter rig, $85; 225-525, 25.00; U.T.C., 9 watts, $8.00; 6000-S watt 5-meter rig, $35.00; 140/438/11 kHz transmitter, $35.00; 35 crystal, $4.85. All shipped postpaid insured. W4PHY, Box 178, Ellenton, Fla.

FOR SALE: Melleser 150-200 watts tone or c.w. with VFO: Abbot TR-4A without power supply. All reasonable offers considered. W41BJ, 0624 33rd St., N., Falls Church, Va.

WANTED: 4-100A with scopes if possible; two 4-400A. Please send QSL card would like to purchase or trade parts. Steve, W7SOS, 70711, several 450 T.L., and 304T.L., all new. Write W6VRN, 313 South 4th, Sacramento, Calif.

ELMAC PMR6A, 12 volt model with power supply. $90. KDZNG, Arthur Andersen, 245 Knight Ave., Collinswood, N. J.

QST and ARRL Membership $4 in the USA $4.25 in Canada $5 elsewhere

MEMBERS of the Eight in ARRL Divisions will soon be nominating and voting for the directors who will represent them for the next two years. Every amateur taking part in these elections helps further the aims and protects the privileges he has as a ham. Naturally, only League members vote in ARRL elections. Let your voice be heard—sign up now.
The No. 80070 Series of Cathode Ray Tube Bezel

The MILLEN "Designed for Application" line of plastic and cast aluminum panel bezels includes units for the 1 1/2", 2", 3" and 5" tubes. The 3" size is also available with a special neoprene cushion for the new flat faced tubes as well as the standard cushion. The finish on all types, either metal or plastic is a handsome flat black. The 2", 3" and 5" sizes include a green plastic glass filter. Memetal and nikelot shields are also available for all types of cathode ray tubes for use with any of these bezels.

JAMES MILLEN MFG. CO., INC.
MAIN OFFICE AND FACTORY
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MASSACHUSETTS
The TMC Model GSB-1, Single Sideband Adapter is a filter type slicer permitting accurate and simple tuning of SSB signals.

The 455 Kc input is converted to a low frequency by means of a mixer and oscillator combination which allows selection of either sideband. The difference frequency is fed to a carefully designed and manufactured bandpass filter, which restricts the band width to 3 Kc at the 6 db points. This filter is so effective that the skirt width 40 db down is only 4.5 Kc. The filter output, in turn, is fed through a second mixer, or product detector, where it is combined with a stable 17 Kc local oscillator. The result is once again passed through a filter having a cutoff at 5 Kc, thus eliminating all unwanted mixer products. The output is a relatively noise and interference free audio signal.

The TMC Model GSB-1 contains a number of features which make it a more useful device. Since single sideband signals require critical frequency adjustment, this unit has been provided with electrical band spread which reduces tuning to the point of greatest simplicity and ease. In addition, AVC is provided within the Model GSB, over and above that which already exists within the receiver, thus serving to further prevent powerful local stations from overloading the slicer. A noise limiter, which reduces impulse peaks, has also been included in this unit.

The Model GSB-1 although originally designed for use with the Model GPR-90 receiver (which already provides the proper terminals) may be used with any receiver which will provide .3 volts (rms) R.F. input at approximately 455 Kc and where access to an audio grid is available.

Illustrated with the GSB-1 (right side) is the TMC Receiver GPR-90 (center) and the companion speaker - Bulletin 179Q.

**FRONT PANEL CONTROLS:**
- Power ON/OFF Switch
- AVC ON/OFF Switch
- SSB-AM Selector Switch
- Upper or Lower Sideband Selector Switch
- Noise Limiter ON/OFF Switch
- AVC FAST/SLOW Switch
- Main Tuning

**SPECIFICATIONS:**

**FREQUENCY RANGE:**
452-455 Kc.

**TYPE OF RECEPTION:**
AM, SSB (Upper or Lower), CW

**IF INPUT VOLTAGE:**
0.3 volts rms (normal) for 0.3 volts rms audio output.

**IF INPUT VOLTAGE RANGE:**
0.1-10 volts rms (with AVC).

**AVC CHARACTERISTIC:**
With 40 db change in input signal, output remains constant within 9db

**INPUT IMPEDANCE:**
High from IF.

**OUTPUT IMPEDANCE:**
To match audio grid.

**INPUT POWER:**
115 volts, 50/60 cycles, 46 watts.

**CABINET SIZE:**
12" wide x 10" high x 15" deep. Matches GPR-90 for height & depth.

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**TMC Canada, LTD.**
**OTTAWA, ONTARIO**

**MAMARONECK, NEW YORK.**

**$149.50**
Compact and versatile—the perfect low-power rig for the Novice. Features: 60 watts input to 207 final; 6AG7 modified Pierce oscillator takes crystal or VFO without circuit changes; band-switching coverage of 80, 40, 20, 15, 11, 10 meters; pi-section antenna output to permit use with any type of antenna; crisp cathode keying of oscillator and final; power take-off plug supplies filament and B-plus voltages for other equipment; excellent TVI suppression; meter reads either plate or grid current of final; jacks for VFO, crystal and key. Size, 8¾ x 11¼ x 8¾". Supplied with all parts, tubes and step-by-step instructions (less crystal and key). Shpg. wt., 18 lbs.

83 SX 255. 50-Watt Transmitter Kit, Only . . . 42.50

Save on This easy-to-build Transmitter only

50-WATT CW TRANSMITTER KIT

Self-Powered $27.50

$27.50

VFO KIT

Complete with built-in power supply! Careful design and voltage regulation assure high stability. Excellent keying characteristic for fast break-in with clicks or chirps negligible. Full TVI suppression. Has plenty of bandwidth; separate calibrated scales for 80, 40, 20, 15, 11 and 10 meters; vernier drive mechanism. 2-chassis construction keeps heat from frequency determining circuits. Output cable plug into crystal socket of above Knight-Kit or any other transmitter. Output on 80 and 40 meters. With Spot-Off-Transmit switch. Extra switch controls for operating other equipment. Complete kit with tubes, all parts and instructions for easy assembly. Shpg. wt., 8 lbs.

83 S 725. Self-Powered VFO Kit. Net. . . . . . . 27.50

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A New Standard of Measurement of Frequency and Time

ATOMICHRON ... the first commercially feasible atomic primary frequency standard ... is typical of the advanced research and engineering that typifies National Company these days. Because it is a full order of magnitude more precise and stable than any primary frequency standard now available, the National ATOMICRON opens new horizons of accuracy for navigation, crystal calibration, frequency monitoring and control, and elapsed time measurement. For example, its use in communications can effect a substantial increase in the number of channels available in the now-crowded radio spectrum.

Advancing Scientific Knowledge

One of National's recent achievements was having its HRO-60 communications receiver selected to accompany Ohio State University’s scientific expedition to Vietnam for observation of a total solar eclipse. Eleven HRO-60’s were used in a communications net extending from Khartoum to Formosa, and an HRO-60 served as the monitor receiver to insure satisfactory recording of time signals from WWV, some 10,000 miles away!

Amateur Communications

National's NC-300 communications receiver has been the talk of the hams since before its introduction in 1955 ... and no wonder! It is designed specifically to serve only the amateur bands. It is the first receiver ever designed after a search for “dream receiver” design suggestions from hams. And it sells for an amazingly low price, in spite of all its extra-value features.

Electronics for Defense

National Company is also active in both development and manufacture of a variety of electronics devices for National Defense use. Typical products include a low-powered portable radar system for Semi-Military use; an exceptionally stable “Stabilidyne” receiver of revolutionary design; automatic alarm systems for radar receivers; radar search receivers; and digital data transmission equipment.

For 42 years, National Company has enjoyed an outstanding reputation as a leading manufacturer of communications receivers and components. Less widely known to hams, but equally important, are National's endeavors in other fields. These add up to an impressive total of achievement in vital areas of national defense, scientific research, advanced communications and standardization of time and frequency measurement. The following paragraphs outline briefly some of the major contributions National Company has made in these fields.

National COMPANY, INC. 61 SHERMAN STREET, MALDEN 48, MASS.

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This is the Hammarlund PRO-310 receiver—designed and built by the company famous for a long line of “Super Pros” since early days of CW. The PRO-310 features a unique front-end with a printed circuit rf stage for improved performance, double IF conversion, and voltage regulation—and it’s equipped with RCA Receiving Tubes throughout!

Here’s why RCA Receiving Tubes make the difference. (1) “Back-ground quietness” enables the operator to get better signal-to-noise ratio—through increased sensitivity. (2) Low hum factor makes it easier to pull weak signals “out of the mud”. (3) Excellent uniformity of electrical characteristics simplifies tube replacement. (4) High stability assures more satisfactory operation under normal voltage variations.

If your present receiver is losing its “hop”, “re-tube” with new “RCA’s”—and give it new snap. See your RCA Tube Distributor for the types you need.

For tube technical data, write RCA Commercial Engineering
Section H37M. Harrison, N. J.

RCA TUBES FOR AMATEURS
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