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**GENERAL ELECTRIC**

RECTIFIER STALWARTS

Once you've plugged in a pair of heavy-duty GL-872-A's, you can forget them!

**TYPE GL-872-A**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filament voltage</td>
<td>5.0 v</td>
</tr>
<tr>
<td>Filament current</td>
<td>7.5 amp</td>
</tr>
<tr>
<td>Typical operating conditions, full-wave circuit (two tubes), choke input:</td>
<td></td>
</tr>
<tr>
<td>a-c voltage, plate-to-plate</td>
<td>7,070 v</td>
</tr>
<tr>
<td>d-c output voltage (approx)</td>
<td>3,180 v</td>
</tr>
<tr>
<td>d-c output current</td>
<td>2.5 amp</td>
</tr>
</tbody>
</table>

**Since** the war, final input to the average ham rig has been going up. This has strained power supplies severely. Overworked rectifier tubes have a reduced life. If you replace them often, your expense mounts.

However ... one pair of rectifier tubes will serve you for years if there's generous reserve capacity. Such as your margin when you can draw steadily 2.5 amperes of d-c power from a pair of GL-872-A tubes—five times the output of two GL-866-A's, for example!

With husky tubes which will sluice power like that into your rig, you needn't worry when you "double up"—i.e., ask your power supply to feed more than one stage. Or you can safely increase your rig's signal strength, knowing that your rectifier has the muscle to shoulder the extra load ... without strain ... without shortening tube life.

Get further facts about Type GL-872-A—big, dependable, long-serving—from your nearby G-E tube distributor. Or write Electronics Department, General Electric Company, Schenectady 5, New York.

---

**Series 6 in a listing, by areas, of tube distributors who can supply you with Ham News, G.E.'s bi-monthly magazine:**

- Canton, O.: Burroughs Radio Co.
- Cleveland, O.: Northern Ohio Labs.; Olson Radio Warehouse, Inc.; Pioneer Radio Supply Co.; Progress Radio Supply; Radio and Electronic Parts; Winterradio, Inc.
- Columbus, O.: General Elec. Supply Corp.; Hughes-Peters, Inc.
- Evansville, Ind.: Wesco Radio Parts.
- Ft. Wayne, Ind.: Pemberton Labs.; Protective Electric Supply Co.
- Gary, Ind.: Cosmopolitan Radio Supply Co.
- Indianapolis, Ind.: Kiefer-Stewart Co.; Van Sickle Radio Supply Co.
- Lima, O.: Lima Radio Parts Co.
- Mansfield, O.: Burroughs Radio Co.
- Muncie, Ind.: Muncie Radio Supply Co., Inc.; Standard Radio Parts Co.
- Richmond, Ind.: Roderick Co., Inc.
- South Bend, Ind.: Radio Distributing Co.
- Terre Haute, Ind.: Archer and Evans.
- Toledo, O.: Toledo Radio Specialties; Warren Radio.

(List as of September 25, 1949)
The new receiver is here!

Increasingly, for some months, rumors have spread that a new Collins receiver of surpassing performance would be available soon. This receiver is now in production.

The new Collins 51J-1 is a double conversion superheterodyne, permeability tuned throughout, and continuously tunable over the range 0.5 to 30.5 megacycles.

Designed as a general purpose communications receiver for military, commercial and individual use, the 51J's outstanding characteristics are extremes of accuracy and stability. Quartz crystals in the first conversion circuit, and the very accurate, stable Collins 70E-7 VFO in the second conversion circuit, contribute notably to these characteristics.

The tuning method employed is an innovation. The range is divided into 30 bands of 1,000 kc each. The tuning mechanism is based on a decade system in which the megacycle figure is set by means of a band switch. 100 kc figures are indicated on the slide rule dial; kilocycle figures on the circular dial. Under normal operating conditions, with a 10-minute warmup, the dial reading is within 2 kc of the receiver's exact frequency throughout its range. Calibration error can be reduced to less than 200 cycles by means of an adjusting knob which permits the reading to be corrected at 100 kc intervals by use of a built-in crystal oscillator. The 100 kc crystal may be compared directly against WWV.

Even without reference to the crystal calibrator the frequency over the temperature range —20°C to +60°C does not vary from the frequency at 20°C by more than 30 parts per million plus 1 kc; thus stability is within 2 kc at the highest operating frequency. Frequency does not vary more than 100 cycles from the frequency at 115 line volts when this voltage is varied through the range 105 to 125. Changes in atmospheric pressure from sea level to 10,000 feet altitude, relative humidity from 10 to 90%, and mild shock, do not vary the frequency by more than 500 cps.

The price of the 51J-1 as shown, with dust cover for standard rack mounting, is $875. It may be had in a cabinet, for table use, at a slight increase in cost.

The price of the well known and highly regarded Collins 75A-1 exclusively ham receiver, which is not displaced in the Collins amateur line by the 51J-1, is $375.

See or write your Collins dealer for further information. If you are not acquainted with him, write us for his name and address.

FOR SUCCESS IN AMATEUR RADIO, IT'S...
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Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio Club reports are also desired by SCMs for inclusion in QST. All ARRL Field Organization appointments are now available to League members. These include ORS, OES, OPS, O0, and OBS. Also, where vacancies exist, SCMs desire applications for SEC, EC, RM, and PAM. In addition to station and leadership appointments for Members, all amateurs are invited to join the ARRL Emergency Corps (ask for Form 7).
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is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experiment, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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Directors
NEWCOMERS

For some time now we've been hearing comment about the constantly-increasing average age of amateurs. Somehow we get the idea that something terrible is in store for amateur radio if we don't quickly get into our ranks more new and young blood. We propose to discuss this month whether the facts support that fear.

To begin with, an increase in average age, of itself, means nothing. Elementary arithmetic proves that any group of persons like that comprising something as relatively new as amateur radio is bound to have an increasing average age. Assume for a moment that amateur radio is a brand-new hobby and that 1000 persons, all age 20, take it up the first year. The average age would, of course, be 20. During each succeeding year, suppose another 1000 persons, each 20 years old, enter ham radio. At the end of the second year, since the original 1000 is a year older, the average age rises to 20 1/2. Following this process over a period of years, we would find that at the end of the tenth year the average age would be 24.5, and at the end of the twentieth year the average age would be nearly 30 — in spite of the fact that the same number of youngsters was entering the game each successive year. This basic principle applies to us: since the majority of hams stay in the game for many years, as they grow older they push up the average age regardless of what comes in at the bottom. So each year, unless five or ten thousand of us older fellows wish to cooperate by dropping out of ham radio, the average age of amateurs is going to increase. Since people have a habit of growing older year by year, we must be content to face the hard fact that there is nothing we can do to prevent the rise in average age short of annihilation of several thousand of our older brethren. Getting youngsters into our ranks is a desirable objective, but is not in itself the answer to the average-age question; if most of the newcomers in 1949 were in their teens, the average age at the end of the year would still go up.

It seems to us that what we all, as hams vitally interested in amateur radio's future, really wish to know is this: What are we getting into our ranks as new blood these days?

The Federal Communications Commission estimates that there were 12,100 amateur examinations successfully passed during 1948. Since 4800 of these were taken by already-licensed amateurs applying for a higher grade of operator privileges, subtraction of that figure leaves 7300 persons to whom new licenses were issued. And since the total number of operator licenses outstanding at the end of the year was 76,666, it can be stated that approximately ten per cent of our present amateur body entered the game as newcomers last year.

Of course that is only a partial answer to our question; we need to know something about this group, to determine whether it satisfactorily fulfills what we amateurs believe is required in the way of new blood for our ranks.

A few months ago Hq. conducted a survey of newcomers to amateur radio who got their first licenses late last year. It indicated that the average age of the newcomer group is 27.8 years (compared with the over-all amateur average of about 34) . . . that one-fourth of the newcomers are 20 years of age or younger . . . that nearly half of them are 25 years of age or younger. Although fully realizing there are no figures available for comparisons, we'll wager that the 1948 crop of young squirts is little different in age distribution from their 1938 or 1928 brother-neophytes. How old were you when you started in ham radio?

So that our intentions won't be misinterpreted, let us say that amateur radio does need new blood — a continuing need which we have pointed out over the years. Our purpose is simply to explode the fallacy of thinking that an increasing average age is necessarily an indication of senility in our ranks and a lack of youngsters coming in at the bottom.
SPECIAL BOARD MEETING

The Board of Directors of ARRL met at the call of the President in special session at Washington, D. C., October 8, 1949. An early action of the Board was amendment of By-Laws to permit the Roanoke Division to have a voting representative, its alternate director, at the meeting. After reiterated its stand against the principle of government blueprinting, and after receiving assurances from its General Counsel and Secretary that the October 10th conference would not be involved with questions of principle, the Board then examined individual FCC proposals for amateur regulation changes. Briefly, the Board favored expansion of 75-meter Class A "phone to 380 kc. and after receiving assurances from its General Counsel and Secretary that the October 10th conference would not be involved with questions of principle, the Board then examined individual FCC proposals for amateur regulation changes. Briefly, the Board favored expansion of 75-meter Class A "phone to 380 kc.

The "secret weapon" shown on the cover is the representative, its alternate director, at the amendment of By-Laws to permit the SPECIAL BOARD MEETING

S. M. Mathes, USN, former Northwestern Division director. Division director, W. E. Slauson, 7ZQ, and Lt. Comdr. Hatry, department editor. Operators 11-meter rig constructed by B. J. Kro11:er, 3APV, and P. M. Hargis, 5AIJ, the 12-meter "lDH" transmitter built of the Charlotte (N. C.)... Midwest Division Manager Porter H. Quinby, 9DXY, and Hoover Cup Winner Don C. Wallace, 9ZT-9XAX, are introduced in the "Who's Who" department.

OUR COVER

The "secret weapon" shown on the cover is the new two-band array for 220 and 420 Mc. now in use at W1HDQ. For structural details, see page 116 of this issue.

SWITCH TO SAFETY!

November, 1924

Two Californians, W. B. Magner, 6BCP, San Pedro, and K. L. Riedman, 6CGW, Long Beach, shatter all DX records by working Frank D. Bell, New Zealand 4AA, during ARRL-arranged tests with Oceania. Wavelengths of 130, 150 and 157 meters were employed.

Traffic Manager F. H. Schneel announces another Daylight Transon test, this time using the new short-wave band of 75-80 meters. Simultaneously, the Experimenters Section invites participation in coming 20-meter listening and sending tests.

J. L. A. McLaughlin tells how to build his famed one-control superhet, one variable condenser and inductances.

... The schooner Boudoin of the MacMillan Arctic Expedition has returned home safely. ARRL's representative on the 14-month trip, Don Mix, IT5, gives a colorful account of his experiences while operating WNP.

... The problems inherent to operating transmitter tubes in parallel are discussed by James H. Turnbull.

... Hassel's "Super-Solih Circuit" is intimately described by Healdon R. Starkey of the Zenith research department.

... A new name appears on the QST masthead — L. W. Hafter, department editor.

... A quartet of Seventh District amateurs summering at Gloucester, Mass., have pooled their equipment under one call — 1AKI. Operators are H. F. Mason, 7BK, of the QST staff, K. W. Weingarten, 7BG, ARRL Northwestern Division director, W. E. Slauson, 7ZQ, and Lt. Comdr. S. M. Mathes, USN, former Northwestern Division director.

... F. S. McCullough reports in detail on his experiments with helium-filled tubes.

... "Atmosphere Electricity" — lightning, aurora, etc. — is authoritatively discussed by Dr. S. J. Machly of the Department of Terrestrial Magnetism.

... Short-wave transmitters that show promise are reviewed by S. Kruse and A. L. Budlong. Included are the 11-meter rig constructed by B. J. Kro11:er, 3APV, and P. M. Hargis, 5AIJ, the 12-meter "ID1" transmitter built by H. A. Wadsworth, ex-3JJ, and W. A. Parks, 3BE-3ZW, and a heretofore unannounced "push-pull" circuit used by E. A. Beane.

... The transmissions of WWV and 6XBM have been expanded to include wavelengths between 150 and 50 meters.

... Featured amateur stations of the month are 1CMB, Bridgewater, Mass., operated by Clarence and William Jackson, SJY, Cleveland, Ohio, operated by S. B. Brown, and 4IU-4XE, Jacksonville, Fla., the station of William Justice Lee.

... Midwest Division Manager Porter H. Quinby, 9DXY, and Hoover Cup Winner Don C. Wallace, 9ZT-9XAX, are introduced in the "Who's Who" department.

Strays

Congratulations are in order to C. A. "Pete" McKnight, W4CFL, who has been named editor of the Charlotte (N. C.) News. Comments the Atlanta Journal editorially: "We look to him [W4CFL] to carry on in a manner worthy of his predecessors." "Pete," a newspaperman of long standing, finds daily deadlines no bar to his ham activities — he's well known in organized traffic circles and is a top-notch performer in ARRL contests.
The "Selectoject"

A Variable-Frequency Selective Audio Amplifier, Oscillator, and Rejection Filter

BY OSWALD G. VILLARD, JR.,* W6QYT, AND DONALD K. WEAVER, JR.,** W6VQL

Here is an attachment for communication receivers which should be of equal interest to c.w. and ‘phone operators, experimenters, and SWLs.

Named "Selectoject" because it serves as a selective amplifier, an oscillator, or a single-frequency rejection filter, the device consists of no more than two dual-triode tubes, some fixed and variable resistors, and a few capacitors. In all three applications, the frequency of operation may be set to any point in the audio range by turning a single knob. The degree of selectivity (in the amplify position) is continuously adjustable, and, like the depth of the null in the "reject" position, is independent of tuning.

In 'phone work, the Selectoject may be used to reject heterodynes. The width of its rejection notch at the base is, if anything, narrower than that of a good crystal filter. In c.w. reception interfering signals may be rejected or, alternatively, the desired signal may be picked out and amplified. Any desired degree of selectivity, from none at all to the sharpest attainable with a crystal filter,1 is available. Finally, the Selectoject may be operated as a low-distortion variable-frequency audio oscillator suitable for amplifier frequency-response measurements, modulation tests, and the like.

In the reception or amplification of music, the Selectoject may be used as a flexible equalizer unit, providing adjustable bass boost or needle-scratch elimination.

This unit is in a sense a successor to the Wien bridge, or Heterofil.2 Its development was the result of an attempt to find a way around the chief practical disadvantage of the Wien bridge — namely, the requirement that the frequency-determining variable resistors track perfectly if the null is to be deep. To avoid the expense of precision resistors, dual potentiometers having deliberately-introduced back-lash in the ganging mechanism have been used in the Heterofil. Such an arrangement is, unfortunately, an operator's nightmare, since the null must be found in a series of successive approximations just as in balancing a laboratory bridge. Slight change of heterodyne pitch caused by drift of the heterodyning signals complicates this procedure beyond endurance, since the bridge must then be continuously rebalanced.

In the Selectoject, this problem has been brought under control. There is only one adjustment when the null frequency is changed, yet standard ganged potentiometers may be used. The depth of the null is for all practical purposes unaffected by frequency setting. Heterodynes may be eliminated with the same positive ease of operation that characterizes a crystal filter. In addition, the rejection "slot" is considerably sharper than that of a Wien bridge.

True, the Selectoject uses two dual vacuum tubes, and is somewhat more complicated than the Wien bridge, but it is also much more versatile. The vacuum tubes make it possible, by sim-

* Dept. of Electrical Engineering, Stanford University, Stanford, Calif.
** 500 Menlo Oaks Drive, Menlo Park, Calif.

1 The Selectoject, being an audio-frequency device, of course does not eliminate the audio image in beat-note reception. — Ed.

It isn't often that as much versatility is packed into a small box as in the case of the "Selectoject." Whether you're a beginner or old-timer, have the simplest or more elaborate station, 'phone or c.w., you'll find this gadget a most useful addition to your equipment.

Pie switching, to convert the circuit into a variable-frequency regenerative audio amplifier. With the regeneration control off, the amplifier has a flat response. As this control is advanced, a peak in amplification occurs at the frequency to which the unit is tuned. This peak becomes higher and sharper as the feed-back increases, until finally the amplifier goes into sustained oscillation. It is a characteristic of this circuit that the amount of feed-back does not depend on the operating frequency; consequently both the per cent bandwidth of the amplifier and the amplitude of the oscillation remain constant as the frequency control is varied.

The Selectoject differs from ordinary variable-frequency tuned amplifiers in the following way:

In the circuits most of us are accustomed to, the frequency response is controlled directly — perhaps by means of a tuned resonant circuit. In the Selectoject the same end result is achieved by means of a special kind of amplifier stage whose amplitude of transmission remains constant, but whose phase shift is made to vary with frequency in some designated way. By controlling phase we may still obtain the over-all response characteristic we desire, for by combining constant-amplitude variable phase-shift voltage with voltage of constant amplitude and no phase-shift, a resultant is obtained whose amplitude depends on the relative phase of the two component voltages, and hence is variable.

The heart of the special amplifier is the phase-shifting circuit of Fig. 1A, which has the valuable property that the magnitude of the output voltage \( e_o \) remains constant even though its phase may be shifted (for a fixed frequency) by varying the resistor \( R \). Similarly, if \( R \) is left constant and the frequency is varied, the phase of the output also shifts (while remaining constant in strength) because changing frequency has the same effect as changing the size of the condenser \( C \).

A vector diagram illustrating this action is shown in Fig. 1B. The voltages \( e_{12} \) and \( e_{13} \) are assigned reference phase. It is assumed that the output circuit (to which the phase shifter is connected) is an extremely high impedance, so that for all practical purposes the only current flowing is that through the condenser \( C \) and the resistor \( R \). This current will lead the amplified voltage, \( e_{12} \). Now we know that the sum of the voltage drops across \( R \) and \( C \) must equal this voltage. We also know that the drop across \( R \) will be in phase with the current, and that the drop across \( C \) will be at right angles to the current. The vector diagram of Fig. 1B consequently must have the configuration shown. It then works out, by a convenient rule of geometry, that no matter what the relative size of \( R \) and \( C \) (that is to say, no matter what the relative lengths of the vectors representing the drops across \( R \) and \( C \)), the junction of these two vectors must trace out a semicircle. Thus if we take as our output the voltage between this junction and the midpoint of the applied voltage (the center tap on the transformer) we have a voltage \( e_o \) which is represented by the radius of a circle, and which

Fig. 1 — A -- Basic phase-shifting circuit. B — Vector diagram of basic phase-shifting circuit.
therefore remains constant in strength as its phase position is varied. Instead of a transformer, in the circuit of Fig. 1A, it is more convenient to use a phase-inverter tube.

Although one phase-shifter stage can be made to give a total shift of nearly 180 degrees, which happens to be the value most convenient to use in the Selectoject, it is best to use two in cascade, because each need only supply a shift of 90 degrees. It is desirable to have some degree of control on either side of the total 180-degree shift.

Now that we have a means for obtaining this shift, it may be used as in Fig. 2 to obtain a single-frequency rejection filter. Once the proper relative gain setting is found, the magnitudes of the output voltages from each amplifier will always be the same. Whether any net output is developed or not will depend on the relative phase of these two voltages, which is controlled by the shift in the phase-shifting amplifier. The action is illustrated in Fig. 3. It is assumed that the tuning control is left fixed. At very low and at very high frequencies, the amplifier currents approach the in-phase condition and thus add to produce a strong resultant output. At the null frequency, the two currents are 180 degrees out of phase, and the net output is zero. This frequency is, of course, that at which the reactance of the condenser C in Fig. 1A equals the resistance R, for at this frequency each of the two cascaded phase-shifting stages produces a 90-degree shift. To change the null frequency, then, it is only necessary to change one or both of the resistances R.

Note that these resistors control only the phase shift and not the magnitude of the voltage delivered by each amplifier channel. All they can do is shift the frequency at which the total phase shift is 180 degrees. Thus if ganged potentiometers are used any tracking error can only affect the linearity of the null-frequency-versus-dial-rotation curve, and will not disturb the depth of the null.

An idea of the sharpness of the null obtainable with the arrangement of Fig. 2 may be gained from Fig. 4. Here curves of over-all response vs. frequency have been plotted for this circuit, the Wien bridge, and a typical twin-"T." (The twin-"T," incidentally, is even more difficult to adapt for variable-frequency operation than the Wien bridge.) The phase-shift circuit has a considerably sharper null than the Wien bridge, and is even somewhat better than a typical twin-"T."

The diagram of Fig. 5 shows how the arrangement of Fig. 2 may be switched around to make a variable-frequency selective amplifier or oscillator. As will be seen at once, this is nothing more than a regenerative connection. The portion of the output that is fed back to the input always has a constant magnitude but its phase varies with frequency, swinging all the way from nearly 180 degrees out of phase with the input, to in phase with it. When it is in phase we have positive feed-back and an increase in gain; when it is out of phase we have negative feed-back and gain reduction. The feed-back will be exactly in phase, and hence most positive, only at one frequency; the amplification accordingly will be greatest at this frequency and we have a selective amplifier. The frequency of operation may be varied once again by changing the R's of the phase-shifting stages. Since the amount of the feed-back is independent of frequency setting, both the percentage bandwidth and the amplification at the center of

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the passband will be the same at any frequency in the operating range. The degree of selectivity may be adjusted from none at all to very sharp, by varying the regeneration control. This is, of course, the same resistor which sets the depth of the null in the filter connection. If the regeneration is set just below the point of oscillation, the selectivity obtainable is very great. The circuit "rings" and sounds just like a crystal filter in the

![Diagram]

**Fig. 5** — Block diagram of selective amplifier and oscillator connection.

The sharpest position. The selectivity obtainable is illustrated in Fig. 6, which shows frequency response for several settings of the regeneration control.

If the regeneration is advanced past the point at which oscillation begins, the circuit makes an excellent variable-frequency oscillator. The fact that the amount of feed-back is independent of frequency setting means that the amplitude of oscillation will tend to be the same over the entire frequency range. For ordinary experimental work, it is not essential to provide special amplitude-limiting devices such as lamp bulbs or a.v.c. arrangements, as must be done in other oscillators in which there may be large changes in feed-back voltage over the operating-frequency range. With the Selectoject the amplitude of oscillation is normally stabilized at any given level by the damping effect of tube-characteristic curvature. If too much regeneration is used, the peak amplitude will build up to the point where grid current is drawn and will not increase further owing to the limiting action. If the feed-back is very large and the clipping severe the output will, of course, be proportionately distorted. For best results the regeneration control should be adjusted to keep the oscillation just barely at the clipping amplitude, or below. Under these conditions the waveform will be very nearly sinusoidal.

**Description of Model**

In Fig. 7 will be found the complete schematic of the model of the Selectoject shown in the photographs. This unit was designed to be used as an accessory to the National NC-57 receiver, and as such performs very successfully. The Selectoject is inserted in the audio lead between the receiver's second detector and first audio amplifier stage. At this point the audio level is fairly low, so that high-µ low-current 12AX7 tubes may be used. The total "A" drain from the receiver is 0.6 amp at 6.3 volts. The "B" drain is 4 ma at 150 volts. This current may be drawn from the VR-150 which voltage-regulates the receiver local oscillator, without any noticeable effect. Since these supply voltages and a connection to the grid of the first audio stage are already available at the receiver's accessory socket, only one small change in the existing wiring is needed. The audio lead from the second detector to the first audio stage is broken and brought out through a shielded lead to an unused pin on the accessory socket. When the Selectoject is not plugged into this socket, a male plug with a suitable jumper should be inserted in order to make a connection between this new audio lead at the accessory socket, and the other one. This is illustrated in Fig. 8.

Component values in the Selectoject are so chosen that the NC-57 audio gain is approximately the same with or without this unit plugged in. The unit has amplification to burn, and still more can be obtained by making R6 and R10 larger.

The frequency range of this model is from about 300–6000 c.p.s. Its performance is illustrated in Fig. 9. Frequency varies inversely with tuning-control resistance (R11 and R12). Theoretically, by making R equal zero, frequency would go to infinity. As a practical matter, an upper limit is set by the falling off in response of the amplifiers.

The lowest frequency at which the unit will operate is that for which the reactance of the condensers C4 and C5 equals the resistance of R11 and R12, which in this case is about 160 cycles. To make it operate at 80 cycles, C4 and C5 could be made 0.004, or alternatively R11 and R12 could be made 1 megohm, and so forth. For reasons of circuit performance as well as economy, C4 and C5

**Fig. 6** — Frequency response of selective amplifier, for different degrees of selectivity.
Fig. 7 — Complete schematic of Selectoject using 12AX7 tubes.

- $C_1 = 0.01 \mu$fd. mica, 400 volts.
- $C_2, C_3 = 0.1 \mu$fd. paper, 200 volts.
- $C_4, C_5 = 0.002 \mu$fd. paper, 400 volts.
- $C_6 = 0.05 \mu$fd. paper, 400 volts.
- $C_7 = 16 \mu$fd. 150-volt electrolytic.
- $R_1 = 1 \text{ megohm, } \frac{1}{2} \text{ watt.}$
- $R_2, R_3 = 2000 \text{ ohms, 1 watt, matched as closely as possible (see text).}$
- $R_4, R_5 = 4000 \text{ ohms, 1 watt, matched as closely as possible (see text).}$

should be kept small, and $R_{11}$ and $R_{12}$ large. However, $C_4$ and $C_5$ should probably not be smaller than $500 \mu$fd., and $R_{11}$ and $R_{12}$ not larger than 5 megohms. Within these limits, the choice is up to the designer.

In this particular model, performance becomes poor above 5000 c.p.s. — i.e., $R_{13}$ will have to be readjusted to find the null, or will have to be turned up higher to support oscillation. This upper limit is satisfactory for ordinary work. However, if operation at higher frequencies is desired, $C_4$ and $C_5$ may be made smaller, and $R_{11}$ and $R_{12}$ larger. The object is to keep the frequency response of all the amplifiers as flat as possible over the range in which one is interested.

The operation of the circuit of Fig. 7 will be affected to some extent by whatever is connected to the input and output terminals. For best results, the input and output impedances should be high — for example, standard interstage coupling circuits. It is not advisable to connect input or output to a low impedance such as a line or voice coil.

The reason $R_4$, $R_5$ and $R_9$ are progressively larger in size is to permit d.c. coupling between stages, thus eliminating a coupling condenser and grid resistor. Since the cathode bias voltage of the preceding stage is applied to the grid of each following stage, the cathode resistors must be successively larger to buck out this positive voltage and assure the correct operating bias.

It is very important that the internal imped-
ance of the power supply feeding the circuit of Fig. 7 be low. This means a large output filter condenser — at least 20 to 40 microfarads. An excellent idea is to use a VR tube as the source of voltage, as may be done with the NC-57 receiver. The VR tube, by providing voltage regulation, stabilizes operation in the selective- amplifier position. In any regenerative circuit the amplification is fairly sensitive to changes in power-supply voltage. This effect will only become troublesome when a large amount of positive feedback is applied — i.e., when the selectivity is set to be extremely sharp. Under these conditions a sizable fluctuation in line voltage may be sufficient to cause the unit to break into oscillation. A VR tube prevents this very effectively. The circuit even without regulation is surprisingly stable in practice.

Resistors $R_2$ and $R_3$, and $R_4$ and $R_5$, should be matched as carefully as possible. Their absolute value is not important. The first two might be 1950 ohms instead of 2000, for example, but it is important that they be the same. An ohmmeter is quite satisfactory for doing the matching. It will be found that production runs of resistors often come out very close together, even though they may be 8 or 10 per cent off the marked value. This is very convenient in finding matched pairs. It is best to use a fairly large resistor (such as 1- or 2-watt) because resistors operated close to their ratings tend to change value with time. Precision resistors are better yet. The reason for matching $R_2$ and $R_3$, of course, is to make the voltages $e_{12}$ and $e_{23}$ in Fig. 1B as nearly equal as possible, so that the radius vector will always have the same length. The reasons for making these resistors relatively small in value is to guarantee that the output impedance of the phase inverter is low. This is to prevent its operation from being affected by the current drawn by the phase-shifting resistor and condenser.

Since frequency varies inversely with resistance, the frequency scale may be spread out better if "standard audio taper" or similar nonlinear potentiometers are used. A typical curve of dial setting vs. frequency obtainable with such a potentiometer is shown in Fig. 9.

Although 12AX7 tubes are convenient in that they consume very little power, their signal-handling capacity is limited. The signal voltage should always be kept moderate in order to avoid distortion and harmonic generation. Type 6SN7s will handle perhaps eight times the signal, but require eight times as much plate current.

**Operating Notes**

Operation of the Selectoject in the "reject" position for phone reception has an interesting advantage as compared with a crystal filter. Once an interfering heterodyne has been notched out, the receiver may be tuned normally without any resetting of the null frequency. This is a great convenience, because it is often desirable, when several interfering signals are present, to detune to one side of the desired station in order to avoid QRM. With a crystal filter, such tuning must be accompanied by a compensating adjustment of the rejection control. Simultaneous knob-turning of this sort is always difficult in practice. An amusing demonstration, with the Selectoject, is to find a station with only one heterodyne present. Once this heterodyne is eliminated, one may tune completely through the station without knowing the interfering signal was there at all.
On the other hand, audio rejection filters of this sort have one fundamental disadvantage which must always be kept in mind. If the two carriers heterodyning each other are nearly equal in strength, the audible beat note is no longer a pure wave, but one containing harmonics. The best a rejection device such as the Selectoject can do is to eliminate the fundamental — the harmonics will still come through. Unfortunately for this situation, the ear has the remarkable property that when supplied with a set of harmonics, it tends to re-create the missing fundamental. This characteristic is the reason why midget radios sound so surprisingly well — they cannot reproduce the fundamental tones of organ or bass fiddle, but they do pass the harmonics, and the ear does the rest. So do not expect the Selectoject to perform miracles when the heterodyning is very strong. Listen closely, and you will hear the fundamental drop out, but the harmonics may still be fairly annoying.

On the other side of the ledger are the following:

1) If the two heterodyning carriers are nearly equal in strength, chances are you won't be able to copy either signal.

2) As soon as the ratio of carrier strengths becomes greater than, say, two or three, the harmonics drop off very rapidly even though the fundamental tone is still strong enough to be deafening.

3) If the pitch of the heterodyne is fairly high (say two or three thousand cycles) the harmonics will tend to fall outside the audible range and the rejection slot is once more fully effective. This is an argument in favor of using a sharp-cut-off low-pass filter in the audio end of one's communication receiver.

4) In c.w. reception or s.s.s.c. phone reception (which is really the same thing) harmonics of heterodynes do not exist (providing the b.f.o. voltage is strong compared with all signals) and the rejection slot is again completely effective.

The most important characteristic of a rejection filter, next to the depth of the slot, is the width of its base. This determines how much of the audio band is wiped out when the slot is switched in. Crystal filters are not as good in this respect as might be thought on the basis of published curves like the one on page 108 of the 1949 Radio Amateur's Handbook. The picture here is complicated by the sharp selectivity of the receiver, and by the additional sharpness introduced by switching in the crystal filter itself. However, if one first considers what the transmission would look like without the slot, and then notes what is subtracted as a result of the presence of the slot, it is seen that the base is in reality noticeably wider than that of the Selectoject as shown in Fig. 4.

There is the following difference between crystal and Selectoject slots, however. Because the crystal slot is the result of parallel resonance at intermediate frequency, its width measured in cycles will be roughly the same at any position in the frequency spectrum adjacent to the center of the passband. With the Selectoject, the width of the slot in cycles depends on the null frequency. As shown in Fig. 4, the width between 0.6 relative transmission points is 150 cycles when the center frequency is 100 cycles. It is then 1500 cycles when the center is 1000, and 15,000 cycles when the center frequency is 10,000 cycles. Since the Selectoject is better than the crystal when a comparison is made on the basis of an audio frequency of 1000 cycles (as shown in the Handbook illustration), it is very much better at a frequency of 100 cycles, although worse at 10,000 cycles. Because frequencies above 3000 c.p.s. contribute little intelligibility anyway, it would appear that the Selectoject has the edge in practice. This is certainly the impression one gains in actual listening.

In c.w. reception, the Selectoject has other interesting characteristics. Its method of operation, as may be seen from Fig. 6, is to amplify the desired signal, rather than to depress the rest. In this respect the Selectoject differs from a crystal filter. There seems to be no particular choice between the two methods from the operating viewpoint, however; each has its advantages.

When the Selectoject is set in the sharp-selec-
Break-In with One Antenna

A Solution to an Old Problem

BY M. E. HIEHLE, W2SO

One problem that has bothered c.w. men for many years has been a method for operating break-in with the same antenna for transmitting and receiving. Many have concluded that there is no practical way, but not W2SO. To add insult to injury, he even uses it on several bands with kilowatt transmitters!

For a long time it has been the ambition of many amateurs to use their transmitting antenna for receiving. It is a logical operation, since the gain and directivity of the antenna are duplicated on receiving and transmitting. The usual procedure is to use an antenna change-over relay, but this precludes break-in operation of any practical kind. A good antenna relay that will handle the power just won't key at even 15 w.p.m., and even at that speed it would probably require a soundproof room to keep peace with the family and the near-by neighbors.

But there is a solution. During the war, every radar set was faced with the same problem — one antenna for both send and receive. In radar, the "T-R box," or "duplexer," was the answer. Essentially, it gave the effect of the circuit in Fig. 1. When the transmitter was "on," the quarter-wavelength line was short-circuited, and the receiver was protected. The quarter-wave line had no appreciable effect on the feed line from transmitter to antenna because a short-circuited quarter-wave line shows high impedance at the open end, and hanging a high impedance across the line at point X has no effect on the line. When the transmitter was "off" the short circuit was removed, and if point X was the correct distance from the transmitter (the "off" transmitter looked like a high impedance), all of the energy coming down the line from the antenna would go into the receiver. In radar work, the short circuit was obtained by either an open spark gap or one in a "T-R tube."

The T-R-tube system won't work on the amateur bands because the keyed spark would bring the FCC on the double (spark has been outlawed for some time now) and, anyway, you would probably have quite a time with a feed mechanism to replace the gap points. However, since amateur rigs aren't keyed as fast as radar rigs, it is possible to use a relay to short circuit the line. "Yeah, but the contacts will burn up or arc over or something," you say. Well, let's see.

If your transmission line is matched to the antenna, the voltage on the line is

$$E = \sqrt{PZ_0}$$

where $P$ is the power output of the transmitter and $Z_0$ is the line impedance. For any standing-wave ratio on the line,

$$E_{\text{max.}} = \sqrt{PZ_{\text{swr}}e}$$

where $e$ is the voltage s.w.r. To take an extreme case, consider 1 kw. into a 600-ohm line with a 20-to-1 s.w.r. $E_{\text{max.}}$ works out to be 3500 volts. Hence the voltage across the line at point X might run this high. The current through the short will be

$$I = \frac{E_{\text{max.}}}{Z_1}$$

where $Z_1$ is the impedance of the stub line. Assuming a 300-ohm line for the stub, the current through the short would be

$$I = \frac{3500}{300} = 11.7$$

amperes.

One of the peculiar characteristics of shorted quarter-wave stubs is the fact that the short current is independent of the short resistance.

![Fig. 1](image-url)

This arrangement will permit use of the same antenna for transmitting and receiving if the quarter-wavelength stub is shorted during "transmit" periods. It will be recognized as the "T-R" circuit used in radar systems.

This means that any relay used for shorting the stub must have low contact resistance. But the foregoing calculations were made for the worst conditions, and most practical cases will not require a relay with such high-current requirements. Even then, the 12-ampere figure is not a
A Practical System

Several features can be added to make the system foolproof. First of all, it is necessary to insure that the relay does not open with the transmitter power on. This means that the following sequence of events be obtained: (1) relay closes, (2) transmitter goes on, (3) transmitter goes off, (4) relay opens.

A method for doing this electronically was described in QST, and in Fig. 2 it is shown combined with the antenna break-in system. The high-current requirement for the relay is decreased by transforming the impedance at the short-circuit point to a higher value. For a 3-to-1 turns ratio, the current is about 4 amperes instead of 12. The separate coil and Faraday shield represent good engineering practice and reduce capacity coupling. Using the shield also permits balanced-to-balanced or balanced-to-unbalanced line without undue capacity coupling. The length of stub shown as $\lambda/4$ requires an electrical length of a quarter wavelength. For 300-ohm Twin-Lead this is equal to $173/f$ and for coaxial line is $146/f$, for the length in feet and the frequency in Mc. These formulas include a 10 per cent shortening factor for the coil reactance. The heavy lines indicate where short heavy leads should be used. The relay $R_y$ should be a fast one, as prescribed in the reference.

For the plutocrats who have separate transmitters and an antenna for each band, Fig. 3 shows one way the break-in system can be applied to multiband operation.

A Double-Relay Version

Still another method than that described above has also been used at W2SO. While not as elegant as the electronic method, it is somewhat more simple. The circuit is shown in Fig. 4. The contacts A on Ry2 are bent to close before the B contacts, so that the receiver will be protected before the transmitter goes on. Ry1 was added after it was found that the oscillator stayed on for a fraction of a second after the key was open because of the shunt capacities in the oscillator circuit. This caused the A contacts of Ry2 to arc as they opened, burning the contacts and causing a heavy click in the receiver. Ry1 has a large condenser across the coil, and the charge in the condenser holds the relay closed for a fraction of a second longer than Ry2. The small NE-48 neon bulb circuit is an adaptation of the "Monitone," to help the sender listen to his keying. The amount of sidetone introduced into the receiver can be varied by the setting of the volume control across the NE-48. The other potentiometer in the circuit controls the receiver gain with the key down, as in Fig. 2. The oscillator is keyed in the positive supply lead, hence the blocking condenser to the receiver antenna terminal. Although the transmitting antenna line is balanced and the receiver input is not, no ill effects have been noticed on transmitting. The relays are surplus ones and have very small contacts and armatures, and with 50 volts d.c. from the selenium-rectifier supply, very snappy keying is obtained. This system has been used at W2SO for six months on all bands and has performed very well. With 1-kw. input, no wear of the contacts has been observed. It works well over an entire band without readjustment, although the current through the relay contacts may vary slightly.

The distance between the transmitter and the tap-on point of the stub (length $D$ in Fig. 2) will depend to some extent on the transmitter coupling, and it is found by cut-and-try. Clip leads are used on the quarter-wave stub, and the line is connected to the transmitter feed line at the point that gives best received signal strength. There is no other restriction, and the location is usually not critical. No detuning effects are noticeable at the transmitter — any serious effects would indicate incorrect length of the quarter-wavelength stub. The stub length can be any odd number of quarter wavelengths if desired, but the quarter wavelength is usually the most convenient. The cheapest type of 300-ohm Twin-Lead may be used for the stub with no arc-over troubles, even with a kilowatt. Where the stub joins the antenna line, the two wires of the stub should be split apart for a length of several inches, leaving some insulation on each wire.

(Continued on page 100)
Harmonic Reduction in a 500-Watt All-Band Rig
A Practical Example of Present-Day Requirements in Transmitters

BY DONALD H. MIX, * W1TS

...While we don't guarantee that the measures toward harmonic suppression discussed here will insure TVI-free operation under all circumstances, actual on-the-air tests have shown that the 500-watt transmitter pictured in the photographs can be operated freely without interference in a neighborhood where TVI previously was widespread. The treatment is simple and there are no critical adjustments to be made when shifting frequency.

For well over a year now, QST has been devoting space in almost every issue to the subject of interference with television reception. This has not been without good reason. The TVI epidemic has been bidding well to become ham radio's No. 1 problem, threatening its very existence in many rapidly-expanding areas. The job of finding a solution that would be both practical and effective has not been an easy one. In fact, not a few of our less rugged members threw in the towel at the sight of the first TV antenna. Viewing the prospects as hopeless, they didn't even try. Fortunately, there have been others who can remember that this is by no means the first test of our ability to overcome difficulties thrust upon us suddenly by an ever-changing radio world. They have rolled up their sleeves determined not to let Kukla, Fran and Ollie push them off the air.

As might be expected, first attempts were rather clumsy. Many of us had to feel our way around in territory unfamiliar to a "low-frequency" man. Like the v.h.f. crowd, we've had to learn to view with suspicion a piece of wire more than a couple of inches long, and to see an inductance, instead of a capacitance, when we look at some of the things called condensers. Our ideas of the best way to do the job have had to be changed from time to time. But through it all, a really impressive amount of progress has been made, considering the magnitude of the problem. While there probably never will be a magic little two-terminal black box that will solve all of our headaches, enough has been learned now so that hundreds of hams with prices on their heads a few months ago can now go back on the air and operate with impunity.

A natural question at this juncture is, "Well, if this is so, just what have I got to do to the rig to be able to operate without having bricks thrown..."

...
through my window?" The answer is still that it may be a little or a lot, depending on such things as what the present rig looks like, how close you are to the nearest TV receiver, and how strong the TV signal is in your neighborhood. Hams living in metropolitan areas where there are local TV stations should have a comparatively easy time of it. A rewiring of the power-supply circuits and a shielding enclosure for the transmitter may be all that is required. The job becomes more difficult (and more experimental too) in the fringe areas where the TV oglers expect interference-free reception whether or not they are entitled to it.

The measures that may be taken are divided into two categories according to whether or not they require readjustment with a change in transmitter frequency. The transmitter shown in the photographs was constructed and tested on the air by Julius Galin, W1LOP. It was built primarily to see how effective suppression could be made without resorting to such things as harmonic traps and antenna filters which must be tuned critically each time the transmitter frequency is shifted. This transmitter has now been operating for some time on all bands, with no complaints attributable to harmonics, in a spot surrounded on all sides by TV receivers — some within 150 feet of the antenna — in a fringe area where the best TV signal is from a relatively low-power station 40 miles away.

The Circuit

Before discussing in detail the measures that have been taken to suppress harmonics, let us become acquainted in general with the exciter circuit shown in Fig. 1. It may look somewhat complicated at first glance, but don’t let that scare you off. It is really quite conventional. The complex appearance results chiefly from the addition of numerous small mica condensers and r.f. chokes the size of a lead pencil, most of which are needed for parasitic suppression, not harmonic reduction.

The design is based primarily on the use of an external VFO, but a 6AG7 modified Pierce crystal oscillator is included for occasional spot-frequency work. When the latter is not in use, $S_1$ removes the plate and screen voltages. Either the crystal oscillator or VFO may be used to feed a 6L6 stage that is operated as a doubler, as a tripler or when necessary, as a straight amplifier. This stage feeds a push-push 807 driver stage that may be operated either as a doubler or as a self-neutralized straight-through amplifier by opening $S_2$ which controls the heater of one of the 807s. This inactive tube then becomes the neutralizing condenser for the other.

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Rear view of the transmitter enclosure with the back screen panel removed. A shielding partition separates the final amplifier and the antenna tuner. Standard 2 X 4 X 4-inch steel boxes cover the final-amplifier meters. The harmonic-filter enclosure at the bottom is fastened permanently to the frame so that the power plugs on the back of the exciter chassis make connection when it is pushed into place from the front.

Coil Line-up Table
When the output frequency is the same as the crystal frequency, the input circuit of the 6L6 is not tuned. This is to prevent instability in the 6L6 stage. In this case no coil is used at \( L_1 \). When the coil socket and form are wired as shown in A and B of Fig. 1, the connection to the tuning condenser is broken automatically when the coil is removed. When the VFO frequency is the same as the desired frequency of operation, the VFO is fed directly to the input of the push-push stage through the link contacts at X-Z instead of Y-Z. The pins of the plug-in-coil base can be wired to make this connection automatic when the coil is plugged in. The accompanying tables give the coil dimensions and show the coil line-up for any desired output frequency, depending upon VFO or crystal frequency.

**Essential Factors in Achieving Harmonic Reduction**

With the general idea of the circuit in mind, we can now examine the details in relation to harmonic reduction. Two essential points are not evident from the circuit diagram. The first is that components have been laid out so as to keep r.f. lead length at a minimum. This is important not only for the purpose of keeping the resonances of the grid-to-cathode and plate-to-cathode paths at frequencies above the TV bands, but also because it helps to discourage v.h.f. parasitic oscillation. Link coupling is used throughout. This system discriminates against the passing of harmonics along from stage to stage and also facilitates short return leads. In capacitive-coupled circuits,
where a single tank circuit is common to the plate circuit of the driver and the grid circuit of the driven stage, it is usually physically impossible to keep both returns short.

The second point not visible in the diagram is that all power-supply wiring is shielded. The use of braid-covered wire has proved to be indispensable in reducing harmonic energy in power leads. Such wire not only is shielded against pick-up of r.f. but it also acts to attenuate harmonics through its continuous capacitance to ground. The sheathing should be grounded to the chassis at every convenient point, especially close to each end of the wire. Where wires cross or run parallel, the braids should be spot soldered together. The insulation should be appropriate for the voltage. Ignition cable covered with shielding braid is recommended for voltages of 1000 or more. The insulation also should be a material that will not disintegrate under soldering.

The use of a doubler stage to drive the final amplifier may seem to conflict with previous warnings that this is bad business from the consideration of harmonic suppression. The conditions under which a conventional single-tube doubler must be operated for reasonable efficiency are favorable for the production of higher-order harmonics, it is true. However, a doubler of the push-push type need not be operated at the high bias and excitation levels associated with a conventional doubler, since the frequency of the plate-current pulses is doubled. As used in this application, there is no evidence that this arrangement is not fully as satisfactory as a straight amplifier.

**Power-Lead Filtering**

Simple v.h.f. filters are essential for all power-supply leads leaving the exciter chassis. If they are not used, harmonic currents can flow back through the power supply into the power lines where they can be readily conducted or radiated to neighboring TV receivers. The filter compo-

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Fig. 2 — Wiring diagram of the harmonic-filter unit for the 500-watt all-band transmitter.  
C6 = 0.005 µfd., 600 volts (Sprague by-pass).  
C27, C29 = 0.01 µfd., 600 volts (Sprague by-pass).  
C30, C31 = 0.1 µfd., 250 volts (Sprague by-pass).  
RFC10-15 = 7-µh. v.h.f. choke (Ohmite Z-50).
Bottom view of the 7 × 17 × 3-inch exciter chassis. The tank condensers are placed so that all panel controls are equally spaced. The crystal-VFO switch is to the left, between the input and output tank condensers for the 6L6. The 807 sockets and the base of the tubular plate by-pass condenser are mounted on a strip of aluminum spanning the chassis, with the 807 grid tank condenser to the left. The meter switch and filament transformer are to the right.

Components must be shielded from r.f. pick-up from the tank circuits. To this end, the filters have in this instance been placed in a separate shielding chassis. The wiring of this chassis, which includes the filters for the final stage, too, is shown in Fig. 2. These filters are far from complex, consisting only of a v.h.f. choke in combination with a bypass condenser at the power-supply end. Various configurations have been tried, but the simple one shown seems to work best. A second condenser at the other end of the choke may, in fact, be less effective than the single condenser. Component values also do not seem to be critical. The 7-µh. choke has been as good as any tried and it is a standard item on the market. Neglecting condenser inductance, it may be said in general that the larger the filter capacitance the better. However, the inductance of the conventional type of mica condenser increases with capacitance rating so that a 470- or 220-µfd. postage-stamp unit actually may be more effective than a condenser of larger capacitance. In this connection, tests have shown that the Sprague Hypeas feed-through type condensers do a better job than the ordinary mica condensers, particularly in the filament-transformer circuit.

It is a good idea to mount the filament transformer on the chassis so that the secondary leads can be short. Then the messy job of filtering the heavy-current leads is not necessary; only filters in the a.c. line to the primary will be required. Leads to meters should be shielded and filtered, too, since the unshielded face of the meter protruding through the panel can be a troublesome source of radiation if harmonic currents are allowed to flow through the meter. RFC3, RFC5 and C25 in Fig. 1 are inserted for this reason. In more severe cases of TVI it would be well to shield the meters completely by recessing them and covering the openings with copper screening. It also helps appreciably to shield the rear of the meters from stray r.f. pick-up from near-by tank circuits.

It will be noted in Fig. 1 that double by-pass condensers are used at several points in the 6L6 and 807 stages and that the output of the 6L6 and the input of the push-push doubler are shunted with small ceramic condensers. These, together with RFC9, RFC7, R9 and R10, are measures taken to suppress v.h.f. parasitic oscillation. The condensers are connected with short leads directly across the socket terminals or grounded close to the grounding point of the cathode by-pass condenser. The use of the suppressor resistors at the screens usually is open to question because it contributes toward instability at the fundamental if the stage is operated as a straight amplifier. However, that is not so much of a factor in this instance because the stage is neutralized for straight-through operation.

The harmonic-filter unit. The 3 × 4 × 17-inch chassis is divided off into shielded compartments. Power-input connections are made at the rear (top in this picture). The banana jacks in the front edge match the plugs at the rear of the exciter chassis.
Fig. 3 — Circuit diagram of the final amplifier and antenna tuner of the 500-watt all-band transmitter.

C23, C24 — 0.1 µfd., 250 volts (Sprague Hypass).
C25 — 0.0022-µfd. mica.
C26 — 100-µµfd.-per-section var. (Johnson 100HD-15).
C27, C28 — 100-µµfd.-per-section variable (Johnson 100ED30).
C34, C35, C36, C37, C38, C39, C40, C41, C48, C49 — 47-µµfd. mica.
C55, C56, C57, C58, C59, C60, C61 — 0.1-µµfd. mica.
C62 — Neutralizing condenser — 14-µµfd. (Millen 15005).
C63, C64 — 12-µµfd. 8000-volt tubular air condenser (see text).
C65, C66 — 470-µµfd. 2500-volt wkg. mica.

The Final Amplifier

The same general precautions are observed in the layout and wiring of the final amplifier whose circuit is shown in Fig. 3. This section consists of a push-pull amplifier for 812As, or tubes of similar construction, and an antenna tuner. So far as harmonic reduction is concerned, the only points to which attention need be drawn are the continued use of link coupling and shielded power wiring, the shielded link-coupled antenna tuner and the v.h.f. filters in the high-voltage and meter-switching leads. The meters themselves are shielded in a separate panel unit between the exciter and amplifier.

As a result of keeping leads short, only C44 and C45 need be added to suppress v.h.f. parasitic oscillation in this stage. Separate filament transformers and a split grid tank coil make it possible to meter the two tubes individually so that the balance of the push-pull amplifier can be checked. R12 and R13 are biasing resistors augmenting the 90 volts of fixed bias provided for tube-protecting purposes. They are used, instead of the conventional grid r.f. chokes, to prevent low-frequency parasitic oscillation.

Fig. 4 — Sketches showing method of constructing the tubular air condensers. A for the 807 plate by-pass condenser and B for the plate-to-ground condensers in the final amplifier. The outer tubing and the inner rod may be of aluminum or copper.
Rear view of the amplifier section. The original mountings of the neutralizing condensers are replaced with large feed-through insulators. Clearance holes in the chassis permit these condensers to be mounted with their top terminals close to the tube plate caps. The jack bar for the plate tank coils is fastened to the tank-condenser frame. The grid tank-coil socket is placed centrally to the right of the tubes. To the right, the antenna tank coil is mounted on brackets, at right angles to the amplifier tank coil. The adjustable link shaft is driven from the panel by means of a right-angle gear drive. The amplifier coils have preset links.

The important constructional details are given along with the photographs. The two units and the amplifier-meter panel are mounted in a shielding enclosure made of copper screening stretched over a framework of 1 X 2 wood strips. The top cover of the enclosure is hinged for access to the final-amplifier and antenna-tuner plug-in coils, while the exciter unit slides out in drawer fashion for band changing. The harmonic-filter unit is fastened permanently at the rear of the bottom section. The exciter power leads terminate in banana plugs at the rear of the exciter chassis and these plug into corresponding jacks in the filter unit when the exciter is pushed into place. All stationary surfaces of the copper screening and the metal panels should be well bonded together and the top should make good overlapping contact all around the edge when it is closed.

Adjustment

The accompanying tables give the coil dimensions and show the coil line-up for any desired output frequency, depending upon VFO or crys-

Bottom view of the 10 X 17 X 3-inch amplifier chassis. The tube sockets, the tubular condensers (C44 and C45) and the feed-through insulators on which the neutralizing condensers are mounted are set in an aluminum strip below the chassis. The grid tank condenser is at the center, spanning the protruding grid-tank-coil socket. The two filament transformers are to the right with the meter-circuit harmonic filters placed close to the terminals at the rear.
Coil Table

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W4ZZ just couldn’t get away from ham radio on a recent jaunt—his itinerary took him through Eighty-Eight, Ky., and Static, Tenn.!

If you’re having difficulty obtaining 160-meter crystals yet have a supply of the 80-meter variety on hand, it will pay you to refer to the “frequency-halving” circuits described by Ed Preston (W2RIZ, ex-WSCSE) on page 37 of January, 1942, QST and by William D. MacGeorge (W3GHR) on page 12 of September, 1941, QST.

Strays

A couple of handy gadgets for the ham’s tool box have just been released by Hytron as aids for the service man. The “Soldering Aid,” a double-ended pick with one end slotted for unwinding wrap-arounds, is especially useful for saving leads on resistors and condensers salvaged from surplus equipment. The “Tube Lifter” is a little tool for getting under the bases of tubes, especially loktals, to help pry them out of their sockets. These are worthy additions to a line of gimmicks that includes the popular pin straightener for miniatures.

QST for
The Regenerative Wavemeter

A Dual-Purpose Tool for TVI Reduction

BY GEORGE GRAMMER,* W1DF

If you're beset with TVI troubles or can see them coming in the future (as who can't?) you need one of these gadgets. It's many times more sensitive than a crystal-detector wavemeter, and besides showing you what harmonics you've got it doubles as a grid-dip meter to help uncover the cause.

The crystal-detector wavemeter has proved to be a valuable tool in TVI reduction, but it has its limitations. Even when provided with a low-range microammeter it is not sufficiently sensitive, at least in those regions where TV signals are weak. Harmonics that are not strong enough to give a meter reading may still break up picture reception.

On the other hand, a v.h.f. or television receiver has all the sensitivity that can be used, but unless it can be provided with a good antenna system, and be placed some distance away, which is inconvenient for testing, it will respond to all sorts of standing-wave effects that are not only confusing but misleading. Besides, a receiver is expensive. Something is needed to fill the gap between the wavemeter and the receiver.

The device described here fills at least part of that gap. It is basically an absorption wavemeter, using the grid and cathode of a tube as a diode to rectify the incoming signal. In this it is no different than the crystal wavemeter. However, it is also a regenerative detector, with the regeneration used to boost the amount of rectified grid current, not for listening purposes. For maximum sensitivity it is operated just below the oscillating point, just as a regenerative detector would be used in listening to modulated signals. The amount of regeneration is controlled by varying the plate voltage and thus the sensitivity may be varied to suit conditions. If the plate voltage is reduced to zero the tube acts like a simple diode and the sensitivity is comparable with that of a crystal detector.

Regenerative amplification, as is well known, is greater on weak than on strong signals. In contrast, a plain diode without a high-resistance load tends to follow a square-law characteristic. This gives a false impression of the success of harmonic-reduction measures because if the harmonic strength is reduced to, say, one-half, the meter reading will decrease to one-fourth. With regeneration the error will be in the other direction, which is more desirable.

It is obvious that in the oscillating state the unit can be used as a grid-dip meter, thus extending its range of usefulness. As a matter of fact, an existing grid-dip meter no doubt can be modified to operate as a high-sensitivity harmonic checker. As ordinarily built, the grid-dip meter has rather poor sensitivity compared with a good crystal wavemeter, even when the "beat" method of detection is used. This is because the conventional grid-dip meter uses a grid leak having a resistance very much higher than that of the d.c. meter, which reduces the sensitivity in the same way that a multiplier resistor reduces the sensitivity of a voltmeter. Also, there is no regeneration control and therefore no means for adjusting for maximum sensitivity.

In the regenerative wavemeter there is no grid leak, as shown by the circuit diagram in Fig. 1. A choke is used instead so that the d.c. resistance in the grid-cathode circuit will be as low as possible. The successful operation of the circuit depends to a very considerable extent on the grid choke, since it must maintain high impedance over the desired frequency range. The Ohmite Z-144 choke used in the model illustrated has been found to work very well over the range 50-260 Mc., which is ample for harmonic checking. There are no

* Technical Director, ARRL.

1 For example, see "TVI Tips." QST, October, 1949.

The regenerative wavemeter, a high-sensitivity replacement for the crystal wavemeter, also doubles as a v.h.f. grid-dip meter. With three self-supporting plug-in coils this model covers the range from 48 to 265 Mc. This view shows the bottom of the 955 socket, with the miniature tubular ceramics mounted between the stator sections of the tuning condenser and the grid and plate terminals on the socket. The grid choke, shunting resistor, and by-pass condenser are at the bottom; the plate resistor, mounted through the socket, and the plate by-pass condenser are at the top. There is no wiring on the other side.

November 1949
dead spots or even traces of them over this range when the rest of the unit is properly built.

Smooth control of regeneration at the oscillating point is essential if the maximum sensitivity is to be obtained. A circuit that “plops” into oscillation will not give reliable indications. In testing several of these units with a large number of tubes it was found that the control is satisfactorily smooth if a minimum of about 60,000 ohms is used for the plate resistor and a maximum of 22,000 ohms is shunted across the grid choke. The only disadvantage of the high plate resistor is that there is a considerable voltage drop through it, so that it is necessary to have a plate supply of about 150 volts if a grid current of around 0.5 ma. is to be obtained (for grid-dip meter purposes) when the tube is oscillating at the high end of the range. The maximum plate current taken by the tube at full voltage is under 2 ma.

With the resistance of the d.c. return path from grid to cathode so low, “contact potential” causes a current of about 0.5 ma. to flow in the grid circuit whenever the cathode is up to temperature, whether or not there is plate voltage. It takes a volt or a bit more to bias it out, hence the 1.5-volt cell shown in Fig. 2.

The mechanical arrangement, an outgrowth of the “handle” idea used in the v.h.f. grid-dip meter that has been in the Handbook for the past few years, was devised by W1LOP, who built the unit shown. The whole works is supported by a “U”-shaped piece of aluminum with the bottom of the “U” screwed to a length of broomstick that serves as a handle. The sides of the “U” are 3½ inches long, with an inside width of approximately 2 inches — just enough to mount the tuning condenser. The tube socket is supported by small homemade aluminum brackets. A crystal socket (half-inch spacing) with its lugs soldered directly to the condenser stators is used as a coil socket. No. 12 wire makes a nice fit in such a socket, so the coils are self-supporting. A little additional strength for the socket mounting is secured by cementing it to the condenser end plates with Duco cement.

This mechanical layout lends itself nicely to wiring with substantially no lead length. It also makes a small and very lightweight unit that can be poked into all sorts of odd places. The connection cable comes out through a hole drilled the length of the handle so it does not get in the way.

The tuning condenser is a Millen 21100, a single-section double-bearing midget that is easily revamped into a balanced unit. This is done by sawing through the midpoints of the bars that hold the stator plates and then removing enough plates from both rotor and stator so that each section consists of 5 stator and 5 rotor plates. The job is not difficult, although it should be done carefully. The unwanted plates will break out of the soldered connection when persuaded a bit with a pair of long-nose pliers. When so altered, each section has a maximum capacitance of about 36 µfd. and a minimum of 6. This gives just enough range, with a 955 tube, to cover the low group of TV channels. In mounting the condenser it is essential, to avoid dead spots, that the rotor be grounded at each end. This can be done conveniently by soldering a short length of wire to the end plates of the tuning condenser.

This view shows the wavemeter complete with the three coils and power supply, the latter built into the meter case. Regeneration is controlled by the knob on top of the power-supply case.

\[
\text{QST for} \]

\[
\text{Fig. 1} \quad \text{Regenerative wavemeter circuit.} \\
C_1 \quad \text{Double-section midget, app. 36 µfd. per section (Millen 21100 modified as described in text).} \\
C_2, C_3 \quad 50-µfd. ceramic (Centralab Hi-Kap). \\
C_4, C_6, C_9 \quad 0.001-µfd. ceramic (Sprague disc ceramic). \\
R_1 \quad 22,000 ohms, ½ watt, carbon. \\
R_2 \quad 68,000 ohms, ½ watt, carbon. \\
L_1 \quad \text{48–98 Mc.} \quad \text{7½ turns No. 12, ¼-inch diam., 1 inch long, with 3½-inch leads.} \\
L_2 \quad \text{76–156 Mc.} \quad \text{2½ turns No. 12, ½-inch diam., ¾ inch long, 2½-inch leads.} \\
L_3 \quad \text{130–265 Mc.} \quad \text{"U"-shaped loop, No. 12, 1½ inches long, ½ inch between sides.} \\
RFC \quad \text{Ohmite Z-144.} \\
\]

\[
\text{This view shows the wavemeter complete with the three coils and power supply, the latter built into the meter case. Regeneration is controlled by the knob on top of the power-supply case.} \\
\]
between the contact washer and a mounting stud at each end. The ground is made to the "U" support through the stud.

Double-section condensers are available in similar construction and may of course be used instead of the altered single-section unit. However, double condensers are not obtainable in quite the same capacitance, so some plates may have to be removed if maximum bandspread is wanted.

There are several methods by which the unit can be given a frequency calibration. If a receiver is available covering at least part of the range the gadget can be used as an oscillator and calibrated against the receiver settings at which it is tuned in. Lecher wires can be used alternatively; they are amply accurate and the method of using them is described in the Handbook. They are not useful at frequencies below which they are about one wavelength long, and while this presents no problems down to 100 Mc. or so it is sometimes difficult to string up solidly-supported wires more than about 10 feet long. For the 50-100 Mc. range it may be preferable to rig up a temporary oscillator covering the range from 16 to 33 Mc., which falls inside the range of most communication receivers, and use its third harmonic for calibration purposes. The harmonic may be detected by operating the unit as a regenerative wavemeter.

The regenerative wavemeter costs very little more than a straight crystal-detector wavemeter if its power can be picked up from an existing supply. Acorn tubes and sockets are still plentiful in surplus for pennies, while the extra parts total little more than the cost of the 1N34 that the 955 replaces. If one wants a portable unit complete with power supply, the circuit of Fig. 2 will serve. It need only furnish about 5 ma. at 150 volts, along with heater power for the 955. The one shown in the photograph was built complete in a meter case. A similar arrangement can be used for mounting the meter and regeneration control even if no special power supply is built. A transformerless supply is not recommended because of the shock hazard.

Without some form of harmonic checker you're fighting the TVI battle with your hands tied. This one is not only just about as inexpensive as a crystal wavemeter but is far more versatile. With high sensitivity and grid-dip meter operation it is a double-edged tool that is indispensable.

ZS6Z Beam Dimensions

The "Super-Interlaced Beam for 10 and 20 Meters," described by ZS6Z in August QST, didn't include the element lengths and spacings of the final design. Since this condition left many of our readers almost as much up in the air as the ZS6Z beam is, we hasten to correct the situation with the sketch of Fig. 1. The beam is tuned for 28,250 and 14,300 kc. For further particulars on the beam, see the original article.
The "City Slicker" Array for 144 Mc.

Improved Performance with Less Directivity

BY F. S. HARRIS,* W8UKS

As more stations go to horizontal polarization for 2-meter work most of them use small parasitic arrays patterned after those used on lower amateur frequencies. The fortunate few who are in a position to put up large stacked arrays thus have what amounts to a monopoly on the 2-meter DX, because of the vastly superior performance of the larger systems. This has tended to reduce the activity in urban areas, where many hams do not have the space or facilities for large remotely-controlled directional arrays.

If we are to do really worth-while work on 144 Mc. we must have a considerable power gain in the antenna system, but in almost all horizontal arrays presently in use this means a high degree of directivity, and usually a bulk and wind resistance sufficient to scare off the average city dweller. The array described herewith was designed with these problems in mind; hence its name. However, its principles may be adapted to larger and more highly directive systems as well.

In its basic form, the "City Slicker" consists of four stacked folded dipoles, spaced $\frac{3}{4}$ wavelength apart vertically, as shown at A in Fig. 1. Details of the individual dipoles and the phasing sections are given in B and C of the same drawing. The center support is a metal tube; the unbroken sections of the folded dipoles go through it. The phasing sections are made of two pieces of coaxial line, the outer conductors of which are connected together and grounded to the mast. The main feed line may be connected at any of the dipoles, but best results are obtained when the second up from the bottom is used. The feed impedance is 72 ohms. Any other line impedance may, of course, be used with a proper matching device. When 72-ohm coaxial line is used a bazooka should be inserted at the feed point for best results.

This phasing method has several mechanical and electrical advantages. The entire system is grounded for lightning protection. It does away with open-wire phasing sections, which are often

![Diagram of the "City Slicker" array](image)

* R.D. 1, Pope Rd., Burton, Ohio.
Two or more sets of dipoles may be placed side to side and fed in phase, for increased gain and directivity. A bazooka, or line balancer, is connected at the feed dipole in each set, and these are connected to the inner conductor of a coaxial matching transformer. The system may then be fed with 72-ohm coaxial line, as shown. The coaxial transformer may be built to dimensions obtained from Fig. 10-15 of the 1949 ARRL Handbook.

Both unstable and unsightly, and the phasing lines may be taped tightly to the mast. It is completely weatherproof. The propagation factor of the line (0.65) is put to use in the spacing of the dipoles: The phasing sections are electrically one wavelength long, but the spacing between the dipoles is only 5/8 wavelength, the optimum for stacked elements. Because the dipoles are phased electrically one wavelength apart, no transposition of the phasing lines is required.

If the vertical support is of strong lightweight tubing, such as 24ST dural, it may be supported at the bottom end only. This makes for an array of exceptionally trim design, with a wind resistance at the absolute minimum.

The gain of a single City Slicker is approximately 8.5 db., making it at least equal to a 4- or 5-element parasitic array. This gain is available in two wide lobes broadside to the array, and over a wider frequency range than with parasitic systems. In many locations a City Slicker can be so oriented that it will handle practically all the available signals without rotation. If rotation is found to be necessary, 90 degrees is all that is required.

**Multiple Versions**

The dipole arrangement and feed system of the City Slicker provide an excellent basis for more complex arrays of higher gain and directivity, where these characteristics are desired. Reflectors may be added to the system in the conventional manner, and if they are made approximately 41 inches long, and are spaced 17 inches behind the driven elements, the effect on the feed impedance is negligible. The gain increase is about 3 db. Slightly more gain may be had with closer reflector spacing, and tuning of the reflectors for optimum, probably about 40 inches. This sharpens the frequency response and lowers the feed impedance, so it is not generally done.

Fitted with a screen reflector spaced 17½ inches from the driven elements the City Slicker comes up with a gain of 14 db., and a front-to-back ratio of 25 db., with no change in feed impedance. Variation of the screen spacing changes the gain and feed impedance over a range of from 4 db. and 100 ohms at 0.3 wavelength to 6 db. and 40 ohms at 0.15 wavelength. These figures were measured, and were found to agree closely with values given by Kraus for screen reflectors.

Two City Slickers mounted side by side, 5½ wavelength apart center to center, make a bidirectional array having very good horizontal directivity, with a gain of between 11 and 12 db. W8WJC is using four sets of four, backed up by reflectors, the system showing a gain in excess of 17 db. The method of feeding two sets of elements

(Continued on page 108)


The City Slicker's country cousin — the 32-element array of W8WJC, Everett, Ohio. Four City Slickers backed up by reflectors tower 95 feet above the highest spot in Summit County.

November 1949
SPECIAL BOARD MEETING

At the call of the President, the Board of Directors of the League is meeting in Washington, D.C., on October 8th to discuss further the FCC proposals for changes in amateur regulations and the League’s participation in the October 10th conference called by the Commission. If time permits, we shall have a brief report of the highlights of the meeting elsewhere in the pages of this issue.

DIRECTOR ELECTIONS

Walter Bradley Martin, W3QV, has been declared reelected, as the only nominee, as director of the Atlantic Division for the coming 1950–1951 term. Similarly as lone nominees, Robert A. Kimber, W9BLK, has been reelected as alternate director, Dakota Division; George S. Aetón, W5BMM, elected as alternate director, Delta Division; and Alvin G. Keyes, W9KTQ, reelected alternate director, Midwest Division.

Valid nominating petitions have been filed by the membership to fill the remaining offices, as listed below, and balloting is now in progress:

ATLANTIC DIVISION
Alternate: Samuel J. Thackeray, W31U
Henry W. Wickenhiser, W3KWA

DAKOTA DIVISION
Director: Goodwin L. Doeland, W0TSN
Willard D. Nelson, W0YPN

DELTA DIVISION
Director: Victor Canfield, W5BSR
Joe T. Harris, W5AQF
James W. Watkins, W4FLS

GREAT LAKES DIVISION
Director: Harold C. Bird, W6DEE
John H. Brakh, W8SPF
Alternate: George H. Goldstone, W6MQQ
Harold E. Stricker, W6WZ

MIDWEST DIVISION
Director: Leonard Collett, W6DEA
Walter B. Jennings, W6YQA

PACIFIC DIVISION
Director: Harry Engwicht, W6RC
Kenneth E. Hughes, W6CIQ
Alternate: G. Porter Evans, W6IF
Ronald G. Martin, W6ZF

SOUTHWESTERN DIVISION
Director: Richard H. Alford, W4BOC
Lamar Hill, W4BOL
Anthon Litshauer, W4JQ
William G. Shelton, W4ASR
Alternate: William P. Sides, W4AUP
A. H. Stakely, W4FXE

CANADA
Canadian General Manager: Thomas Hunter, jr., VE3CP
Alexander Reid, VE2BB
Alternate CGM: William M. Butchart, VE6LQ
Ronald J. Hesler, VElKS
Leonard W. Mitchell, VE3AZ

Batter Resigns

Everett L. Batter, W4IA, has resigned as director of the Roanoke Division effective September 1, 1949. Commander Batter has recently gone on active duty in the office of the Chief of Naval Communications with an assignment relating to communications reserve activities, and did not feel that under such an assignment he could continue fulfilling the duties of director. A special election is now required to fill his unexpired term.

NOTICE OF SPECIAL ELECTION

To All Full Members of the American Radio Relay League Residing in the Roanoke Division:

A special election is about to be held in the Roanoke Division to choose a director to fill the unexpired term of Everett L. Batter, W4IA, resigned. Nomination is by petition, which must reach the Headquarters by noon of December 20, 1949. Nominating petitions are hereby solicited. Ten or more Full Members of the Roanoke Division may join in nominating any eligible Full Member residing in the Division as a candidate for director therefrom. Suggested form:

Executive Committee
The American Radio Relay League
West Hartford 7, Conn.

We, the undersigned Full Members of the ARRL residing in the Roanoke Division, hereby nominate . . . . . . as a candidate for director from this division for the unexpired remainder of the 1949–1960 term.

(Signatures and addresses)

(Continued on page 1013)

Northern California amateurs recently provided the televiewing public in the Bay area with first-hand data on amateur radio through Dr. Ben Sweetland’s “Hobby Show” over KPIX. Participating, l. to r.: Bob Grace, W6VQJ; Dr. Sweetland; Leonard Hughes, W6CIS (Pacific Division alternate director, representing Director Ladley); Hank Eckhard, W6DZQ; Mrs. Sweetland; Philip Lasky, W6NM; James von Striver, W6ASL; and (seated) Charlie Smith, W6JDG. As part of the program W6JDG worked W6RAK, mobile in San Francisco, on 29 Mc., to demonstrate the efficiency of amateur emergency communications.
The Story of FP8AA

A Sojourn on St. Pierre

BY JOHN H. DU BOIS,* W3BXE

It all started one warm July evening while I was driving down New Jersey Route 25. Vacation was scheduled in a couple of months but only tentative plans were being kicked around. DX had not been very good, and a blistering sun beating on the roof of the shack all day long didn’t help things a bit. That old chestnut of the DX man — “What would it be like to be DX instead of chasing it?” — kept running through my mind, but where can one go in only two weeks’ time? St. Pierre and Miquelon, the French islands east of Nova Scotia, seemed to be the only answer, and I began whistling “CQ de FP3AA” just for fun. It may sound crazy to a non-DX man, but it isn’t when you think of how many other DX hounds have had the same idea. Just about this time I realized that I had been following some slow-poke for about two miles. When I glanced at his license plate I did a double take. No, it couldn’t be! CONN (ARRL Hq.) FP (St. Pierre) DJ (my initials in reverse)! I’m not superstitious (except when it’s convenient), but this coincidence clinched it.

Inquiries were made at the local radio club, but information was very scanty. The French consul in Philadelphia suggested writing the Governor of St. Pierre, which I did, and this started a long string of correspondence. I will mention the various steps only to help anyone else who may be addicted to reading license plates. The following procedure got me into St. Pierre with a ham station, but I won’t guarantee it will work for other countries.

My first letter to the Governor included a brief description of amateur radio and the reasons for my request for permission to operate a station temporarily. I also asked about transportation, housing facilities, type of power available and passport requirements. It may save time to include a character reference by a well-known company or public official, because I had to send one along later. After a lot of anxious waiting I finally received a very cordial letter in French granting me permission to operate a temporary amateur station on 7 Mc., subject to inspection by certain local officials and compliance with the French laws governing amateur radio, and the answers to my questions about transportation and other facilities. I then had to scurry around for a passport, which required two 3 by 3 photographs and a copy of my birth certificate (with raised seal). With a visa from the French consul, the red tape was out of the way.

The letter from the Acting Governor assigned me the call “FQ8AB,” which worried me a little because FQ8 is the French Equatorial Africa prefix, but I used it the first night on the air. The Chief of Radiotelegraphic Service, whom I met the first day, explained that the commercial prefix for the island and its ships is “FQ” and that is why it was given me by the Acting Governor. However, the following morning the Chief notified me that I should use FP8 followed by two letters of my own choosing. Some joker had once used FP8AB while operating under cover or aboard ship and had sent a W4 a QSL card, but no licensed amateur had ever operated on the island prior to my trip (the local authorities confirmed this), so I used FP8AA to avoid any confusion. I realize that this did cause a little mix-up on the air, but several QSTs were sent, explaining that FQ8AB and FP8AA were the

*4105 Elbridge St., Philadelphia 35, Penna.
same station. By the time this is in print all contacts will have been confirmed, with both calls appearing on the card.

While the red tape requirements were being satisfied, the gear was put in shape. We included 100 per cent spares on tubes, some extra meters, tools, logbooks and everything else that could be anticipated. Since I was planning to pass through a foreign country (Canada) to get to FPS, all of the radio gear was packed in large boxes that could be sealed by the Canadian customs inspectors. It was packed to withstand shocks and handling, because I knew I couldn’t dig up any replacement 6SN7s, 5R4GYs or 2X2s on St. Pierre.

The trip to St. Pierre was uneventful except for one flat tire and some engine overheating that caused a day’s delay. Reservations had been made by mail with the boat agents at North Sydney, Nova Scotia, and the M/V Miquelon left there on August 25th. This ship is about 135 feet long and has a roll that would put a Lake Erie swing on a Kleinschmidt head. The jaunt from Sydney is 170 miles and takes about 17 hours.

Upon arrival at St. Pierre on August 26th, it was found that the island’s 110-volt 60-cycle power was not available in the hotel where I planned to operate. Furthermore, it maintained an average level of about 80 volts throughout the island. (There are plans afoot to replace the present 19-kw. generator with a new 500-kw. 50-cycle installation, to provide better electric power for this town of 3,500.) At present the 80 volts a.c. is available only from twilight to midnight, local summer time.

The only salvation to the power situation was the fact that the hotel had a bar. Two fluorescent lights and a juke box in the bar required 110-volt 60-cycle power, which was obtained from an inverter connected to the hotel’s 32-volt d.c. lighting system. Upon inquiry, it was found that the inverter was located in the wine cellar. Lacking wire to run an a.c. line from the cellar to the hotel room, it was decided to set up in the basement. The 66-foot end-fed antenna was strung around the ceiling. Shack furniture was easy — the operating table consisted of eight cases of French champagne, with three more for the operator’s chair!

The receiver was an HQ-129 with built-in 100-ke. oscillator, and the transmitter was the little emergency rig described in November, 1946, QST, with an antenna coupler added. The transmitter ran about 40 watts input (575 volts at 70 ma.) when the Variac was set at 110 volts. Operation was started each dusk as soon as the power was available and signals started to come through, and it was continued until 11 P.M. or a little after. A gasoline-powered generator was used by the hotel to charge the batteries of their 32-volt system, but it was turned off at about 10:45 each evening. By 11:20 the voltage would be down to 70 or 80 and further operation was impossible. The hotel wasn’t being niggardly with its power — fuel is both scarce and expensive on the island, and is used mostly for the motor dories and the few trucks there.

The stations that were worked (and a few that weren’t) know that the 7-Mc. signal from FPSAA was weak, and a few words of explanation are in order. The “underground antenna” was not the only cause. The town of St. Pierre is located at the head of the harbor on the island, and the ground toward the United States slopes upward to an ultimate height of from 400 to 670 feet. If power had been available on any of

“... the operating table consisted of eight cases of French champagne, with three more for the operator’s chair!”

QST for
the peaks, considerably more contacts could have been made, but even the radio beacon used d.c. In addition to the poor location, we were favored with a severe electrical storm on August 27th and 28th.

During the first two nights of operation, stations were worked on or close to the transmitter frequency of 7050 kc., in order to clean off the stronger signals and give the others a chance. After it was realized that the signals from FP5AA were so weak, "1M" was used to keep off the stations that were calling me blind. A few smart operators made contacts by calling me near the edge, but they still had trouble copying me because of those who couldn't hear me but were calling on the frequency where they judged me to be. Also, there was the group that insisted on trying to work me every night I was there, despite the fact that reports had been exchanged and confirmed previously. It is realized that my signals were weak, but the reverse was also true, since only five or six stations could be heard at any one time, even though the whole band was calling me (they tell me). It had been hoped that 500 or 1000 stations could be worked during my stay at St. Pierre, to give all of the DX hounds a chance to add the country, but conditions didn't permit it. Only 124 different stations were worked, in W1, W2, W3, W4, W8, G, KP4, KV4, ON, PA and PY.

There were several visitors to the station during operating hours, and a little time was taken out to explain the purpose of the trip, in half-English half-French. I hope that I have, through the Chief of the Radiotelegraphic Service at St. Pierre, started enough interest in amateur radio to encourage permanent operation in the ham bands on that rare island. The Acting Governor indicated that he would be very happy to have any other amateurs operate at St. Pierre in the future, but it is my suggestion that thinking of doing so should furnish his own power or wait until the new power plant is installed. Prices on the island (and wages, too) are ridiculously low. A hotel room with meals included (excellent food and wine) is $5.00 a day; American cigarettes are 13 cents a pack, and a good double Scotch is 27 cents! Incidentally, all the money you intend to spend must be changed into French francs (186 per dollar at the time we were there), and the remainder deposited with Customs.

A plane was scheduled to leave Tuesday, August 30th, and reservations were made for the flight, but fog closed in on the island the previous Sunday and remained for 10 days. Wednesday morning the equipment was disassembled and packed in readiness for the plane's arrival. Ordinarily the fog lasts for only two or three days at the most, and the weekly plane flight is made the first clear day after schedule, but the fog was still there the following Sunday and so passage was booked on the M/V Miquelon for Monday, September 5th. In desperation I set up the rig again on Sunday evening, and for two hours I couldn't even raise my hat. Finally KV4AA heard me and got a message through to Philadelphia, giving the estimated time of my arrival. After a rough trip to Sydney, the 1200-mile car trip was made in three days, with stops at several ham shacks along the way.

The general impression of St. Pierre is predominantly that of the friendliness and generosity of the people and the barrenness of the island. Cod fishing is the main industry. It is an old-world town in modern surroundings. The visit was a very pleasant one, and my only regret is that conditions were such to prevent more contacts being made. I will be very happy to furnish further data to anyone wishing to duplicate the journey. Those who may be interested in the topography or history of the island are referred to a map published by the Hydrographic Office in Washington, D. C., and a 260-page illustrated book (in French), St. Pierre et Miquelon, by E. Aubert de la Rue, published by Les Editions de L'Arbre, 60 Ouest, Rue Saint-Jacques, Montreal, Canada.

ARRL SOUTHWESTERN DIVISION CONVENTION
San Diego, Calif., Nov. 12th

Balboa Park, in San Diego, site of the world's greatest expositions, will be the setting for the 1949 ARRL Southwestern Division Convention sponsored by the San Diego Amateur Radio Club.

The program will include mobile-rig inspection, hidden-transmitter hunts on 2, 10 and 75 meters, ARRL forum, technical talks, DX meeting, TVI film, and ladies' program planned by YLRL Club of San Diego. It will be topped off by a banquet in the beautiful House of Hospitality at 6 p.m. Since this event falls in the middle of a three-day holiday, it is suggested that out-of-town visitors spend two or three days in San Diego. Convention headquarters will have tour and sight-seeing information. There will be a concert at 2:30 p.m. Saturday and Sunday on the world's largest outdoor organ at the convention site.

Plenty of parking space will be available on the grounds. Registration will start at 9 a.m. on the 12th at $3.50 per person, including banquet. Tickets and information will be available at wholesalers and by mail at: Convention, 5227 Santa Cruz Avenue, San Diego 7, Calif.

November 1949
Announcing the 16th ARRL Sweepstakes

Certificates Will Be Awarded to C.W. and 'Phone Winners in Each Section and to Top Scorers in Club Groups

**CONTEST PERIODS**

<table>
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<th>End</th>
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<td>5:00 P.M.</td>
<td>2:01 A.M.</td>
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<td>MST</td>
<td>4:00 P.M.</td>
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<tr>
<td>PST</td>
<td>3:00 P.M.</td>
<td>12:01 A.M.</td>
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</table>

It's time to get your station in readiness for the 16th Annual ARRL Sweepstakes, to be held this November. This popular contest affords you an opportunity to pit your operating skill against the best men in your ARRL section, or to fill in some of those states that are lacking for WAS. Every licensed amateur in every League section is urged to participate; whether or not you're an ARRL member, you are cordially invited to get into the SS and submit an entry. All scores reported in accordance with the rules will be listed in a QST tabulation of final results.

As usual, the contest will run over two consecutive week ends, with a maximum allowable total operating time of 40 hours out of the possible 66 for each entry ('phone or c.w.). The rules are identical to those of last year. You can operate both 'phone and c.w., but separate logs must be filed for each entry.

Entries by multiple-operator stations are encouraged and will be listed, but only single-operator stations will be eligible for the certificates offered to the top 'phone scorer and the top c.w. scorer in each section. Multiple-operator scores can be grouped with single-operator scores in club competition, however, and a handsome gavel is offered to the club with the highest aggregate score. Within a club, single-operator entries can compete for the "club-certificate" awards given to the top c.w. and 'phone scorers.

The Sweepstakes, like Field Day, is a contest that puts a premium on operating skill rather than on sheer power, since the 1.25 score multiplier applied to stations operating with 100 watts or less during the contest practically insures that most of the operation will be in this power class. The 80s and 60s really go to town in the SS!

If you're new to the SS, it won't take you long to catch on. During the contest period, call "CQ SS" or answer such a call, exchange preambles in the form shown elsewhere in this announcement, and keep your log properly. ARRL will gladly send you contest forms upon request, or you can draft your entry in accordance with the sample. Tune up your gear now, warn the folks that you'll be unavailable the week ends of Nov. 19th and 26th, read the rules to acquaint yourself with the pattern, and then get set for an operating spree that is real fun.

**Rules**

1) **Eligibility**: The contest is open to all radio amateurs in the sections listed on page 6 of this issue of QST.

2) **Time**: All contacts must be made during the contest periods indicated elsewhere in this announcement. Time may be divided between week ends as desired, but a total of 40 hours must not be exceeded for each entry. Time spent in listening counts as operating time.

3) **QSOs**: Contacts must include certain information sent in the form of a standard message preamble, as shown in the example. C.w. stations work only c.w. stations and 'phone stations only other 'phones. Valid points can be scored by contacting stations not working in the contest, upon acceptance of your preamble and/or receipt of a proper preamble.

4) **Scoring**: Each preamble sent and acknowledged counts one point. Each preamble received counts one point. Only two points can be earned by contacting any one station, regardless of the frequency band. The total number of ARRL sections (see p. 6) worked during the contest is the "sections multiplier." It is not necessary for preambles to be sent both ways before a contact may count, but one must be received, or sent and acknowledged, before credit is claimed for either point(s) or multiplier. Apply a "power multiplier" of 1.25 if the input power to the transmitter output stage is 100 watts or less at all times during contest operation.

The final score equals the total "points" multiplied by the "sections multiplier" multiplied by the "power multiplier."

5) **Reporting**: Contest work must be reported as shown in the sample form. Mimeographed contest forms will be sent gratis upon receipt of radiogram or postcard request. Indicate starting and ending times for each period on the air.

There are no objections to one's obtaining assistance from logging, "spotting" or relief operators, but their use must be annonced in your log. The final score is based on the "sections multiplier" only. The entrant in the multiple-operator class, and it must be so reported.

A single-operator station is one manned by an individual amateur who receives no assistance from other persons during the contest periods. He may not have assistance in

**HOW TO SCORE**

Each preamble sent and acknowledged counts one point.

Each preamble received counts one point.

Only two points can be earned by contacting any one station, regardless of the frequency band used.

For final score: Multiply totaled points by the number of different ARRL sections worked, that is, the number in which at least one bona fide SS point has been made.

Multiply this by 1.25 if you used 100-watts-or-less transmitter input at all times during the contest.

38 QST for
any manner in keeping the station log and records, or in spotting stations during a contest period. Contest reports must be postmarked no later than December 10, 1949, to be eligible for QST listing and awards.

6) Awards: Two certificate awards will be given in each section, one for the highest c.w. score and one for the highest phone score. Only single-operator stations are eligible for certificate awards. Multiple-operator scores will receive separate QST listing in the final results. A gavel will be awarded to the highest club entry. The aggregate scores of phone and c.w. reported by club secretaries and confirmed by the receipt at ARRL of contest logs constitute a club entry. Separate club entries into phone and c.w. totals. Both single- and multiple-operator scores may be counted for club entries. Only the scores of bona fide club members, in a local club territory, may be included in club entries.

The highest single-operator c.w. score and the highest single-operator 'phone score in any club entry will be rewarded with a "club" certificate where at least three single-operator 'phone and/or three single-operator c.w. scores are submitted.

7) Disqualification: Failure to comply with the contest rules or FCC regulations shall constitute grounds for disqualification. In such cases, the decisions of the ARRL Contest Committee are final.

### STATION W.... — SUMMARY OF EXCHANGES, SIXTEENTH A.R.R.L. ALL-SECTION SWEEPSTAKES

<table>
<thead>
<tr>
<th>Freq. Band (Mc.)</th>
<th>Time On or Off Air</th>
<th>Send (1 point)</th>
<th>Received (1 point)</th>
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<tr>
<td></td>
<td></td>
<td>NR Str.</td>
<td>Section</td>
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<tr>
<td>3.5</td>
<td>6:10 P.M.</td>
<td>W1AW</td>
<td>589 Conn.</td>
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<td>14</td>
<td>Off 9:35 P.M. Time: 3 hrs. 25 mins.</td>
<td>569 &quot; 7:15 P.M. 20 K6AD 506 Alaska</td>
<td>2:18 P.M. 20 7 2</td>
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<tr>
<td></td>
<td>Off 9:15 P.M. Time: 2 hrs. 30 mins.</td>
<td>569 &quot; 7:25 P.M. 127 WZ7N 650 Idaho</td>
<td>5:20 &quot; &quot; 8 2</td>
</tr>
<tr>
<td>3.5</td>
<td></td>
<td>569 &quot; 7:35 P.M. 114 W7HSM 676 Utah-Wyo.</td>
<td>5:50 &quot; &quot; 9 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>569 &quot; 9:12 P.M. 107 W5KIP 479 Ark.</td>
<td>8:05 &quot; &quot; 10 2</td>
</tr>
</tbody>
</table>

Total Operating Time: 5 hrs. 55 min. 3.5, 7 and 14 Mc. used. 10 Sec., 22 Pts. 35 Watts Input Power

Assisting person(s): name(s) or call(s), etc. ...
Claimed score: 22 points × 10 sections = 220 × 1.25 (35 watts input) = 275

I have observed all competition rules as well as all regulations established for amateur radio in my country. My report is correct and true to the best of my knowledge.

Signature ...

Address ...

Number Different Stations Worked ....

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November 1949 39
A 75- and 20-Meter Single-Sideband Exciter

BY BYRON GOODMAN, WIDX

Here is a single-sideband exciter that uses one of the preadjusted audio phase-shift networks now available on the market. This takes much of the sting out of adjusting the unit, since the audio network has been one of the stumbling blocks. Other features of the unit include both 3.9- and 14-Mc. operation, with your present frequency-control unit furnishing the excitation.

Although a number of amateurs have successfully made audio phase-shift networks for single-sideband transmitters and receivers, there isn’t much doubt that the lack of certain test equipment necessary for their alignment has been a deterrent for many who would like to get into the single-sideband swim. However, this stumbling block has been removed by the recent announcements of at least two manufacturers that factory-adjusted networks are now available.

To avoid unnecessary repetition, this article is written with the assumption that the reader understands the phase-shift method of generating a single-sideband signal. Several articles have appeared in past issues of QST that will fill you in on the basic principles if you are not familiar with them. You can still build this unit without the background, but a lot of the circuit explanations will sound like mumbo-jumbo.

Frankly, the unit to be described borrows from the exciter of W2UNJ. You may recall that his adapter was designed to work with one’s present speech amplifier and frequency-control unit. This one includes the speech amplifier (one tube) and the power supply, but otherwise it bears a strong family resemblance. Two points of difference are worth mentioning, however.

The two balanced modulators in this exciter are plate-modulated triodes, since this is the simplest and most familiar type of modulation. The circuit of a plate-modulated balanced modulator is shown in Fig. 1. If you look at just one tube, you will see that it is simply the familiar plate-modulated triode, with the audio modulating power fed into the negative instead of the positive lead. The condensers from cathode to ground are r.f. bypasses. So far, no difference. However, when you look at both tubes, you will see that the excitation is fed to the grids in parallel, while the output is connected in push-pull. Since each tube acts as a neutralizing circuit for the other, none of the excitation voltage passes through the stage. However, when the tubes are modulated with push-pull audio, the double sidebands (minus carrier) appear in the output, and we have a “balanced modulator.” You may wonder at the fact that no steady plate power is applied to the tubes, but any such power does no good and only dissipates itself on the plates of the tubes. The output sideband power is a transformation of the applied audio power, with the usual tube loss. The thing is quite tolerant so far as excitation is concerned, requiring only that there be sufficient drive for Class C operation over the range of modulating voltages. At the small powers involved, it also seems to be reasonably tolerant of loading, although it does require some load (which can be the losses in the circuits) and it can’t stand overloading beyond its linear operating conditions. We submit that it is fairly simple and something everyone can understand. In this unit,
a 6SN7 twin triode is used in each balanced modulator.

Since this exciter is to follow the station frequency-control unit, it is imperative from the standpoint of operating convenience that the necessary 90-degree r.f. phase shift be maintained over the band in use, and this dictates a low-Q phase-shift network of the type described by W6DIQ² and also used by W2UNJ. However, it was modified slightly to use series reactances and shunt resistances, as shown in Fig. 2, instead of the other way around. The idea, of course, is that when \( R = X_L = X_C \) the voltages at the grids will be 90 degrees out of phase. However, the tubes and wiring introduce capacity, so the circuit isn't the ideal one of Fig. 2. To make it approach this ideal, we used additional inductances from grid to ground across the tubes to tune out the stray reactances. Since the r.f. phase-shift networks were switched from band to band, these compensating inductors can be switched at the same time and add little to the complexity of the circuit.

Several times during the design and construction of this unit we were tempted to increase the over-all power level, so that the output from the exciter would be sufficient to drive a big output amplifier in Class B. Each time we got this urge we started to reckon costs, and always came out with the answer that the right way to approach this thing, from an over-all economy standpoint, is to generate the signal at low level and then amplify. For example, this unit uses two 6SN7 balanced modulators in the output, modulated by a pair of 6SN7s. The resultant output is some fraction of a watt - enough to swing some grid 3 or 4 volts in the no-grid-current region. To increase the output would require more audio gain, more modulator power, a larger power supply, and some honest-to-goodness modulation transformers. But with one or two amplifiers following this unit you get to the same level much more economically. It just didn't add up to any other answer than the one presented here.

The complete circuit of the exciter is shown in Fig. 3. The audio amplifier is a dual-triode affair, departing only from standard in the low values of coupling condensers and the addition of shunt capacitors \( C_1, C_4 \) and \( C_7 \). This is done to restrict the range of the amplifier to frequencies above 150 and below 3500 cycles. While not giving the sharp cut-off obtainable with a filter, it nevertheless holds down the passband to the useful audio frequencies.

The output of the audio amplifier is fed into the two channels of a Milten 75011 audio phase-shift network. This preadjusted unit uses four 12AT7 tubes and the necessary resistors and condensers to give two push-pull outputs differing by 0 ± 1 degrees over the range 70 to 5400 cycles.

Two 6SN7s are used for the modulators, operated in push-pull Class A directly from the output of the phase-shift network. A d.p.d.t. switch, \( S_1 \), reverses the drive to one stage and enables the operator to use either the upper or lower sideband. The modulators are coupled through 1-to-1 audio transformers to the cathode circuits of the balanced modulators.

In the r.f. phase-shift section, excitation from a crystal oscillator or VFO is coupled in at \( L_s \) and tuned by \( C_{21} \). The correct networks are selected by throwing the three toggle switches, \( S_2, S_3 \) and \( S_4 \), to the proper positions. Toggle switches were used instead of a single rotary switch because they lent themselves better to the layout and there was no particular need for good insulation or single control at these points.

The power supply is unusual only in that so much output capacity is used. This is to furnish a low-impedance supply for the audio phase-shift network. All heaters throughout the unit are wired with both sides "hot" and the transformer-winding center tap grounded, since it was the manufacturer's recommendation that the audio phase-shift network be wired this way.

Construction

There isn't much in the construction that departs from usual audio and r.f. practice. The unit is built on a 13 × 17 × 3-inch steel chassis, and d.c. and audio grounds are made to soldering lugs at the tube sockets. The r.f. grounds for \( C_{13} \),

![Fig. 1 — The plate-modulated triode balanced-modulator circuit. The r.f. excitation is fed to the grids in parallel and the output is taken in push-pull. The audio modulation is applied in push-pull in the negative plate lead.](image)

![Fig. 2 — The low-Q r.f. phase-shift circuit used in the exciter.](image)
**POWER SUPPLY**

**AUDIO PHASE-SHIFT NETWORK**

**BALANCED MODULATORS**

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Fig. 3 — Wiring diagram of the two-band single-sideband exciter.

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C1, C2, C6, C10, C19, C20, C21 — 680-µfd. mica.

C3, C4, C5, C16 — 10-µfd. 25-volt electrolytic.

C7, C15 — 2200-µfd. mica.

C8, C9, C11, C12, C13 — 0.1-µfd. 400-volt paper.

C14, C17 — 100-µfd. mica.

C18, C19 — 100-µfd. per-section dual (Millen 24100).

C20, C21 — Dual 40-µfd. 450-volt electrolytic.

C22, C23 — 50-µfd. midget variable (Millen 20050).

C24, C25, C26 — 80-µfd. (dual 40) 450-volt electrolytic.

R1, R2 — 0.27 megohm.

R3, R4 — 3300 ohms.

R5, R6 — 0.5-megohm volume control.

R10 — 0.1-megohm volume control.

R11 — 0.39 megohm.

R12, R13, R14, R15 — 1.0 megohm.

R16, R17 — 0.27 megohm.

R18, R19, R20, R21 — 12,000 ohms.

R22 — 1000 ohms, 1 watt.

R23, R24 — 660 ohms, 2 watts (two 330 ohms, 1 watt, in series).

All resistors 1/2-watt unless specified otherwise.

L1, L2 — 8 hours, 120 ma.

L3 — 3.9 Me.: 43 t. No. 26 enam., link 12 t. No. 26 enam. spaced 1/4-inch from other coil.

L4 — 44 t. No. 26 d.s.c. spaced to occupy 1/2 inch, link 7 t. No. 26 d.s.c. spaced 1/4 inch from other coil. L5 is wound on 1-inch diameter 4-prong plug-in form (Millen 45004).

L6 — 21 t. No. 26 d.s.c. close-wound on 1-inch diameter form, slug-tuned. (See text.)

L7, L8 — 37 t. No. 30 enam. close-wound on 1/4-inch diameter 1-megohm resistor.


PSN1 — 90-degree audio phase-shift network (Millen 75011).

S1 — D.p.d.t. rotary wafer switch, shorting type (Mallory 1215L).

S2, S3, S4 — S.p.d.t. toggle.

T1 — 350-0-350 at 120 ma., 6.3- and 5-volt filament.

T2, T3 — 131 audio transformer, push-pull (Stancor A-4711).

---

**QST for**
because it does require a little retuning with wide frequency excursions, and panel control is provided for it, through an insulated extension shaft.

The two slug-tuned coils, \( L_4 \) and \( L_5 \), are made from Millen 45000 1-inch diameter forms. The slugs were made from ½-inch lengths of ¾-inch diameter copper tubing. A ¾-inch diameter disk of short copper was soldered to the head of a 2-inch 6-32 screw, and the short length of tubing then soldered to the disk. A little touching up with a file and steel wool results in a good copper slug. Two holes spaced ¾ inch on the end of each coil form were tapped for 4-40 screws. Before fastening the coil to the chassis, the screw from the copper slug was run through a clearance hole in the center of the end of the form and then a nut was put on the screw. When the form was fastened to the chassis with two 4-40 screws, tightened these screws held the 6-32 nut firmly in place between the coil form and the chassis and gave a working thread for the slug adjustment. A locking nut on the top side of the adjusting screw completed the job. Three 4-40 screws in each coil instead of two would have made a little better mechanical job, but the thing isn’t likely to fall apart as it is.

The compensating inductances \( L_9, L_1, L_6 \) and \( L_9 \) shouldn’t be too critical, because they are shunted by \( R_2a \) and \( R_2d \) and consequently the circuits are low-Q ones. Anyone who has a grid-dip meter can check the resonant frequencies by lifting \( R_2s \) and \( R_2d \) and the grid leaks on the 6SN7 balanced modulators, but unless the construction departs widely from that used in this unit there should be no need. \( L_6 \) and \( L_9 \) are standard r.f. chokes, and \( L_7 \) and \( L_9 \) are wound on resistors for want of a better coil form. Any ½-inch diameter resistor above 50,000 ohms should be satisfactory.

**Adjustment**

While it is convenient and perhaps simpler to adjust this unit with an oscilloscope, it isn’t absolutely necessary. However, you should have an audio oscillator of some kind, a voltmeter, and a receiver.

The first thing to do is to couple some r.f. to the r.f. input jack and determine that the circuits tune to resonance. For drive we used a VFO that has Class A 6AG7 output, delivering a few watts. Tuning the input circuit, \( L_9C_{27} \), to the VFO, you should be able to measure from 5 to 20 volts d.c. from any of the grids of the balanced modulators to ground. A 2.5-mh. r.f. choke in series with the negative lead of the voltmeter will permit measuring the d.c. without upsetting the circuit. Couple the output of the exciter to your receiver through a length of RG-59/U or other coaxial line, and terminate the line at the receiver terminals with a 75- or 100-ohm resistor. Switch the receiver to “AVC” and reduce the r.f. gain until you get a reading on the scale of the S-meter. If your receiver is one that renders the r.f. gain control inoperative when the a.v.c. is turned on, you will have to attenuate the signal some more at the receiver input, by using some series and shunt resistors. Then tune the output tank, \( L_{10}C_{22} \), to resonance. You will get a signal through, of course, because the modulator balance isn’t perfect, but by trying various bits of wire soldered to a grid lead and moved near a plate lead of the same triode section, you will be able to reduce the unbalance. Actually, of course, you are building in a small neutralizing condenser to compensate for the slight differences in the tube interelectrode capacities. You don’t have to bother too much with this, but you should be able to find a combination that will pull the S-meter reading down a few points. We ended up by using a 1-inch length of wire from the No. 4 pin that ran parallel to the No. 5 pin lead a separation of about ½ inch. Do the job on 14 Mc. with the heaters turned on.

Adjust the audio volume control, \( R_5 \), to almost wide open, and feed in just enough audio at around 1500 cycles from the audio oscillator to kick the S-meter up 3 or 4 S points above the carrier level. You will hear a modulated signal, and now you have to do a little juggling with \( L_4 \) and \( C_{25} \) if you are on 3.925 Mc., or with \( L_5 \) and \( C_{29} \) if you are on 14.25 Mc. Look for a combi-

(Continued on page 108)
The following timely words on communication teamwork are based on an item appearing in the First Naval District Electronic Warfare bulletin:

Operating on a Naval radio circuit can be likened to a football team on the gridiron. The control station is the quarterback, calling the plays. Each radioman operating his station is a player on the team. The monitoring station is the referee. The coaches are the communication officer and the supervisor. The net is the team. The drill period is the playing time. The rules are the published communication instructions. All communication personnel must carry out their assignments to have a good communication team. Follow the rules and the instructions of your coach. How is your team scoring?

Effective 1 September 1949, the Secretary of the Navy ordered changes in the boundaries of certain Naval districts. The State of New Mexico has been taken from the Eleventh Naval District and added to the Eighth Naval District.

Interest is high in the Ninth Naval District Communication Competition. The award for the unit attaining first place is a beautiful cup trophy, known as "the Oscar." Winners during the fiscal year 1949 were: first quarter, ending 30 September 1948, Naval Reserve Training Center, Mansfield, Ohio (K8NRQ); second quarter, Naval Reserve Training Center, Hannibal, Mo.; third quarter, Electronic Warfare Company 9-170, Valparaiso University, Valparaiso, Ind. (K9NRT); fourth quarter, ending 30 June 1949, Naval Reserve Training Center, Waterloo, Iowa (K9NRF). There are over 100 competing units.

Some 5000 persons viewed the exhibit of the Naval Reserve Training Center, Santa Barbara, at the Santa Barbara County Fair, Santa Maria, Calif. Principal feature was the emergency communications truck and trailer operating under the Training Center's amateur call, K6NRA. Naval personnel participating included Charles K. Schroer (W6VGI), RMN3.

A highlight of the Washington (D.C.) Radio Club's 1949 "Hamboore" was the exhibit by Electronic Warfare Company W-1 of a Naval Reserve mobile communications unit.

The First Naval District Naval Reserve mobile communications truck was on display at Hampstead, N.H., in August, during the 200th Anniversary Celebration of the founding of the town.

Cmdr. Everett L. Battey, USNR (W4IA), long active in ARRL affairs, has returned to active Naval duty in the Public Information and Naval Reserve Liaison Section, Office of the Chief of Naval Communications. Ev will maintain close contact with ARRL and amateurs in general, particularly for coordination of plans for emergency communications circuits.

Cmdr. Bannie L. Stewart, USNR, well known in ham circles as W1CE, has been transferred from Sixth Naval District Headquarters to the Fourth Naval District, where he is Reserve operational communication officer. Bannie is on the air with his new call, W3CH.

For the information of those who may be wondering what happened to the Navy Day Receiving Competition this year, an announcement by the Secretary of Defense that all armed services "days" are to be unified in a single "Armed Forces Day" resulted in the cancellation of the customary celebration. Thus the affair conducted jointly by the Navy Department and ARRL on 27 October 1948 became the twentieth and final Navy Day Receiving Competition. The first Armed Forces Day is scheduled for 20 May 1950.

On the evening of 21 April a Douglas transport loaded with freight from Mexico was approaching the Harlingen, Texas, airport. The ceiling over the area had closed down to 300 feet. The airport tower control operator requested Electronic War-
CONDUCTED BY ROD NEWKIRK.* W9BRD

How:

The Radiotelephone DXCC award category has been the subject of much postal comment from time to time. These writings dwell mostly upon apparent discrepancies in individual interpretations as to what constitutes a legitimate (for DXCC purposes) two-way 'phone contact.

That there must be intelligence exchanged orally to and from the stations concerned is no doubt universally appreciated. It's also widely realized that it isn't too difficult to obtain an apparent two-way verification for a contact of doubt universally appreciated. It's also widely from time to time. These writings dwell mostly the half-and-half variety, i.e., one end strictly 'phone and the other strictly c.w. To say that has been the subject of much postal comment upon apparent discrepancies in individual interpretations to what constitutes a legitimate phone and the other strictly c.w. To say that

We haven't arrived at, or heard of a practical suggestion for, a solution of this bone of contention, and until one comes along it appears as though the "quick-switch" proponents will retain a somewhat unfair advantage in the opinion of those who believe in sticking to voice when working c.w. Off-hand, the latter sounds like a good practice to recommend but "I'll call you back in half an hour on 'phone" would get around it fairly.

Round and round we go, Jeeves. Snap us out of it with a peek at the mail.

What:

W3BXE caused quite a to-do on the lower frequencies by trotting up to St. Pierre and putting FQ8AB/FPSAA on forty for a few evenings — details on page 35 of this issue. — Another new Cayman representative, VPSBE, showed up on 7295 kc. for W9RBI. The high end seems to be getting quite popular with DX in this hemisphere as W2AG0 contacted VP5BD, K74AA, HZ5WZ, TV5AL and PQ7WB just below the high edge. — KL7HZ estimates four watts output from a VFO and works VEs, Z1a, UA9FP (7010), J3AA (7030) and KP6AE (7030). A Windom antenna must be the secret. — W2CJX has been working HZ1KE on the low end and relies word to the effect that Ken has ambitions concerning 3.5 Mz. You may have worked him as MD5KW, J2BQ, UA9FP, LUS1A, HC7KD and KA7RZ using the 7-Mz. range and the latter was barreling through with four watts to a 6AQS.

There rarely fails to be something unique in the tabber-gasting department on forty. The 'phone gang have been making much hay with CRSUP (14,160) on Sao Thome and Wa 2AGO, 3DKT and 9RI1 were among the first to be in on the kill. Continuing with voice notes, G6RH tagged MP4BAD (14,200) and HSISS (14,350) while W3LTU slipped the aforementioned CR5 and HZ2CO (14,315). SPIKAB provided a rare one for W2AGO on 14,520 kc. To prove that a returning old-timer broke through to HSISS, MP4AC, PK4DA and some JAs which is a good way to give BCI the icem treatment. XE1AC enjoyed chats with CRSUP, CR6AI (14,317), CR7AH (14,194), VPSAK (14,240), MP4AC (14,337), LZIUD (14,134), VK1VR (14,199), ZK3AA (14,348), M1B (14,317), ZS9F (14,334), FM8AA (14,385), VO8AF (14-195), ZCIAL (14,183), VK1ADS (14,380) and V1JAA (14,362), all of eye-popping quality. HC22R has cards on the way from VK9GW (14,350), YK9G (14,269), V56AZ (14,300), K3AZ (14,210), FQ7T/FS8 (14,347), TA3BS (14,378), PK6NO (14,320), EA9AI (14,338), H51BJ (14,312), YK1AC (14,317) and a nifty, W5FYV/VRE (14,199), whom we hope is a landlubber. W9TRD hints of possible future FN8 phone activity on QRGs of 14,150, 14,280 and 14,300 kc.

Speaking of the old guard getting bitten by the bug again, who drops us a line but prewar-DXCC W4CEN! Tom still has the knack: ST2TC (14,008), SVEA (14,010), T33FAS (14,040), ZD2KY (14,093 Ix), ZD9AA, ZB1JH (14,060), ZP8BL (14,025), EA6EG (14,150 Ix). H51BJ

November 1949
These four gentlemen are largely responsible for keeping Sardinia represented on the ham bands: IS1AIK, AFM, AYN and PIC.

(14,005 t8), HZ1LD (14,005 t9), HZ1KE, MD2GO, MD7MR (14,006 t7), VQ8AD (VFO t7), P2K2Z (14,105), YKIAI (14,020) and one VR5Z (14,005) who gives Box 47, Nukusoba, Tonga, as his QTH. - We're glad to hear W6EQB back in the battle after an illness session which left him somewhat handicapped in handling the bug. But this hasn't slowed Bill down much, especially since the addition of an automatic keyer to the shack equipment. No worry of giving him a QRQ or you may get socked in the diaphragms with some 90 w.p.m. I DX must...

Still claiming to be a long way from DXCC, W6JWL surrounded in French Guiana! W2AG0 is handling the QSL task for...

Third All-European DX Competition

1) European amateurs call “CQ A.W.” All amateurs outside Europe call “CQ EU.” Object is to encourage Europeans to work as many other stations in the world as possible, and for all other stations to work as many European stations as possible.

2) C.w. contest period is from 0001 CET, Nov. 26th, to 2400 CET, Nov. 27th. “Phone contest period is from 0001 CET, Dec. 3rd, to 2400 CET, Dec. 4th.

3) Log form, contest serial numbers, and qualifications parallel ARRL DX Competition.

4) Separate certificate awards for “phone” and “c.w.” to first three high scores in each country and each W and VE licensing district.

5) Points. Every European station earns 1 point for receiving acknowledgment of number sent, and 2 points upon acknowledging a number received. Stations outside of Europe earn 2 points upon receiving acknowledgment of a number sent, and 1 point upon acknowledging a number received. Thus, a maximum of 3 points per contact.

6) Final score. European stations multiply total points by a multiplier which is sum of all European countries worked on each band. Countries outside of Europe multiply total points by a multiplier which is sum of all non-European countries worked on each band.

Countries according to ARRL Countries List, except that each W and VE licensing area counts as a separate country. Stations outside of Europe multiply total points by a multiplier which is sum of all European countries worked on each band.

7) Quota. European stations, in c.w. section, may have a maximum of 3 points per contact. All others have a maximum of 3 points per contact.

8) All entries must be single-operator stations. No "phone-to-c.w. or c.w.-to-phone" contacts allowed. Competition on the following bands: 3.5, 7, 14, 28, and 50 Mc.

9) Logs must be postmarked not later than Dec. 31, 1949, and must be received by April 30, 1950. Logs should be mailed to CAV, P.O. Box 99, Praha 1, Czechoslovakia.
Meet Capt. Ed C. Tietz, USAF, who operates DLATL at Furstenfeldbruck, Germany. Ed's home call is W9QDL and his efforts with the layout shown here resulted in the first DL4 DXCC membership.

continue to go to the IARC, P. O. Box 4099, Tel-Aviv.

A807Q
S. Najah, P. O. Legemp, Nissink State via Silliguri, N. W. Bengal, India

CM7NR
P. O. Box 188, Camagüey, Cuba

CR4UP
Leonel Fias, Sta. Thome, Portuguese West Africa

CR7BZ
A. De Silva, P. O. Box 276, Lourenço Marques, Mozambique

EASDD
Box 346, Las Palmas, Canary Islands

EK1TY
J. Bury, 16 rue du Fondouck, Oran, Algeria

FADBZ
D. B. Seal, Hattleb, Dakota, Chahmenage, Nigeria

FNSAC
样的, P. K. Seal, Dayerdhar, Chandernagore, India

FNSAD
(Person as above)

FNSMS
P. K. Seal, Dayerdhar, Chandernagore, India

FO8SN
(QSL via Q56LL)

HE1EU
(QSL to HB9EU)

HE1IL
(QSL to HB9IL)

HI1DP
P. O. Box 1072, Balboa, Canal Zone

K10NRA
U. S. Naval Reserve Facility Facility, Hilo, T. H.

KM16AO
Navy 1904, 4% FPO, San Francisco, Calif.

LZ1ID
% Radio Sofia, Sofia, Bulgaria

MIB
M. Graziani, N.Y. Graziani, Navy 1504, Eritrea

MD7MR
M92AC
D. Watkins, British Army Broadcasting Station, via Bellosguardo S. stripes, F.T.T.

M13AB
A. Fantonelli, Via-Molise, 31, Asmara, Eritrea

M13DF
P. O. Box 622, Asmara, Eritrea

MP4BAC
(QSL via RSGB)

OQ56A
(QSL via Q56LL)

P11LS
(QSL via VERNON)

P15FN
(QSL via W5FNA)

P15TR
(QSL via W4BYF)

VP5AY
R. L. Cowan, 31 Hope Rd., Kingston, Jamaica, B.W.I.

VP5AZ
C. W. Bastian, Vernamfield, Sandy Gully, Jamaica, B.W.I.

VP5BA
B. E. Hutchinson, Vernamfield, Sandy Gully, Jamaica, B.W.I.

VP5BB
Mm. Currerieta Laos Sossard, Vernamfield, Sandy Gully, Jamaica, B.W.I.

VP5BC
D. Crooks, Up Park Camp, Jamaica, B.W.I.

VP5BE
H. C. Coe, Grand Cayman, Jamaica, B.W.I.

VP5FZ
(QSL via VP5AD)

VP5RC
Jamaica Amateur Radio Club, "Cardiff," Retreat Post Office, Jamaica, B.W.I.

VP9RR
1931, AACS Sgnd., APO 380, % PM, New York, N. Y.

V81DC
Major Les Hill, Base Workshops, REME, Singapore, Malay

V86H
Box 541, Hong Kong, Asia

V92RR
(QSL via ARCI)

W6ALT/KC6
(QSL via WTTI)

YN4CB
Calegio San Jose, Bluefield, Nicaragua

Tidbits:
Word via W6YDI from H11BJ in the land of strange headgear: H11s BJ, BM, BQ and CQ are at present the only licensees in Korea. All may be reached through APO 404, % PM, San Francisco, Calif. They are now authorized to operate 14.15-14.2 and 14.3-14.35 Mc. and are particularly interested in lining up W schedules with landline relay facilities. -.-.-. Q55D M writes to tell of a Congo mission radio network which keeps him busy when not working amateurs on the higher frequencies. He arrived in the Congo a year ago and is enjoying the use of a rig from W6YDI and an NC-24OD. -.-.-. Space restrictions cause the necessity of boiling down VQ2DH's unique account of his jaunt to Nyasaland as ZD6DH but here's the gist: 10 to 15 watts input was run to a 616-GL8 exchanger on 14,085 ke. during a good portion of his 7-day stay at Chifua Airfield near Blantyre. A folded dipole and a modified BC-346A aided in collecting 212 contacts with 27 countries on all continents. Conditions were quite poor generally but on any future excursion of the kind Bunny intends to give the 28-Mc. constituents a break. Now he's trying to figure out how to work ZD6 for the benefit of his own log! Which reminds us of the long and difficult time it took AC4YN to work Tibet -.-.-. The personnel turnover continues on its merry way on Swan Island. KS4AI is closing down permanently this time and may be reached in the future as follows: Ralph W. Bird, W5KWY, Lacombe, La. KS4AJ is also leaving and KSAC plus W6QCC/KS4 will be left responsible for island ham affairs. W6MO is scheduled for duty in the outpost and may be active on 40 meters after arrival. Ralph's solicitation of W contacts should be appreciated by the entire DX congregation. He could have easily attained a high position in the DXCC roster by playing hard-to-get but he tackled some 76 countries, nevertheless -.-.-. Those suffering from dire consequences in the ZK1 department may get a break on this one: Not all of ZK1AK's contacts were shipboard stuff as has been herefore assumed. Some contacts were made from terra firma and you may have one of the lucky ones. We suggest you resubmit your ZK1AK confirmation for DXCC; if the details jibe with our information you'll receive credit and notification. For those still awaiting a card, ZK1AK is now operating as ZL1PO -.-.-. W4CEN has it that ZL1AA is terminating his duties on Tristan da Cunha on doctor's orders. He can be reached henceforth at his home QTH.

(Continued on page 108)
Two-Band Antenna-Matching Networks

How They Work and How To Design Them

PART II

BY JOHN G. MARSHALL,* W5ARL

[The first part of this article appeared in the October, 1949, issue of QST. — Ed.]

Case of $Z_1 < Z_0 < Z_2$

This general case covers such antenna systems as:

1) A current-fed half-wave or long-wire system at $f_1$, also operating on any even harmonic, $f_2$, of $f_1$, using 300- or 600-ohm line.

2) The common variety of parasitic-element array at $f_1$, also operating on its second harmonic, $f_2$, using any type of line, and having suitable networks in the center of the parasitic elements.\(^2\)

Fig. 6 shows a suitable network for this general case of $Z_1 < Z_0 < Z_2$.

Even though the intended function of $G_p$ is to establish the $f_2$ transformer ratio, it is in parallel with $Z_1$ at $f_1$, which requires the $f_1$ transformer ratio to be between $Z_0$ and the resistance component of the equivalent series circuit of $C_p$ in parallel with $Z_0$. Also, even though the intended function of $L_p$ is to establish the $f_1$ transformer ratio, it is in parallel with $Z_0$ at $f_2$ as well as at $f_1$, which requires the $f_2$ transformer ratio to be between $Z_2$ and the resistance component of the equivalent series circuit of $L_p$ in parallel with $Z_0$, instead of being between $Z_2$ and $Z_0$.

With due consideration of these relationships, $L_p$ and $C_p$ are proportioned so that:

1) At $f_1$, the reactance of $L_p$ is of such magnitude that the resistance component of the equivalent series circuit of $C_p$ in parallel with $Z_2$ equals the resistance component of the equivalent series circuit of $L_p$ in parallel with $Z_0$.

This is a relatively complicated set of conditions to meet, since $L_p$ and $C_p$ across their respective resistances must produce equal resistance components of the equivalent series circuits on $f_1$, and, at the same time, do the same on $f_2$. (The $f_1$ value of equivalent series resistance will be different than the $f_2$ value, of course.)

Through the use of basic formula (10) setting up the resistance components of the equivalent series circuits of $L_p$ in parallel with $Z_0$, and $C_p$ in parallel with the d.p.i., to be equal, as was stated above, on $f_1$ we have

$$
\frac{Z_0}{1 + \left(\frac{Z_0}{X_{L_p}}\right)^2} = \frac{Z_1}{1 + \left(\frac{Z_1}{X_{C_p}}\right)^2}
$$

and on $f_2$ we have

$$
\frac{Z_0}{1 + \left(\frac{Z_0}{K X_{L_p}}\right)^2} = \frac{Z_0}{1 + \left(\frac{Z_0}{K X_{C_p}}\right)^2}.
$$

Simultaneous solution of these two expressions gives the reactance of $L_p$ and $C_p$ at the $f_1$ frequency as

$$
X_{L_p} = \frac{\sqrt{K^2 Z_2 - \frac{Z_1}{K^2} \left(\frac{Z_0}{Z_1} - 1\right) + Z_1 \left(1 - \frac{Z_0}{Z_2}\right)}}{K^2 Z_2 - \frac{Z_1}{K^2}} \text{ ohms (18)}
$$

and

$$
X_{C_p} = K \sqrt{\frac{K^2 Z_2 - \frac{Z_1}{K^2}}{K^2 Z_1 \left(\frac{Z_0}{Z_1} - 1\right) + Z_2 \left(1 - \frac{Z_1}{Z_0}\right)}} \text{ ohms, (19)}
$$

respectively.

The reactances of both sets of $L_p$ and $C_p$ are simultaneously proportioned so that:

1) At $f_1$, the total net reactance, $X_{B1}$, is equal in magnitude but opposite in sign to the algebraic sum of the reactance components of the two equivalent series circuits of $L_p$ in parallel with $Z_0$ and $C_p$ in parallel with $Z_1$; and

\footnote{Box 6023, Kansas City 4, Mo.}
2) At \( f_2 \), the total net reactance, \( X_{R2} \), likewise balances out the algebraic sum of the two reactance components of the equivalent series circuits of \( L_p \) in parallel with \( Z_0 \) and \( C_P \) in parallel with \( Z_2 \).

Then, from basic formula (11), the total net balancing reactance necessary on \( f_1 \) is

\[
X_{B1} = \frac{X_{CP}}{1 + \left( \frac{X_{CP}}{Z_1} \right)^2} - \frac{X_{LP}}{1 + \left( \frac{X_{LP}}{Z_0} \right)^2} \text{ohms;}
\]

and on \( f_2 \) it is

\[
X_{B2} = \frac{K X_{CP}}{K^2 + \left( \frac{X_{CP}}{Z_2} \right)^2} - \frac{K X_{LP}}{1 + \left( \frac{K X_{LP}}{Z_0} \right)^2} \text{ohms.}
\]

It happens that as long as \( Z_1 < Z_0 < Z_2 \), \( X_{B1} \) will be capacitive and \( X_{B2} \) will be inductive. This complies with condition (3) of the basic series circuit of Fig. 1. Then, from basic formulas (1) and (2), the reactance of each \( L_0 \) and each \( C_0 \) at the \( f_1 \) frequency is

\[
X_{LS} = \frac{K X_{B2} - X_{B1}}{2(K^2 - 1)} \text{ohms} \quad (20)
\]

and

\[
X_{CS} = \frac{K X_{B2} - X_{B1}}{2(K^2 - 1)} \text{ohms} \quad (21)
\]

respectively.

Perhaps it is well to point out that the use of the network of Fig. 6 is not strictly limited to the case of \( Z_1 < Z_0 < Z_2 \), but nearly so. Its usefulness actually extends somewhat into the workable ranges of the other two networks. \( Z_1 \) must always be less than \( Z_2 \) in this network, but \( Z_0 \) may be anywhere within a range of from slightly less than \( Z_2 \) to somewhat greater than \( Z_2 \), the limits depending upon the relationship between \( Z_1 \) and \( Z_2 \). The lowest possible value of

\[
Z_0 = \frac{K^2 Z_2 - Z_1}{K^2 Z_2 - Z_1} \text{ohms,}
\]

and occurs when the denominator of formula (18) is zero, which gives a value of \( \infty \) for \( X_{LP} \) and, in turn, an open circuit for \( L_P \). The highest possible value of

\[
Z_0 = \frac{Z_2(K^2 - 1)}{K^2 Z_2 - Z_1} \text{ohms,}
\]

and occurs when the denominator of formula (19) is zero, which, in turn, yields an open circuit for \( C_P \). If the denominator in the expression above is zero or negative, it simply indicates that \( Z_0 \) has no upper limit.

When \( Z_0 > Z_2 \), both \( X_{B1} \) and \( X_{B2} \) are capacitive and, when \( Z_0 < Z_1 \), both are inductive. Then, the values of \( X_{B1} \) and \( X_{B2} \) must completely satisfy either condition (1) or (2) of the basic circuit of Fig. 1, or this circuit is unworkable. When they do, formulas (20) and (21) are applicable, of course. When they don’t satisfy either condition in its entirety, which is most likely to happen when \( Z_0 \) is near either of its workable limits, each set of balancing reactors must be made up of a series-parallel combination of three, instead of two, elements. This is hardly worth while since the networks of Figs. 5 and 7 handle such cases nicely.

Such a difficulty will not arise if the use of this network is strictly confined to the general case of \( Z_1 < Z_0 < Z_2 \).

**Case of \( Z_1 \) and \( Z_2 < Z_0 \)**

This general case covers such systems as a current-fed doublet or long wire at \( f_1 \), also operating on any odd harmonic, \( f_2 \), of \( f_1 \), such as operation on 7 and 21 Mc., using 300- or 600-ohm line. These antennas are current fed on \( f_2 \) also.

The network of Fig. 7 is suitable for this general case of \( Z_1 \) and \( Z_2 < Z_0 \).

The reactance of \( L_P \) and \( C_P \) in Fig. 7 is proportioned so that:

1) At \( f_1 \), the net reactance, \( X_{PI} \), is inductive and of such magnitude that the resistance component of the equivalent series circuit of \( X_{PI} \) in parallel with \( Z_0 \) equals \( Z_1 \); and

2) At \( f_2 \), the net reactance, \( X_{P2} \), is capacitive and of the proper magnitude to establish the correct transformer ratio between \( Z_0 \) and \( Z_2 \).

Since \( X_{PI} \) is inductive and \( X_{P2} \) is capacitive, condition (3) of the basic parallel circuit of Fig. 2 is satisfied. Then, from basic formula (12), the required net reactance of \( L_P \) and \( C_P \) at \( f_1 \) is

\[
X_{PI} = Z_0 \sqrt{\frac{Z_1}{Z_0 - Z_1}} \text{ohms;}
\]

and at \( f_2 \) it is

\[
X_{P2} = -Z_0 \sqrt{\frac{Z_2}{Z_0 - Z_2}} \text{ohms.}
\]

**Terminology**

- \( f_0 \) — Resonant frequency.
- \( f_1 \) — Lower operating frequency.
- \( f_2 \) — Higher operating frequency.
- \( K \) — Frequency ratio = \( f_2/f_1 \).
- \( Z_0 \) — Characteristic impedance of transmission line.
- d.p.i. — Driving-point impedance (general).
- \( Z_1 \) — d.p.i. at \( f_1 \).
- \( Z_2 \) — d.p.i. at \( f_2 \).
- \( L_P \) — Parallel inductor.
- \( X_{LP} \) — Reactance of \( L_P \) at \( f_1 \).
- \( C_P \) — Parallel capacitor.
- \( X_{CP} \) — Reactance of \( C_P \) at \( f_1 \).
- \( L_0 \) — Series inductor.
- \( X_{LS} \) — Reactance of \( L_0 \) at \( f_1 \).
- \( C_0 \) — Series capacitor.
- \( X_{CS} \) — Reactance of \( C_0 \) at \( f_1 \).
- \( X_{PI} \) — Net parallel reactance at \( f_1 \).
- \( X_{P2} \) — Net parallel reactance at \( f_2 \).
- \( X_{B1} \) — Net balancing reactance at \( f_1 \).
- \( X_{B2} \) — Net balancing reactance at \( f_2 \).
From basic formulas (3) and (4), the reactance of \( L_p \) and \( G_p \) at the \( f_1 \) frequency is
\[
X_{p1} = \frac{X_{p1} (K^2 - 1)}{K (K - X_{p1})} \text{ ohms (22)}
\]
and
\[
X_{p2} = \frac{X_{p2} (K^2 - 1)}{X_{p1} - K} \text{ ohms, (23)}
\]
respectively.

The reactances of both sets of \( L_s \) and \( C_s \) are simultaneously proportioned so that:
1) At \( f_1 \), the total net reactance, \( X_{B1} \), is equal in magnitude but opposite in sign to the reactance component of the equivalent series circuit of \( X_{p1} \) in parallel with \( Z_0 \);

2) At \( f_2 \), the total net reactance, \( X_{B2} \), likewise balances out the reactance component of the equivalent series circuit of \( X_{p2} \) in parallel with \( Z_0 \).

Then \( X_{B1} \) must be capacitive and \( X_{B2} \) inductive. This satisfies condition (3) of the basic series circuit of Fig. 1. Therefore, from basic formula (13), the required total net reactance of \( L_s \) and \( C_s \) at \( f_1 \) is
\[
X_{B1} = -Z_1 \sqrt{\frac{Z_0}{Z_1} - 1} \text{ ohms;}
\]
and at \( f_2 \) it is
\[
X_{B2} = Z_2 \sqrt{\frac{Z_0}{Z_2} - 1} \text{ ohms.}
\]

From basic formulas (1) and (2), the reactance of each \( L_s \) and each \( C_s \) at the \( f_1 \) frequency is
\[
X_{1s} = \frac{KX_{B2} - X_{B1}}{2(K^2 - 1)} \text{ ohms, (24)}
\]
and
\[
X_{Cs} = \frac{K(X_{B2} - KX_{B1})}{2(K^2 - 1)} \text{ ohms, (25)}
\]
respectively.

**Capacitor Voltages**

Since the voltage across the capacitors is almost always of a different value on \( f_1 \) than on \( f_2 \), it is necessary to know the greater in order to determine safe ratings. In some instances, it is apparent from the network diagram at which operating frequency a certain capacitor will have the greatest voltage across it. In others, it is feasible to find the voltage at both \( f_1 \) and \( f_2 \). The values of voltage given here are the peak unmodulated values. \( W \) is the transmitter's power output in watts.

Network of Fig. 5:
The greatest voltage across \( C_p \) occurs at the frequency having the greatest d.p.i. Then, using the larger of \( Z_1 \) and \( Z_2 \), this voltage equals
\[
\sqrt{2W} \left(\frac{1}{\text{d.p.i.}}\right).
\]
The greatest voltage across \( C_s \) occurs at \( f_1 \), and equals
\[
X_{Cs} \sqrt{\frac{2W}{Z_0}}.
\]

Network of Fig. 6:
Since \( Z_2 \) is always larger than \( Z_1 \) in this network, the greatest voltage across \( C_p \) occurs at \( f_2 \), and equals
\[
\sqrt{2WZ_2}.
\]
The greatest voltage across \( C_s \) may occur at either frequency. At \( f_1 \) it equals
\[
X_{Cs} \sqrt{\frac{2W}{Z_1}},
\]
and at \( f_2 \) it equals
\[
X_{Cs} \sqrt{\frac{2W}{\sqrt{K^2Z_2}}},
\]
A substantial margin of safety should be allowed because of tuning variations and possible error in determining the d.p.i.'s.

**Tuning**

If we could determine the d.p.i.'s, construct the inductors and set the capacitors exactly, we could realize an s.w.r. of unity on both frequencies without the necessity of tuning the network. But unfortunately some error exists, especially in determining the d.p.i.'s, resulting in some increase in s.w.r. At the lower transformer ratios, the effect of these errors is comparatively small, and tuning, in many cases, can be disregarded.
However, at the higher transformer ratios, especially in the case of the close-spaced parasitic type of array, tuning the network is well worth while.

If we could tune both the network's inductors and capacitors, using the correct procedure, we could bring about an s.w.r. of unity on both bands even if the d.p.i.'s are not determined very accurately, or even if they are somewhat reactive. Such a tuning procedure would be difficult and would necessarily have many variations in order to fit all individual cases. A satisfactory compromise is to construct the inductors as accurately as is convenient (formula method has been found satisfactory) and tune the capacitors for minimum s.w.r. on each band. Tuning these capacitors cannot bring about an s.w.r. of unity as long as any error exists; it can only reduce to a considerable degree what might be an intolerably high s.w.r. It is not a "cure-all" for these errors, but merely provides a convenient method of reducing their effect.

It happens that in present-day radiating systems, at least in those commonly used by amateurs, \( K > \frac{Z_2}{Z_0} \). When this relation is satisfied, using any of these networks, the series capacitors have their greatest effect upon the \( f_1 \) s.w.r., while the parallel capacitor has its greatest effect upon the \( f_2 \) s.w.r. This means that the series capacitors should be simultaneously tuned for lowest s.w.r. on \( f_1 \), while the parallel capacitor is used on \( f_2 \).

In most cases, tuning on one band will affect the other, especially when the transformer ratios are low. This is even more pronounced when using the networks of Figs. 5 and 7. Then, it makes little difference upon which band we start tuning. When the transformer ratios are high in the network of Fig. 6, such as in close-spaced parasitic arrays, tuning on \( f_2 \) has no noticeable effect upon the \( f_1 \) s.w.r., so if tuning is done on \( f_1 \), only one complete tuning operation is necessary. All parasitic elements should be in their final operating condition before final tuning of the network is done. It seems best to have the network entirely out of the system while adjusting the parasitic elements, using a "tuned feeder" to excite the driven element. Then, after the parasitic elements have been tuned for the radiation pattern desired, the network can be connected and tuned for lowest s.w.r. on each band.

**Driving-Point Impedance**

All the network formulas in this article assume that the d.p.i. is purely resistive on both \( f_1 \) and \( f_2 \).

The d.p.i. is purely resistive only when the antenna is of some self-resonant length, unless, of course, the antenna is tuned to bring about a resonant condition. When self-resonant, the d.p.i. contains only a resistance component, and it is quite easy to determine its ohmic value from its effect upon the s.w.r. of an unmatched line. The d.p.i. of a self-resonant unmatched antenna equals

\[
\frac{Z_0}{\text{s.w.r.}}
\]

when the d.p.i. < \( Z_0 \), and equals

\[
(\text{Z}_0) \; (\text{s.w.r.}) \; \text{ohms}
\]

when the d.p.i. > \( Z_0 \).

A deviation from the self-resonant length increases the s.w.r. on this unmatched line, causing the answers to these simple formulas to be too low when \( Z_0 > \text{d.p.i.} \), and to be too great when \( Z_0 < \text{d.p.i.} \). Irrespective of whether the antenna is fed at a high-voltage or a high-current point, the reactance component of the d.p.i. changes much more rapidly than the resistance component. Even when the entire d.p.i. is properly considered to be a vector quantity, the change in the reactance contributes more to the increase in s.w.r. than the change in the resistance component. Since the resistance component of the d.p.i. is the power-handling agent, so to speak, and represents \( Z_1 \) or \( Z_2 \) in the network formulas — and contributes less to this increase in s.w.r. — the s.w.r. on the unmatched line is best measured when the antenna is self-resonant. (Parasitic elements should be in their final operating condition before taking this s.w.r. measurement.) Even though the reactance component of the d.p.i. can be balanced out completely when tuning up single-frequency networks, and to a considerable degree in these two-band systems, an increase in s.w.r. resulting from the presence of some reactance in the driving point will cause error when using the above simple formulas to find the value of d.p.i., and, in turn, cause some error in computing the values of the network's inductors.

The actual values of both the resistance and reactance components of a reactive d.p.i. can be found, and formulas for doing so were given previously. Even though two-band network formulas capable of handling known values of reactive d.p.i.'s can be derived, they would necessarily be quite cumbersome and comparatively difficult to handle. It is easier to start with the antenna in a self-resonant condition.

An antenna, self-resonant at \( f_1 \), probably isn't exactly self-resonant at an exact harmonic of \( f_1 \), because of such factors as:

1) The 5% of \( \frac{1}{2} \lambda \) shortening, to compensate for end effects at \( f_1 \), becomes 10% of \( \frac{3}{4} \lambda \) at the second harmonic of \( f_1 \), 15% at the third, etc.;

2) The antenna's distance from ground and other objects, measured in wavelengths, is greater at \( f_2 \); and

3) In the case of a parasitic array, the parasitic

(Continued on page 110)
**What MARS Offers the Amateur**

This space, made available regularly to the Military Amateur Radio System through the cooperation of the ARRL, is usually devoted to activities within the MARS. Readers of *QST* who have followed these reports have literally swamped MARS Headquarters in Washington with requests for more information about the System and how they can become members.

_How To Join_— The MARS was activated in November, 1948, as a joint operation of the Army and the Air Force. Membership presently is restricted to an individual in the active military service or one of its civilian components (ORC, National Guard, ROTC, USNR, etc.) who possesses a valid ham license. Proposed legislation (now before the Bureau of the Budget) would authorize the extension of the MARS to admit qualified civilian radio amateurs who have no military affiliation. The major purpose of the MARS is to foster and encourage amateur radio operations to the maximum extent possible and to coordinate practices and procedures in amateur radio operations with those of military radio communications. The MARS director at your nearest Army Area or Air Force headquarters is prepared to assist you in establishing eligibility for MARS membership.

**What MARS Offers the Member**

_Retirement Credits_— One retirement credit is given for each three hours of MARS network participation (not necessarily consecutive) to each Army reservist who has a signal communications assignment.

_Spare Parts_— The armed forces have a stockpile of radio parts which is excess to military requirements. Most of these parts are obsolete for military usage but are just right for the “junk box.”

_Instruction and Training Aids_— Policy directives and information are sent to member stations from MARS Headquarters via Army and Air Force networks. Joint Army-Navy-Air Procedures (JANAP) and Standing Operating Procedures (SOP) are taught and practiced on MARS nets. Studies relating to electronics and radio communications appear in the _MARS Bulletin_, the official publication, distributed free to all members.

_Military Frequencies and Call Signs_— Army and Air Force frequencies have been allocated to MARS members for their exclusive use. Worldwide schedules are operated on 6997.5, 14,405, 20,994 and 27,994 kc. Military calls are assigned each member. Calls with the prefix “A” are assigned Army members and calls with the prefix “AF” to Air Force members.

_Crystals_— Each member station receives crystals for operation on military frequencies.

_Network Operation_— Live traffic is generated and handled on MARS networks. Quasi-official and personal messages help build a large traffic load.

_Service Integration_— In emergencies and disasters the MARS strives to coordinate all radio facilities. Most recent example was the August hurricane which ripped through the Florida citrus belt and lashed northward, spending itself in the Atlantic coastal states. Third Army and Fourteenth Air Force MARS Directors alerted 120 member stations on a stand-by basis in the event normal communications were disrupted. An American Red Cross mobile radio unit from Washington moved into the Fort Lauderdale, Fla., area and established contact with the MARS Headquarters station in Washington. Using a MARS call sign and operating on MARS frequencies, the mobile unit (A4ARC) transmitted 348 messages to the Washington Red Cross typewriter outlet through the MARS Headquarters station.

Col. E. S. Van Deusen, W3ECP, is a busy ham. Serving as Maryland NCS in the MARS Net and as route manager for the Md.-Del.-D.C. Section, ARRL, takes a lot of his time but he has never lost his hankering for a friendly rag chew.

_QST for_
One of the purposes of this column is to record the amateur "firsts" as they come along in the single-sideband field, and we have a honey for you this month. Credit for the first amateur trans-Atlantic two-way single-sideband contact goes to John Erhart, W2TGO, of Long Branch, N. J., and Leo Jensen, DL4PA, Heidelberg, Germany. They made it on Sept. 9th, and both stations were using single-sideband suppressed-carrier when the contact was established on 14,240 kc. They were QSO for over an hour in the early evening.

Not too far behind (Sept. 29th) came the first single-sideband three-way, with W2EB, W4INL and DL4PA holding down the fort with a solid contact for 1 hour and 50 minutes. No dope on W4INL, but "Yoe" of W2EB is running 250 watts peak. From here on, it looks like we'll have to shoot for the first three-continent single-sideband QSO or the first WAC!

The first Canadian amateurs that we have heard about on single sideband are VE2VV and VE2SA of Verdun. We have no dope on VE2SA yet, but A. Lawruk, VE2VV, uses a filter rig on 75, running about 30 watts. Time is limited at VE2VY and his best two-way on single sideband so far is W2VVC. Plans are in the works at VE2VV for increasing power and the addition of 20-meter operation.

None of the local soothsayers will venture to say what magic there is about the letter combination "SHN," but the fact remains that W1SHN and W2SHN are both on the air with single sideband. You know about W1SHN on 75 already — Millard Hoagland. W2SHN, at Dryden, N. Y., has a duplicate of the W2UNJ exciter on 75 and kicks a pair of 813s to about 900 watts peak.

Sidney Rexford, W2TBZ/2, at Forth Monmouth, N. J., has a version of the W6DHG rig using 6V6s instead of 6L6s. So far he has only been running 6 or 7 watts peak on 75 with this outfit directly into the antenna, but he gets out fine around the Atlantic seaboard. The whole rig plus power supplies is on a single chassis, and it "worked the first time."

Frank Wedge, W9BVU, of Marinette, Wis., has a filter rig that ends up with a pair of T220s running about 120 watts peak. Frank schedules W3MBY week-end afternoons on 14,220 kc., where they are often joined by W9MNN and W9MO. We don't have anything on W9MO at present, but if he uses a filter rig it will make that group 100 per cent filter users.

Anyone working toward a single-sideband WAS can take heart in the knowledge that Rhode Island is now represented in the ranks by Al Hyde, W1GR, at Cranston. Al's rig is patterned after the phasing job of W2KUJ, and the final is an 829 running 100 watts peak on either 20 or 75. He seems to like the stuff, and says the 829 has really surprised him. "... After running 1 kw. on a.m. 'phone for so many years I am very well pleased with single sideband and the excellent reports and ability to get through QRK. . . . I'm on single sideband to stay."

A few months ago we mentioned in this column that now all districts were represented by single-sideband stations, but when W4OLL asked who was on in W8 we checked back and found no one had been recorded from there. It is still a holdout in our records — are there any W8s on with the stuff?

— B. G.
A.R.R.L. QSL BUREAU

As a service to American and Canadian amateurs, ARRL maintains a QSL Bureau to make it easy for you to get your cards from foreign stations. Here is how it works: When you work a DX ham, you ask him to QSL via ARRL, then send a stamped, self-addressed stationer's size No. 10 envelope to the QSL manager for your call area, whose address is listed below. When he has an envelope full of cards for you, he drops it in the mail. Upon its receipt, you should immediately send another such envelope so that the QSL manager always has at least one on file for you.

If you've had a different call before, send an envelope to the manager for that call area; all cards are routed to the home district as shown in the call.

Best bet on handling cards for foreign amateurs is to send them to appropriate bureaus as listed on page 50, June QST.

W1, K1 — Frederick W. Reynolds, W1JNX, 83 Needham St., Dedham, Mass.
W2, K2 — Henry W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.
W3, K3 — Jesse Biebman, W3KY, Box 34, Philadelphia, Pa.
W4, K4 — Johnny Dorch, W4DDF, 1611 East Cahal Ave., Nashville, Tenn.
W5, K5 — L. W. May, jr., W5AGJ, 9128 Hobart St., Dallas 18, Texas
W6, K6 — Horace R. Greer, W6TF, 414 Fairmount St., Oakland, Calif.
W7, K7 — Bob Donovan, W7EYS, 1530 Fairview St., Bellingham, Wash.
W8, K8 — William B. Davis, W8JN, 4228 W. 217th St., Cleveland 18, Ohio
W9, K9 — John F. Schneider, W9CPT, 311 W. Ross Ave., Waukegan, Ill.
W9, K9 — Alva A. Smith, W9DMA, 238 East Main St., Caledonia, Minn.
VE1 — L. J. Ecker, VE1FQ, 125 Henry St., Halifax, N. S.
VE2 — Austin A. W. Smith, VE2UW, 6164 Jeanne Mane, Montreal 8, Que.
VE3 — W. Bert Knowles, VE3QB, Lanzar, Ont.
VE4 — Len Cuff, VE4LC, 286 Rutland St., St. James, Man.
VE5 — Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Sask.
VE6 — W. R. Savage, VE6EO, 329 15th St., North, Lethbridge, Alta.
VE7 — H. R. Hough, VE7HR, 1785 Emerson St., Victoria, B. C.
VE8 — Jack Spall, VE8AS, P. O. Box 268, Whitehorse, Y. T.
KP4 — E. W. Mayer, KP4KD, P. O. Box 1061, San Juan, P. R.
KZ5 — C.Z.A.R.A., Box 407, Balboa, Canal Zone
KLQ — Andy H. Fachikami, KLQBA, 2049 Nanaimo Dr., Honolulu, T. H.
KL7 — J. W. McKinley KL7CK, Box 1533, Juneau, Alaska

FEED-BACK

In Table I of W1WV's October article, "Your Beam — Will It Stay Up?,” the potentials for magnesium through lead should have carried a negative sign, those for copper through gold a positive sign.

Silent Keys

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

W2DLR, Ernest H. Newman, Seaford, L. I., N. Y.
W3LLU, Claude V. Tryon, Feura Bush, N. Y.
W3AWM, Charles J. Walter, Washington, D. C.
W3HKB, Robert E. Topham, Washington, D. C.
W3KM, Robert L. Linthicum, Washington, D. C.
W3LYT, William M. Adkins, Shickshinny, Penna.
W3RS, William T. Daw, Pittsburgh, Penna.
W3T3, Norman Bernstein, Philadelphia, Penna.
Ex-W5JPB, Paul L. Talley, Dallas, Texas
W5LIV, KL7UH, Maj. Robert G. Dunphy
W6AQD, Harold N. Jackson, Monrovia, Calif.
W6LTN, George W. Werner, Jr., Berkeley, Calif.
W9EJH, Lonnie H. Webb, Indianapolis, Ind.
W9QFF, Dr. Hugh F. Bowers, Belleville, Ill.
W9HFF, Harry T. Hauley, Minneapolis, Minn.
VE1KE, Dr. Robert L. Ellis, Jacquet River, N. B.
VE7RN, ex-VE5RN, Clarence E. Curver, Victoria, B. C.

Strays

In many ham rigs a 'phone jack is wired in the cathode circuit of an r.f. amplifier to allow external metering of the stage. One side of the jack is placed at ground potential; therefore it is thought that all is safe — a most dangerous assumption. If the amateur uses a portable test meter everything is OK so long as the external circuit is kept closed. However, most test meters have small pin jacks for different ranges. If the amateur decides to change the range, what happens? He opens the external circuit and in so doing has carelessly placed the full plate voltage of the amplifier in his hands.

Switch to Safety! Shunt the jack with a 50-ohm resistor. This will not upset the meter reading yet it will protect the operator.

— Martha M. McVey, W7KCU
WHAT is the limit of the working range on
144 Mc. when conditions are right? A few
years ago we might have guessed that it
would be about 300 miles, and so it seems to be,
even under fairly good conditions. But we have
long since become accustomed to occasional
openings that provide strong signals at 400 to 600
miles and more. When these chances come along
the greatest distance worked is almost always
limited by the available activity, rather than by
weak signals. The western end of all our recent
record-breaking contacts has been the end of the
line of activity on the particular night when the
opportunity broke.

This was true on the night of September 16th.
At 8:30 W4JFV, who operates from a 3900-foot
elevation, 12 miles southwest of Roanoke, Va.,
noticed that the TV channels were showing
interference. Turning on his 2-meter receiver he
found the band full of DX. One of the first
stations identified was W0EMS, Adair, Iowa! At 8:42 contact was made with W9GZQ, Losant­
ville, Ind., followed by twenty QSOs with Ohio,
Indiana, and Illinois stations, at distances from
200 to 650 miles. W4JFV was on 147 Mc. —
he was having trouble getting fellows to tune
that high!

W0WGZ, Grinnell, Iowa, 770 miles, was worked
at 10:10, and W0EMS was contacted at midnight,
for a new record of 860 miles. W0EMS was
running S5 to 6 and he reported W4JFV S3 to 5.
The QSO started on c.w., but voice was used after
the initial contact. W0EMS attempted to
raise someone farther west, but no one could be
found, and another new record went begging! The rig at W4JFV is a 522 exciter driving an 829
amplifier at 80 watts input, feeding a 6-element
horizontal array. The receiver is a broad-band
converter with 6J6 preamplifier, working into an
HQ-129. He would like to use a bigger beam, but
80-mile-an-hour winds and frequent icing are
factors to be reckoned with at this mountain
location.

Signals heard included W0s BJL, DEN and
ZJB, and 10 states were logged. W0EMS reports
working W8EP, Terra Alta, W. Va., 800 miles,
and W3RUE, Pittsburgh, Penna., 760 miles, the
same evening. W4JFV regrets that he was unable
to work all the stations calling for a Virginia
contact. One of the more persistent was W9HKQ.

who heard the initial contact made by W4JFV
and kept after him until 12:39, when he finally
made the grade! Besides W4JFV, W0WGZ
worked two stations in Pennsylvania, five in
Ohio, and several in Indiana. His 434-Mc. signals
were heard by W9MBI, Coleta, Ill., a distance
of 150 miles.

The fall equinoctial period also brought the
50-Mc. band back into the DX limelight. HC20T
found 6 open the first time on Aug. 23rd, when he
worked LU1BV at 8:47 P.M. EST. LU9MA was
worked the following evening at 8:55. YV5AC
and YV5BX were joined in a three-way with
HC20T on the 30th, and LU9MA and LU6DO
were worked the following evening. Venezuela
was worked on Sept. 2nd, 5th, 6th, 8th, and 16th,
with YV5s AC, AE and BX handling the YV
end. Mexico openings on the 6th, 7th, 9th, 10th,
13th, 14th and 16th brought QSOs with XEs
1GE, 1FU, 1QE and 2C. CX3AA was worked
on the 13th. Steve worked W6PUZ on the 9th,
and Don called W6WSQ and W60B to get them
in on the opening. This was the first time that
HC20T has heard the band open to both Mexico

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and this country at the same time. W6FPUZ had just worked W5JLY, and was still audible in San Antonio during the South American contact, but W5JLY was unable to hear HC2OT. W6FPV, Van Nuys, Calif., reports working LU9MA at 5 p.m. PST on Sept. 10th.

Here and There on 6 and 2

For some time 6-meter enthuasiasts have hoped to work KL7 by keeping skeds with KL7UH-W6WLV. Now, from KL7WK, comes the sad news that M/Sgt. Robert G. Duphmy was killed in the performance of his duty on Sept. 2nd. No other details have been received. Bob put Jima on the 50-Mc. map, by working Okinawa and Japan, and he was active on 6 under his Stateside call in San Antonio, before going to Alaska. As KL7UH he was one of the few Alaskan stations set up to operate on 50 Mc.

Lancing, Ontario — In every v.h.f. contest to date somebody has managed to work one or more VE3s on 50 Mc, by means of aurora reflection. This would seem to indicate that 6 is open for that sort of propagation much more often than we ordinarily notice. VE3ATP notes that there is something doing on 50 Mc. in the Toronto area almost every evening, with VE3A NY, AXT, ARB, BKQ, DDT, ATB, BYZ, AJJ, AFV and AET supplying most of the activity. Moral — when you hear signs of aurora effect on lower bands, keep an eye on that frequency, and see if northern sky加拿大地平线插在的, aim the beam north, and make some calls.

Siber Spring, Md. — There is regular 50-Me. activity in the Washington area. The stations in that region, including W4LVA, W3s AHIQ, MPD, OTC and KMY, meet each Monday and Thursday night at 10 o'clock. They are active at random times, too, and they ask that 6-meter enthusiasts in Baltimore, Philadelphia, and other cities keep an eye out for them.

South Norwalk, Conn. — W1MIQ advises that JA2AZ is now set up to operate on 50 Mc. He would be glad to hear from any of the 6-meter gang who would like to add Japan to their 50-Mc. countries lists.

South Carolina, Calif. — According to K6BF (ex-XElKE) Argentine beginning must work one year on 50 Mc, before being allowed to operate on any lower band. "BJ" thinks this might be a good idea in this country, too. In the intervals between checking the 6-meter band, K6BF has been working on 2. Contacts are made regularly as far south as San Diego, 190 miles away, and the coastal regions in between are easy.

Collerville, Tenn. — In between regular schedules with WS5YJ and WS2JTJ, W4FBJ, Glasgow, Ky., and W4FWII, Nashville, all 150 to 200 miles distant, W4HHi got some good 2-meter openings during September. On the 2nd Paul worked WS9KI, Rantoul, Ill., and WS8UV, Aronica, both on 350 to 400 miles. W8EIIH, McLean, Ill., was worked on the 10th. The bright night was the 14th. Listening to the northeast Paul heard WS8QFQ, apparently in a local rag chew, running a steady S5. This was too much for Paul, so he put in a landline call to WSUKS. This didn't work either, so W8WJC was 'phoned and informed that WSUKS was 'phoned and informed of reception of WS8QFQ down in the southwest corner of Tennessee. After several tries they made contact on 2 at 10:28, W8F9Q and WSUKS were worked soon after. These contacts are 625 and 650 miles respectively.

Nashville, Tenn. — Though he is less than 200 miles east of W4HHi, W4FJF finds that conditions vary considerably between the two locations. An example: When W4HHi worked WS8UKS and W8WJC, as reported above, W4FJF heard the W9s, but it was not until the night of the 18th that he was able to work them, and W9UCH in Fort Wayne, Ind. This same evening he heard a WS9 calling CQs, but he couldn't hear that all the 2-meter DX he has ever heard has come through after 8 P.M., and wonders whether other operators find it the same. We feel sure that some schedules between sunrise and about 11 A.M. would help to take some of the nighttime DX away, but we know from years of experience that Sunday-morning operation can turn up some very surprising results. This applies to 50 Mc. as well as 144, and it should be a good header for those who want to extend their coverage on 220 and 420 also.

Terrace, Ala., W. Va. — The 2-meter band was open at W8ECP during the afternoon of the 16th, but very few stations were active, and things didn't really begin to break until 10:30 P.M. "Smokie" had just put up a beam on a near-by hill, requiring 300 feet of open-wire line, and it worked out very well. During the evening 22 stations were worked, 19 of which had not been contacted previously. WS8EM and W88JL was the best DX.

Medora, Calif. — Having had excellent results with rhombic antennas on lower frequencies, W8EPE decided to try one when he went to 144 Mc. His vertical 2-meter job was 12 feet on a side and 14 feet 8 inches high. Ter-
CONTESTS
18 W. Summerfield Ave., Collingswood, N. J.
Editor, QST:

Probably I have been messing around with ham radio too long, or possibly getting too old, or even needing sleep, but I say let us have done with these bughouse contests. After listening to a great number of them I cannot possibly understand what is being accomplished.

The apparent accomplishment, from my viewpoint, seems just about summed up in one big mess of QRM with no one getting anywhere. You hear the boys with their bugs all screwed up tight trying to send high-speed stuff. This sounds great but after all you have only to copy the other fellow's call and check. The 'phone boys are just as bad with high-speed returns and off before they have completed the QSO.

Ham radio was built on contests, the sort where you get to know the other fellow, swap dope on your rig for the dope on his, talk about new gear, just plain fellowship. How can you get to know the other fellow when your entire contact can be completed in something less than a minute? I know that I am not a single voice crying out just about summed up in something less than a minute? I know that I am not a single voice crying out in the wilderness; there are many that have the same feeling.

It must be nice to see your call on the top of the list with fourteen million points, and only costing a night's sleep. The gratification must be great, particularly when you know that to accomplish this you did it all alone, except for the four or five other fellows who were manning search receivers for you, and reporting on another h.f. band.

While writing this my receiver has been set on 14,030 and I work in Trenton, N. J., and get home to N.Y.C. only on weekends. Upon arriving home last week I found a form complaint had been filed against my station by a neighbor a few doors down the street. Upon calling upon the complainant, I found that he had no television receiver and had merely called FCC because he had a-buzzing sound in his broadcast set.

Now this isn't the reason why I am quite peeved. The fact is, I haven't any transmitter, receiver, or antenna! I have never operated a station under my own call letters nor am I in New York City during most of the week! I have never operated a station under my own call letters...

--- Allan R. Munsey, W3ORF

YEHUDI
2107 Cropsey Avenue, Brooklyn 14, N. Y.
Editor, QST:

I work in Trenton, N. J., and get home to N.Y.C. only on weekends. Upon arriving home last week I found a form letter from FCC waiting for me. It stated that a TVI complaint had been filed against my station by a neighbor a few doors down the street. Upon calling upon the complainant, I found that he had no television receiver and had merely called FCC because he had a buzzing sound in his broadcast set.

Now this isn't the reason why I am quite peeved. The fact is, I haven't any transmitter, receiver, or even an antenna! I have never operated a station under my own call letters nor am I in New York City during most of the week!

--- Edward S. Miller, W2YGF

NOT REALLY!
Larchmont, N. Y.
Editor, QST:

Quoting from an article entitled "Stop Thief" in the February issue of Parent I read, "Some thieves are more ambitious. Take the..." muscle man in Palm City, California, who purloined a telephone pole...for what devious reason no one has been able to figure out."

Certainly a poor job of publicity has been done for the amateur if eighty or a hundred thousand people can be classified as "no one."

--- M. K. Bretsfelder, W6JPX

QSLs
Brentwood Heights, Calif.
Editor, QST:

In recent months, many have maligned our QSL system, deploring the low return, but I have a good word to say for foreign returns.

In the past two years I have mailed out 900 cards, all to stations outside the U.S.A. At the present time I have in hand 748 cards, excepting duplicates, received in exchange from foreign stations. That is a return of 82%. My return in this category are low compared with many local DX men, some of whom have as high as 95% received. Of course, in some tough countries I have had to work two and sometimes three stations to get a card from one. It has not been my practice to use airmail and enclosed addressed envelopes with coupons to cover airmail return. Doubtless this helps, but I can't afford it. I have sent about a dozen reply coupons, but that is all.

So, friends, don't despair. Have patience, for many cards take 18 months to 2 years to arrive. My cards have no special pulling power — W6 cards are a dime a dozen with most rare DX, so it must be a pretty general desire to play square that accounts for the above figures. I think it's mighty swell.

--- Bill Lippman, W6SN

P.O. Box 3450, Transvaal, Johannesburg, South Africa
Editor, QST:

I recently had a great struggle sorting out the W QSL cards which resulted from the 'phone contest of February and March, and as a result I should like you to make a plea that everybody should include the actual time of the contact, and not just a date as is done by some: furthermore, the time should be related to GCT. Normally, if one gets a card for a certain day it is not very difficult to identify the contact, but in a contest where there may be pages of the log for each date the hunting-up business is terrible. When designing QSL cards I think that the call sign should be repeated on the back if the information of the contact is on that side.

ZS6Z was unfortunately caught without cards at the time of the contest and there have been considerable delays in producing new ones, but by the time you receive this letter every QSL card received by me will have been acknowledged by one of mine through the QSL Bureau.

--- Arland Usher, ZS6Z

HOW MANY TURNS?
1912 Western Ave., Manitowoc, Wis.
Editor, QST:

In my opinion, an item covering the calculation of the inductances and capacitances necessary in the r.f., mixer and h.f. oscillator circuits of superheterodynes would be of inestimable value to the many construction-minded members of ARRL.

The Lightning Calculator takes the grief out of a lot of these formulas, but what about the tracking capacity? And how would one go about winding the large values of inductance necessary to cover the ranges below the h.f. band, down to 20 kc.? Also, I realize that the use of permeability-tuned (Continued on page 180)

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SIMPLE N.F.M. FOR 75-METER 'PHONE

Shown in Fig. 1 is an extremely simple method of obtaining an excellent n.f.m. signal for use in the 75-meter 'phone band. The scheme amplitude-modulates the plate and screen of a 6SK7 VFO similar to the one described in both September, 1946, QST and recent editions of the Handbook. All effects of the amplitude modulation are washed out in the following stages, because they are operated under Class C conditions, thus leaving only the f.m. component.

Fig. 1 — Simple method of obtaining an n.f.m. signal for 75-meter 'phone-band operation. The plate and screen of a high-C VFO are amplitude-modulated as shown. The diagram is adapted from that of the VFO described in QST for September, 1946.

The audio is applied to the oscillator by inserting the secondary (500-ohm tap) of the output transformer of a low-power speech amplifier in the common lead to the plate and screen of the oscillator tube, as shown. In the unit described in QST, the transformer is inserted between the VR-150 and the junction of the plate and screen leads.

The conversion of my rig to n.f.m. took exactly 30 minutes using this system, and results have been very gratifying. — S. W. Thomas, W1IXO

"Q5-ER" AS VERTICAL AMPLIFIER FOR AN OSCILLOSCOPE

The "Lazy Man's Q5-er" (BC-453) makes an ideal vertical amplifier for an oscilloscope, and in so doing produces wave-envelope patterns of any signal the receiver is tuned to. The Q5-er is connected to the receiver in the usual fashion, and a lead is run from Pin 4 of the 12SR7 tube in the Q5-er to the vertical deflection plate of the 'scope tube. A linear sweep is needed, of course, but in most cases this will already be present.

In monitoring 'phone signals, percentage of modulation can be observed at a glance. Overmodulation, carrier hum, and the make and break characteristics of e.w. signals can be observed. The connection to the 12SR7 does not interfere with normal functioning of the Q5-er. — A. T. Purogloke, W1QFB

CHECKING CONDENSERS FOR DRIFT

If you have the usual junk box filled with condensers of unknown characteristics, the following scheme may be of interest to you. If you are looking for a condenser to use in a frequency-determining circuit, you want one with a low temperature coefficient. A pretty good check on those unknown micas can be made as follows:

Make up an inductance of 10 turns of No. 20 wire on a 1½-inch form. Space the winding to occupy ½ inch, and attach short clip leads to the ends of the coil. The condenser to be checked is then clipped across the coil, and the resulting LC circuit is checked with a grid-dip oscillator to determine its approximate resonant frequency. Now bring a hot soldering iron close to the condenser, and hold it there until the condenser becomes warm to the touch. Recheck the resonant frequency with the grid-dip meter. The difference between the two resonance points will give you a good idea of the advisability of using the condenser in the VFO circuit. Usually you can find which of several condensers will be least apt to cause drift with no trouble at all. — Clare B. Reynolds, W9MBI

HOMEMADE STRANDED ANTENNA WIRE

Need some stranded enameled antenna wire in a hurry? If you have some old No. 26 or No. 28 enameled wire kicking around the junk pile, take five or six strands of it, each of the required length, tack one end of each to a convenient post, and loop the other ends through a screw eye. Grip the threaded portion of the screw eye in your hand drill, stretch the wire out a bit to prevent snagging, and turn the crank on the drill until you've made about 100 turns in the wire. It works out fine. — Jack Nelson, W2FW

PROTECTION FOR SCHEMATIC DIAGRAMS

When I make a schematic diagram which I want to save as a permanent record, I paint it with colorless nail polish. Two coats will usually be enough if you draw the diagram on an
Index card or other similar material. "Varnishing" diagrams in this way saves them from wear and tear. The same treatment is useful to keep hand-calibrated dial scales looking clean and neat. — Carolyn J. Hull, W2YCX

**QUICK QRS FOR BUG USERS**

I have found the following trick quite useful in making rapid changes in speed when using a bug key. I adjust the weights on the bug for the highest speed I normally use, and then slow it down by merely slipping a large nut over the setscrew of one of the weights. Several different nuts can be kept available at the operating position to permit speed changes to be made at an instant's notice without having to disturb the original adjustment. — Merritt E. Malvern, W20RG

**TIMESAVING CONSTRUCTION HINT**

I recently purchased one of the new square punches that are now available, and after using it for a time, find the following gadget a very useful addition to my kit of tools. It eliminates the need for spending time laying out all of the various pilot holes that must be drilled whenever a hole larger than the punch is to be cut.

A six-inch square of $\frac{3}{4}$-inch dural was obtained. On it I scribbled squares the size of my punch and drilled a $\frac{3}{4}$-inch hole through the center of each square. Now when I wish to cut a square hole of any size up to six inches, I merely scribe the lines for the hole on the chassis, fit the dural template over it, and mark the location of the required number of pilot holes through the $\frac{3}{4}$-inch holes. Care must be taken, of course, that two edges of the template line up with two edges of the hole to be cut, and that the template does not shift position while the scribing operation is being done.

The template idea is a great timesaver, as anyone who has had to cut a lot of chassis holes with a square punch will agree. — S/Sgt. William C. Schaefer

**INCREASING SENSITIVITY OF NEON BULBS**

In the course of tracking down parasitics in a new rig, I had need for a more sensitive indicator than the usual neon bulb. It was remembered that in some radar units a "keep-alive" voltage was used to keep the gas in the "T-R" boxes ionized, and the following scheme was evolved to apply a similar voltage to a neon tube.

A half-megohm potentiometer was used to form a voltage divider by connecting the outside terminals of the potentiometer across the 115-volt a.c. line. Then a small neon bulb (NE-2, 1/4-watt, resistorless) was connected between the tap on the potentiometer and one side of the line. Thus, by turning the potentiometer, the voltage across the neon bulb can be varied until it is just below the point at which the tube glows. In this condition, very little additional voltage is needed to cause the bulb to glow, and a very sensitive indicator results.

The neon bulb can be mounted at the end of a 4- or 5-inch length of bakelite tubing, which then serves as a probe with which to dig into out-of-the-way places inside your rig. The leads to the bulb can be run inside of the tubing.

In addition to being a simple gadget to construct, this little indicator has the advantage of being very sensitive to r.f. fields, yet it is discriminative enough to enable one to pick out the "hot" lead in a crowded chassis. — Midshipman Robert A. Brown, USN, W8COS

**BIAS SYSTEM FOR CLASS-B MODULATORS**

Shown in Fig. 2 is an arrangement that can be used to provide bias for the Class B modulator set-up encountered in most medium-power ham rigs. The scheme makes use of the constant drop of about 15 volts obtained with mercury-vapor rectifiers. Type 83s are shown in the diagram, and they provide about 30 volts of bias. Adding a third tube and transformer will boost this to 45 volts, and so on. Larger tubes, such as the 866, should be used in installations where higher peak currents are encountered. The filament transformers need not be insulated for high voltage.

— R. T. McFarland, W8SKT

(Continued on page 188)
Staff Notes. Our heading pretty well tells its own story of several CD staff changes this month. The post of National Emergency Coordinator now is filled by George Hart, WINJM, whose more than ten years' Hq. staff experience should insure continued progress and success in the important field of emergency communications. He will continue to coordinate all data for Net Directories, since such facilities constitute bona fide emergency routings as required. As NEC he replaces "Doe" Hayes, W11HN, who has resigned to enter the radio publishing field and who has our good wishes. As was mentioned in this section in August QST, the functions of the ACM, C.W., closely parallel those of the AOM, 'Phone, and John Cann, W1RWS, is carrying forward the review and recommendations on operational c.w. matters. Since WINJM and W1RWS have been in ARRL staff work for some time, no further introductions to the gang should be necessary.

Lewis G. (Mac) McCoy, jr., W0ICP/1, former assistant SCM for Missouri, joins our staff as Assistant Communications Manager, 'Phone. The Missouri 'Phone Net's loss of its efficient NCS is our gain in the national operational policy-planning field for 'phone. A project already under study is review of Official 'Phone Station functions and objectives, and holders of this appointment will hear from Mac with a request for ideas. All operators working any of the 'phone bands are cordially invited to drop him a line. Give him your notions of what you like and what you don't.

A low-number 'Phone DXCC Certificate does not mean that Mac spends all his time on ten and twenty 'phone. You will find him equally on "75" and always ready for a rag chew.

For the Holidays Use ARL-Check Type Messages. With Thanksgiving and Christmas coming up, don't forget that a complete list of numbered-text messages is included on the number sheet in the back of each ARRL Logbook. (The list of 60 ARL-CK messages will be sent members gratis also on mail or radio request for CD Form 3.) Even after the holidays it is well to have the drafted texts suited to standard abbreviation on hand for possible emergency communications purposes. These greatly simplify message writing and facilitate handling accurately a volume of inquiry traffic in and out of an area in the secondary phases of disaster contingencies of different kinds.

ARL goes in the check just before the figures indicating the number of words (the count of groups appearing in the text as transmitted) to show that any text is from the ARRL Numbered Radiogram List. Also note the following additional usage:

ARL? . . . Do you have the list of ARRL Numbered Radiograms, and are you ready for such a message?  
ARL . . . I have the ARRL Numbered Radiogram List. I am ready for such a message.

Calling Frequencies and NEFs for Emergency. It is a precept that the National Emergency Frequencies as well as all local-net frequencies concerned with handling emergency traffic be kept clear by general and generous cooperation of all operating amateurs during the period of any communications emergency, either FCC-declared or of lesser proportions. The NEFs, 3550, 3875 and 7100 kc. primarily, and 14,050 and 14,225 kc. additionally for remote coverage, are to be monitored closely, both 'phone and c.w., during all communications-emergency alerts.

Just as the ham bands generally have activity at all hours, so some amateur is always ready to pick up an emergency call. It is now conceived that the NEFs may be made even more valuable, if utilized widely between emergency needs as general calling frequencies to expedite general traffic movement between amateur stations. We would use them "as the commercials use 500 kc.," not for working frequencies but as a place for all amateurs to indicate, by directive calls or indication of traffic destinations, when they have traffic to be moved. This suggestion comes from W3ADE. He writes, "Such spot frequencies would become known in all ham circles as the place for general traffic exchange at practically any time of the day or night. All amateurs could monitor such frequencies at times when not otherwise busy.”

How To Use the Calling Frequencies. The only requirement for success in using designated frequencies for calls is that general use and understanding and cooperation in this plan of operation obtain! (1) Listen on the calling frequency from the following list, in the band of your
The Victoria, B. C., AEC conducted a demonstration of their emergency communications facilities for the local Red Cross during late June. Several mobile stations cruised about the city, maintaining contact with the base station, set up at RC Headquarters. Shown here at the base station, which also showed its ability to contact stations all over the continent, are Emergency Coordinator Roy V. Farrell, VE7TG, Stephen M. Jones, VE7XX, and Alan Pratt, VE7SW.
TRAFFIC TOPICS

Take a good look at the traffic classifications in the BPL this month. It is the last time you will see them in this form in QST. Beginning with the next issue, traffic reports will be in accordance with the new traffic categories of originated, received, relayed, delivered, as explained in detail on page 66, September QST. All traffic-handlers are requested to submit their future reports to their SCMs in accordance with the new categories, if they have not already been doing so. Form 1 report cards, if they do not contain the above classifications, should no longer be used. New Form 1 cards are available upon request.

ARRL appointees voted overwhelmingly in favor of adoption of the new categories—307 votes were recorded, of which 295 were in favor of the change and 12 against it. Let's all use the new categories, and let's use them right.

It is hard to report news of the ARRL National Traffic System when the situation is constantly changing. Suffice it to say that at the present writing (mid-September) we are in the final throes of organisation, that the system is getting decent, if not unanimous, support, and that a successful season is contemplated.

This season is the trial season, and it is inevitable that there will be a few organisational difficulties. We must be careful not to be disappointed by what appears to be lack of immediate and complete success. A system as widespread and seemingly complex as the NTB takes a great deal of coordination among its members and its member groups, and this coordination, while looking fine on paper, takes time and effort in actual operation. With participation by such leaders as W2BYF (ex-WIJIN), W61MM, W9IC, W7F1X, W1BYR, W21RW, W4ANK, W4NNJ, W7CZT, W8NOH and VE2GM, all of whom have accepted managerial posts to date, to say nothing of dozens of other outstanding traffic men who have agreed to assist wherever possible, and with plenty of enthusiasm from many organized traffic nets outside this system, the new set-up can hardly help but be a howling success in the end. Plenty of work is in prospect for everyone in the beginning. Later, we may be able to taper off a bit.

Some stupendous traffic totals were rolled up during the month of August. Such “single-operator” traffic totals are almost without precedent in League history, and were made possible largely through traffic originating at fairs, exhibits, hobby shows, etc. Those of you who managed, during the month of August, to roll up a mere 500 or so message points are to be congratulated, though it is known that a terrific expenditure of time and energy is required to rack up totals such as are seen at the head of the BPL this month. Night after night of operating time is required, to say nothing of skilful arrangement of outlet contacts and source points. The boys who spend enough time and energy to run up totals in the thousands deserve any mention they get in BPL and elsewhere.

Along with the unprecedented totals, however, we receive reports of unwise and unethical practices in handling traffic. If the charges are true, they reflect a disappointing trend inimical to the grand old game of amateur traffic handling, traditionally a service rather than a competition. Let's cut it out, fellows! Let's (1) quit the same calling and (2) abide by the following rules:

1) Originated traffic must be sent by radio from your station within 48 hours after being filed, unless the originator gives his consent to a further delay; otherwise, it may not be counted in your total.
2) The same message should be sent only once to one station.
3) Messages held in your station for a period longer than 48 hours, whether for relay or delivery, are not to be counted in your traffic total.
4) “Book” messages (i.e., multiple-address messages with the same text) count only one point each time they are made or received in “book” form (see Operating at Amateur Radio Station, p. 12). It is more convenient and faster to handle such messages in book form; you get more points if you handle them singly. Service, or competition?

Contests are a lot of fun, but only if they are conducted honorably and fairly, within the intent as well as the statement of the rules governing them. Traffic handling is primarily a service to the public. It can be enhanced and made more interesting by friendly competition; when the competition ceases to be friendly, we’ll abandon it in favor of the service every time. It’s up to you, gang.

Elsewhere on these pages will be found the first installment of the ARRL Net Directory. This directory consists of all nets registered as of the first of September. Below is the following information: (1) name of net; (2) net call, if any; (3) frequency; (4) call of net manager; (5) time and days of operation.

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Rel.</th>
<th>Credit</th>
<th>Total</th>
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*July Traffic.*

The following made the BPL for deliveries:

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Rel.</th>
<th>Credit</th>
<th>Total</th>
</tr>
</thead>
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<td>W5TQX</td>
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<td>W5DEY</td>
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<td>W5GME</td>
<td>137</td>
<td>W7F1X</td>
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<td>W5CNE</td>
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<td>W7HDN</td>
<td>122</td>
<td>W1IN</td>
<td>104</td>
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</tbody>
</table>

A message total of 500 or more in a month plus extra delivery credits will put you in line for a place in the BPL. The Brass Founders League is open to all operators who qualify for this monthly listing.
NET DIRECTORY

The following nets have been registered with ARRL as of September 15, 1949. If your net is not listed, or if the listing is incorrect, we would appreciate further information. Registration data should include: (1) name of net, (2) net call, if any, (3) frequency, (4) call letters of net manager, and (5) time and days of operation.

<table>
<thead>
<tr>
<th>Name of Net</th>
<th>Freq.</th>
<th>Time</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama Emergency Net</td>
<td>3715</td>
<td>1900 CST</td>
<td>Daily</td>
</tr>
<tr>
<td>Arkansas Net</td>
<td>3885</td>
<td>2000 MST</td>
<td>Mon.-Fri.</td>
</tr>
<tr>
<td>Ark. Emergency Net</td>
<td>3605</td>
<td>0900 CST</td>
<td>Mon.-Fri.</td>
</tr>
<tr>
<td>Beaver Net (N.H.)</td>
<td>3625</td>
<td>1900 CST</td>
<td>Mon.-Fri.</td>
</tr>
<tr>
<td>British Colonial Net</td>
<td>3970</td>
<td>2200 EST</td>
<td>Mon.-Sat.</td>
</tr>
<tr>
<td>Connecticut Net</td>
<td>3640</td>
<td>1900 EST</td>
<td>Mon.-Fri.</td>
</tr>
<tr>
<td>Conn. Training Net</td>
<td>3640</td>
<td>1900 EST</td>
<td>Sat., Sun.</td>
</tr>
<tr>
<td>Crolley Net (Va.)</td>
<td>3705</td>
<td>1900 EST</td>
<td>Mon.-Fri.</td>
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<tr>
<td>Eastern Area Net (NTS)</td>
<td>3705</td>
<td>2000 EST</td>
<td>Mon.-Fri.</td>
</tr>
<tr>
<td>Eastern Penna. Net</td>
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<td>1930 EST</td>
<td>Mon.-Sat.</td>
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<tr>
<td>Eastern Shuttle Net</td>
<td>7120</td>
<td>0900 EST</td>
<td>Daily</td>
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<tr>
<td>Eighth Regional Net (NTS)</td>
<td>3530</td>
<td>1945 EST</td>
<td>Mon.-Fri.</td>
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<tr>
<td>First Regional Net (NTS)</td>
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<td>2115 EST</td>
<td>Mon.-Fri.</td>
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<tr>
<td>Fla. Emergency Phone Net</td>
<td>3910</td>
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<td>Tue.</td>
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<tr>
<td>Fla. Phone Traffic Net</td>
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<td>0700 EST</td>
<td>Mon.-Sat.</td>
</tr>
<tr>
<td>&quot;Gator Net&quot; (Fla.)</td>
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<td>1900 EST</td>
<td>Mon.-Fri.</td>
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<tr>
<td>Georgia Slow-Speed Net</td>
<td>3892</td>
<td>2100 EST</td>
<td>Mon., Wed., Fri.</td>
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<tr>
<td>Illinois C.W. Net</td>
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<td>Mon.-Fri.</td>
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<tr>
<td>Indiana Net</td>
<td>3856</td>
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<td>Tue., Thu.</td>
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<tr>
<td>Indiana Phone Net</td>
<td>3905</td>
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<td>Mon.-Sat.</td>
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<td>Interstate Utility Net</td>
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<td>Kentucky Net</td>
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<tr>
<td>Ky. Blue Grass Net</td>
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<td>Md.-Del./D.C. Net</td>
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<td>Michigan Emergency Net</td>
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<td>Missouri Emergency Net</td>
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<td>Sun.</td>
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<td>N.Y.C.-L.I. Net</td>
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<tr>
<td>Net</td>
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<td>Daily</td>
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<td>Oregon Phone Net</td>
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<td>Daily</td>
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<td>Oregon Phone Net</td>
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<td>Daily</td>
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<td>Mon.-Fri.</td>
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<td>Mon.-Fri.</td>
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<td>Quebe Net</td>
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<td>Mon.-Sat.</td>
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<td>So. Maine Net</td>
<td>7272</td>
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<td>Sun.</td>
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<td>So. California Net</td>
<td>7205</td>
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<td>Mon.-Fri.</td>
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<td>Mon.-Fri.</td>
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<td>Mon.-Fri.</td>
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<td>Tennessee Net</td>
<td>3737</td>
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<td>Mon.-Fri.</td>
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<td>Tenn. 'Phone Net</td>
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<td>Truck Line S</td>
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<td>2100 EST</td>
<td>Mon.-Fri.</td>
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<td>Washington C.W. Net</td>
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<td>Washington State Net</td>
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<td>Western Mass. Tea-Meter 'Phone Net</td>
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</tr>
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<td>1900 EST</td>
<td>Mon.-Fri.</td>
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</table>

For a long time we have wanted a picture of W7CZY for these pages, and Larry finally came through. From this convenient operating position, W7CZY usually generates a total of over a thousand message points per month. Larry's big rig uses a single 304TL in the final with 750 watts, and the stand-by rig runs 120 watts. The receiver is an HORIZON, plus a Wilcox crystal-controlled receiver permanently set on the Washington State Net frequency. There is a rapid turnover of messages on W7CZY's "hook," which can be seen above the receiver.

Y.L.R.L. DOINGS

During the first week in October YLRL activated the nets listed below. All YLs, whether or not members of YLRL, are invited to join in the nets and become acquainted. Alternate NCSs will be added later.

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<thead>
<tr>
<th>Net</th>
<th>Frequency (ke)</th>
<th>Day</th>
<th>NCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 phone</td>
<td>23,000 (will tune)</td>
<td>Tue.</td>
<td>W3NNS</td>
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<tr>
<td>entire band</td>
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<td></td>
</tr>
<tr>
<td>10 phone</td>
<td>23,000 (will tune)</td>
<td>Tue.</td>
<td>W3NNS</td>
</tr>
<tr>
<td>entire band</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 c.w.</td>
<td>7320</td>
<td>Wed.</td>
<td>W3NHI</td>
</tr>
<tr>
<td>90 c.w.</td>
<td>29,000</td>
<td>Thurs.</td>
<td>W7CUL</td>
</tr>
<tr>
<td>80 c.w.</td>
<td>3610</td>
<td>Thurs.</td>
<td>W3ARK</td>
</tr>
</tbody>
</table>

In October of this year the Young Ladies' Radio League celebrated its 10th anniversary. As has been customary during recent years, YLRL will hold an Anniversary Party Contest on the air on the weekend of Thanksgiving Day, the prize to be the Littlefield Cup. For YLRL members only, the rules are the same as for 1948 and may be found in your last October's Harmonics.
There was work to be done, but first, efforts were constantly made to contact stations in stricken areas. Brute-force 120-m.p.h. winds howled and attempted to force their way through every crevice. Messages flashed the need for aid at this point and that point. Information went out about highway conditions. The Pentagon relayed an inquiry about a friend of the President. More weather reports came in and were correlated. Patient forecasting equipment, rendered invaluable service until his strike. He maintained continuous operations on 7290 kc. and ingenuity the fellows managed to stay on the air.

A typical AEC set-up was established in Miami at the Red Cross offices. Separate transmitters were installed to handle traffic on 7100, 7290, 3875 and mobile on 3910 kc. WA4JIP broadcast official weather reports from the Weather Bureau directly as a public service and for rebroadcast by b.c. stations. At Lake Placid W4BYR, with professional weather-stations, the anemometer went down during some blows that hit at a devastating blow. The Red Cross has reported that only two lives were lost this year and casualties were very light.

Amateurs participating in this display of ham versatilities are W91-LG, JSD, ROX, KQL, 8SP, UQT, WPP and W9MVJ. As long as we have amateurs, we can step in and provide public service.

Amateur station at the Bridge and of course proceeded immediately to the scene of the accident. It showed hundreds of people just how race was still going on and direct reports of progress were transmitted from the station on the Point and by means of the "patch" the crowd was able to hear what went on as it happened. This was truly a scoop for amateur radio in covering an emergency. It showed hundreds of people just how readily hams can stop in and provide public service.

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WIAW OPERATING SCHEDULE

(All Times Given Are Eastern Standard Time)

Operating-Visiting Hours:
Monday through Friday: 1130-0060 (following day)
Saturday: 1900-0230 (Sunday)
Sunday: 1800-2200

General Operation: Refer to page 84, September QST, for a chart showing W1AW general operation. This schedule is still in effect and is not reproduced herewith for space considerations. Mismarked complete master schedules of all W1A W operation in EST, CST, MST, PST or GCT are available upon request.

W1AW will be closed from 2400 November 23rd to 0000 November 25th, from 2200 December 25th to 1130 December 27th, and from 2200 January 1st to 1130 January 3rd. On Saturdays and Sundays during which official ARRL activities are being conducted, W1AW will forego general-contact schedules in favor of participation in the activity concerned.

Official ARRL Bulletin Schedule: Bulletins containing latest information on matters of general amateur interest are transmitted on regular schedules:

Frequencies:
C.W. — 1887, 3555, 7215, 14, 100, 28,000, 52,000, 146,000 kc.
Phone — 1887, 3950, 14, 280, 29,000, 52,000, 146,000 kc.

Times:
Sunday through Friday, 2200 by c.w., 2100 by phone. Monday through Friday, 2300 by phone, 2400 by c.w.

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/W0TQD will be made on November 16th, from W60WP, November 2nd.

Activities Calendar elsewhere in these pages.

DX CENTURY CLUB AWARDS

HONOR ROLL

W2PH ....... 223 W6EDG .... 210 W9GAU .... 203
W6VFR .... 218 W8BBS .... 209 W8BDP .... 201
G2PL ....... 212 W8BZA .... 209 W8XYO .... 201
W8HGW .... 211 G8RR .... 201

RADIO TELEPHONE

W1PH ....... 181 W1JCK .... 186 W1BZA .... 182
W6DI ....... 163 W6HGQ .... 155 G2PL .... 150
XE1AC .... 161 W6HMR .... 153 W1WNO .... 160
W7CYU .... 187 W7AFQ .... 150

From August 15 to September 15, 1949, DXCC certificates and endorsements based on postwar contacts with 100 or more countries have been issued to the amateurs listed below.

NEW MEMBERS

W2YW ....... 128 W6CUL .... 107 G8KU .... 101
W8KD ....... 122 W1KQQ .... 105 W8TKE .... 105
W9OL ....... 121 W2CK .... 105 W8ABS .... 100
W7PGS .... 119 OKINS .... 104 W7IOZ .... 100
W7AC ....... 118 2SU .... 104 W2CGJ .... 100
W2BJ ....... 114 W1ABF .... 104 H6AEG .... 100
K8GCI .... 114 W2JJC .... 104 H6DBH .... 100
W8RQM .... 110 W6HMR .... 103 SMAH .... 100
W4AS .... 110 W6ABA .... 103 W3KJ .... 100
IIXX .... 109 W6AHF .... 103 G4XU .... 100
V8KSA .... 108 W2CTO .... 102 SMHZ .... 100
W8BP .... 107 W2GST .... 102 W6MFW .... 100
ZL2BH .... 102

RADIO TELEPHONE

PTZCK .... 119 W2UY .... 105 W8KJ .... 105
W2RQ .... 109 W6ARD .... 105 W1KWD .... 101
CE1AH .... 108 IAS .... 104 W2HZ .... 101
SM4KF .... 106 SM7PA .... 100

ENDORSEMENTS

W6SAI .... 200 W6LU .... 151 W1AH .... 130
W6TT .... 192 HBOJ .... 150 W8BYR .... 129
W6MV .... 190 W6SDR .... 150 W6CGJ .... 127
W6AK .... 185 W8RDQ .... 144 W8CBO .... 129
W2JY .... 183 W6KDX .... 144 W8VQ .... 124
PA0UN .... 181 W1KVF .... 143 W6QPT .... 124
W2OCY .... 181 W2JYU .... 142 W1WG .... 120
W6AM .... 159 W6SDR .... 141 W8DZ .... 120
W2OWE .... 173 W6KPL .... 141 W6DX .... 123
W6HDD .... 172 W6XUQ .... 143 W6DJ .... 120
W6BDF .... 172 W6AGI .... 143 W6LW .... 120
W6ZM .... 171 W2AGO .... 143 GM3AYA .... 114
H6QX .... 162 W1DX .... 140 W6CT .... 112
W6UCX .... 162 W6RFB .... 140 W6LYN .... 112
W6NR .... 162 W6CUIQ .... 140 G8KQ .... 112
W2IQ .... 160 G5YY .... 140 W9GT .... 112
ON4W .... 160 W6UAS .... 139 PASCB .... 111
W6BF .... 159 W6OEP .... 137 W2KJ .... 111
W6OP .... 159 W6AD .... 136 W8GPP .... 111
W2JF .... 157 G2MI .... 135 W6CTL .... 110
W3DK .... 157 W1KXL .... 134 W6QMY .... 110
W8GCV .... 154 W6KFC .... 133 W8KL .... 110
W9KCG .... 150 W1PG .... 132 W6QCT .... 110
W3JKO .... 152 W6DMD .... 130 G8PL .... 110
W6TI .... 151 W4VE .... 130 W6QNL .... 110
W2WR .... 130

RADIO TELEPHONE

W9RBI .... 140 GAY .... 121 W3LTV .... 120

November 1949
MEET THE SCM

Epps W. Darna, W3BWT, an active amateur of long standing, recently began his second term as SCM of the Maryland-Delaware-District of Columbia Section. His initial venture into amateur radio took place in 1911, and since receiving his first license in 1916 he has held the calls W3BM, W3QCNJ and W3BWT.

Prior to World War II he was a member of the old Army Amateur Radio System and served as alternate NCS for WLM with the call WLMB. During the war he was chief operator of Washington-area WERS on 144 Mc. For nearly twenty-five years he has kept schedules with League Headquarters stations and has participated in every Governors-President Relay. In addition he has taken part in innumerable ARRL contests and holds A-1 Operator, WAC, and Code Proficiency awards, and several Public Service Certificates. A past OBS, he now holds appointment as RM and OBS and is a trunkline station. A member of the Washington Radio Club since 1923, he has held the posts of president-secretary-treasurer and chief public operator. Epps has done notable work in floods, hurricanes (especially the Maryland and Florida hurricanes), and in storms and blizzards. In 1931 he copied news dispatches nightly for many months from the Hardt Trans-Axis Expedition in Beirut, Syria, for the National Geographic Society, Washington headquarters.

Transmitters in use at W3BWT are (1) 6V6-210-211, 150 watts, (2) 6V6-6L6-812, 170 watts, (3) 210-211-201A, 1000 watts, (4) 6V6-807-p.p. 812, 400 watts. Each rig can be worked on at least two bands. In addition there are two small experimental transmitters on 50 and 144 Mc. Receivers include an NC-200, SX-23, BC-312 and FT7X. Antenna is a 132-foot wire, end-fed. Emergency equipment consists of two battery-operated receivers, 1000-watt gas-engine a.c. generator, 300-amper-hour 32 volt Edison battery (60 cycles), portable 150-watt transmitter for 3.5 and 7 Mc., receivers include an NC-200, SX-23, BC-312 and FT7X. Antenna is a 132-foot wire, end-fed. Emergency equipment consists of two battery-operated receivers, 1000-watt gas-engine a.c. generator, 300-amper-hour 32 volt Edison battery (60 cycles), portable 150-watt transmitter for 3.5 and 7 Mc., and a 10-watt battery-operated rig for 3.5 Mc. Using autotype batteries and dynamotors. One room of the house is completely devoted to ham radio and contains all the gear for same, plus a repair bench. In the rear yard there is a shop for building and heavy work.

An employee of the Potomac Electric Power Company as meter tester and inspector, Epps’s former positions have included motion-picture operator, radio operator, and stage electrician. He has had experience in both marine and broadcast operating. Although he has no spare time for other hobbies, he maintains an interest in such sports as swimming, tennis, baseball, badminton and table tennis.

Ep certainly lives up to his belief that a ham should engage in all phases of ham radio to get the most out of his hobby. His preference, however, is traffic work on cw. In spite of the effort, expense, and sacrifice involved, he feels that he has been amply rewarded in the many happy hours of pleasure afforded and the many fine friends he has made. Above all, he is forever indebted to amateur radio because it was over the air that he first met WSAKB, who was later to become Mrs. Darna.

JUNE V.H.F. PARTY RESULTS

The second v.h.f. contest of 1949, the June V.H.F. QSO Party, brought entries from 124 participants in 35 ARRL Sections in the United States. A detailed report on the party and a list of claimed scores were published under “The World Above 50 Mc.” in August QST. A detailed check of the valid entries revealed that the standings of the top-scoring stations in each section remain unchanged. You are therefore referred to the August listing for the calls of the 35 winners of certificate awards.

Several corrections were made in scores after detailed checking was completed. The following replace the listings published under claimed scores: F. New York — W2ZUZ, 498 points; W2PLU, 250 points, 46 contacts; W2IZ, 24 contacts. W. Pa. — WMQW, 23 points. Illinois — W9GLY, 41 contacts. No. N. J. — W1QIQ, 2023 points; W1IDZ — 64 contacts; W2ALJF, 666 points; W1DZA, 106 points. Conn. — W1PBB, 57 contacts. Cal., Mass. — W1QXW, 90 contacts. San Francisco — W6VCC, 43 contacts.

RESULTS — 1949 VE/W CONTEST

Listed below are the final scores of leaders in the 1949 VE/W Contest, sponsored by the Canadian Amateur Radio Operators Association.

Ten high scores in the U. S. and Canada were; W3GYV 29,440, W2VC 22,912, W3BWD 20,925, W3YZG 19,328, W4JLW 18,144, W6HZT 15,744, W1AXW 13,440, W2WZQ 13,440, W8YGR 11,424, W1EZG 11,394, W3PAR 23,768, W3SENE 25,596, W5QEQ 23,130, W3EMS 21,600, W6AGX 21,042, VE5RW 18,832, VE7YL 17,932, VE3BBQ 17,566, VE4ASO 17,580, VE3BOS 16,672.

Section Leaders

1. B. Pa. W3GYV 29,440 Oregon W7ABH 720
2. Mid-De-D. C. W3LY 10,240 Wash. W7ETO 2932
4. W. N. Y. W2WZQ 13,440 N. Y. W6RMS 1430
5. W. Pa. W3GYJ 8512 San Fran. W3WBU 3384
7. Wisc. W8KZ 10,854 S.J. W6BMI 6114
9. Minn. W8LHT 4948 W. Va. W8CGR 7560
10. Miss. W5WZ 1824 Colo. W1OC 2078
13. Ohio W8YGR 11,424 Los Ang. W6EBC 15,744
14. N. Y. C. W2Y2G 10,328 N. J. W3D 9460
15. Iowa W8LDH 7592 S. Tex. W5PD 5750
16. W. Tex. W3DXY 3500 New Mex. W5VLL 3062
17. Conn. W1ODW 10,272 Mar. V8RMS 12,710
18. Iowa W1KZG 7448 Que. VE2XK 9150
19. B. Mass. W1AWX 13,440 Ont. VE3BSTG 25,785
21. N. H. W1WVZ 7544 Sack. W5QEQ 23,130
22. Idaho W7GHT 1408 Alt. W2EDO 18,218
23. Mont. W7BWR 6720 B. C. VE7YL 17,382

BRIEFS

OBS W6UTII, Moraga, Calif., is sending ARRL Official Bulletin daily for one hour by radioteletype on 28,952 and 27,228 kc.

It was just a few minutes before the end of Field Day, 1949, and members of the Northwest St. Louis Amateur Radio Club, operating W0DVR/B, at St. Charles, Mo., were having their last FD QSOs. As the clock began striking the official end of Field Day, the portable gasoline generator at W0DVR/B coughed, used up its last drop of fuel — and stopped.

NATIONAL CALLING AND EMERGENCY FREQUENCIES

C.W. 7100 kc. (day) 3575 kc.
3550 kc. (night) 14,225 kc.
14,050 kc.

Duration of communications emergency these channels will be monitored by stations of the National Emergency Net for the handling of third-party personal-inquiry traffic.
MB-20 If the number of letters we have received is any indication of the general interest aroused in our MB-20 multi-band tank, there certainly must be plenty — at least our office is kept busy by inquiries.

The MB-20 was originally designed as a low power multi-band tank, primarily to be used in grid circuits of transmitter stages where relatively low powers (20 watts input) are to be encountered. This unit may be used either in push-pull or single-ended circuits. It is small and compact and tunes all amateur bands from 3.5 mc. to 30 mc. in 180° rotation. Several interesting things were noted when we were designing a test fixture for the MB-20. Actually, these tanks are tested in the same set-up as the MB-150 with a necessary jig to adapt it to the machine and a switch to cut down the amount of power that the tank will dissipate.

While experimenting to find how much we had to cut down on this power it was noted that the gadget made a pretty swell low powered plate tank for possible mobile or portable work. We found that the MB-20 would handle powers in the order of 40 watts input if the link is kept loaded. If the link is left unloaded, the coils tend to get quite warm and it is certain that the tank under these conditions would not dissipate much more than 25 watts and stay relatively cool. At higher than rated inputs, the condenser does not arc over except at 30 mc. Here again, it can be pointed out that in plate circuit applications the MB-20 can be used in either push-pull or single-ended amplifiers or multipliers either neutralized or not with tubes like the 6L6, 815, 832 and triodes of similar ratings, keeping in mind all of the above.

So summing it all up, here is the tank for all of your exciter grid and plate requirements which will get rid of all your plug-in coil or bandswitching worries. Of course the MB-150 is available for higher power application. Application notes on MB-150 apply in usage for the MB-20, or a direct inquiry to us will produce our new pamphlet on MB-20 applications.

Robert J. Murray, W1FSN

P.S. To W6QWX and others, the installation of our TU-BY condensers in conjunction with either the MB-20 or MB-150 does not affect the tuning range adversely.

— R. J. M.
ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SOM, Jerry Mathis, 23rd. OCU is rebuilding to use a pair of 250THs. His DX races. MCG vacationed in Maine. EQK has been appearing in an issue of Amateur Radio Communications Society resumed regular photograph on the front cover of pile-up was something to behold. Jack used an indoor antenna and his bucket of bolts. LLW has new YL operator. Sorry to Mention OM Henry P. K. OBC has moved back to Lolli and has discontinued schedules with VE3ANT because contacts have been too reliable. HQB has moved to Long Island - our loss will be yours. W3BES — We are sorry to have to accept the resignation of long-standing ORS, ADE, for reasons of health. He will continue to operate. EDJ, however, Silent Key was on the 10-20 list for August 23rd. OCU is rebuilding to use a pair of 250THs. His DX total is now 183 worked and 186 confirmed. CUL makes the BPL list for the year. K1XW has been held Day from 28 Mc. while at St. Pierre signing QSOAB and FP6AA. The pile-up was something to behold. Jack used an indoor antenna and his bucket of bolts. LLW has new YL operator. Sorry to Mention OM Henry P. K. OBC has moved back to Lolli and has discontinued schedules with VE3ANT because contacts have been too reliable. HQB has moved to Long Island - our loss will be yours.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SOM, Erpa W. Darne, W3BWT — The Baltimore Amateur Radio Communications Society resumed regular meetings Sept. 15. Officers for the coming year are: GBB, pres.; AFR, vice-pres.; BDY, secy.; KKH, treas. The Club held a picnic and a transmitter hunt Sept. 11th. The Washington Radio Club’s August meeting was a picnic-hamfest at the National Park, Meadowbrook Picnic Grounds on Aug. 21st. Approximately 300 attended the affair and enjoyed a day and evening of fun, eats, and entertainment. A ‘Hidden Transmitter Hunt’ games for adults and children, and pony rides for the kiddies, were followed by plenty of cake for everybody. After the eats the gang enjoyed an evening of entertainment and prize drawings with many valuable prizes, tubes, receivers, transmitters, VFO exciter units, etc., going to the lucky ticket holders. President HHN and his hamfest committee are to be congratulated for a splendid affair, well done. The “M.D.D.” Section Network resumed operation with 1,101 members on Sept. 14th, tended by hams from Baltimore and Washington. The gang enjoyed outdoor sports, many valuable prizes were given away, a few hundred feet away, DL4LN passed through Philadelphia and visited some of the local lads. Traffic: W3CUL 363, ANK 39, OCU 21.

SOUTHERN NEW JERSEY — SOM, W3T3Q — SEC0; SJJ RM; FCG Activity continues at the usual summer high level but with the holidays we will pick up in "live" style. NES finds a difference of 18 db. between identical beams indoors and outdoors at the same height above the ground on 28 Mc. In addition to the regular pile-up was something to behold. Jack used an indoor antenna and his bucket of bolts. LLW has new YL operator. Sorry to Mention OM Henry P. K. OBC has moved back to Lolli and has discontinued schedules with VE3ANT because contacts have been too reliable. HQB has moved to Long Island - our loss will be yours.

WESTERN PENNSYLVANIA — SOM, Ernest J. Hilsinsky, W3KWL — The South Hills Brass Bouncers & Modulators of Pittsburgh held their Annual Hamfest in August. The APA reports that LOE, outstanding DX and contest winner, will be principal speaker at club meetings. OMA, Allegheny County EC, is getting local emergency affairs under way. KQ6CU wants the traffic boys to line up schedules with him when he returns to Guam. He operates on 2022, 14,000 and 28,000 kc. Congrat to the Horsehead Radio Club of Altoona on their splendid radio work during the Centennial Celebration. MYN and LIOU used 144 Mc. to cover the parade and Soapbox Derby. LIV and MBB used walkie-talkies. POZ and EQD carried on radio communications. BWL, recently-appointed ORS, is knocking off the traffic. Had the pleasure of meeting MYN at the National Communications demonstrations at W3FR. Potomac emergency Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. KDY, NTM, OWN, OBY, and MWW participated in recent Baltimore Yacht Club sailing regatta. Many members of Marine Safety and Emergency Corps drill. 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General Electric announces a new line of Permafil d-c paper-dielectric capacitors designed especially for operation in high ambient temperatures. They require no derating for temperatures up to 100° C and can be used up to 125° C.

Hermetically sealed in metallic containers, these new units are available in case styles 61, 63, 65 and 70, as covered by Joint-Army-Navy Specifications JAN-C-25, in ratings of 0.10 to 4.0 muf. 600-, 1000- and 1500-volts.

Permafil capacitors are similar in appearance and construction to other General Electric paper-dielectric capacitors. Permafil, the impregnant, has excellent insulating properties at high temperatures. Permanently sealed silicone bushings are provided on all types.

Permafil capacitors were developed to provide suitable components for the many new applications involving continual operation at ambient temperatures above 85° C—another example of capacitors "designed for the job" by G-E engineers. For further information on these or on capacitors for other applications, write Capacitor Sales Division, General Electric Co., Pittsfield, Mass.
his quad antenna. AAT still is knocking off 14-Mc. DX. The Western Pennsylvania Traffic Net will start activities on Oct. 3rd, at 7:00 PM, on 3750 kc. with Chief RM NUG in charge. Newly-appointed OBS are FAB and IYR. PKE is an addition to staff station YA, of Pennsylvania State College.

The Western Pennsylvania Traffic Net has a New Secy.; TCK, treas.; and ZYP, sgt. at arms. The Club recently purchased a BC-654 complete with dynamotor. GDF is new QO, so watch for notes. N is bringing up the antenna for the winter season. JMG returned to the air using an 814 on 3.6- and 7-Mc. c.w. EEK is working on 28-Mc. mobile jobs.

The Ramiesters Radio Club sponsored a very successful picnic at M.&M., with KL7DF welcome back to the CD fold, UIT, with OBS transmitters. The Fort Wayne Radio Club resumed meetings. The Michiana Amateur Radio Club has rotated new antennas at JBF's shack. PKE received mementos, call letter plates, etc., from W0DUD, FIF 68, PM 70, KQL 14, FFR 13, APK 10, JMG 6, CMC 2.

**CENTRAL DIVISION**

**ILLINOIS** - SCM, Lloyd E. Hopkins, W9EVJ - Section nets: ILN on 3756 kc. and IEN on 3940 kc. UQT is Our Phone Activities Manager again this year. QRL resigned as Chief RM. New club members will be around when time permits, EYJ is Acting Manager of ILN at present. The Chillicoit Amateur Radio Club reports MKT and ITF as new members. PKE is on the air in a new place, B 1200 kc.

**MINNESOTA** - SCM, James F. Nurnberg, WAGM - DOP has been transferred from Sioux Falls to the St. Paul office of W. N. Bell, RWE has a new home with a room set aside as the shack. PRZ is back. PRZ is back. W0E on 14-Mc. 75A. FIF 67, e.g., is using an L-2104. TSN visited the Arrowhead Club in Duluth and discussed points of interest in League functions and things, that take up the future of the Amateur Radio Emergency Service. TSN went to the Skyway 8th Ward meeting in Minnesota.

**WASHINGTON** - SCM, John E. Walter, KYE - SEC: BOL. RM: RJF. Send QEC applications to BOL as soon as possible. BOL has a lot of notes but a lot of work too. BOL is working on 144-Mc. DX opening up. AER reports 14-Mc. DX opening up. APK at long last heard a DX operator ever at 3YA. AER reports 14-Mc. DX opening up. Traffic: W3AESR 12, BWL 9.

**DAKOTA DIVISION**

**SOUTH DAKOTA** - SCM, J. S. Fonberg, WANGM - DOP has been transferred from Sioux Falls to the St. Paul office of W. N. Bell, RWE has a new home with a room set aside as the shack. PRZ is back. PRZ is back. W0E on 14-Mc. 75A. FIF 67, e.g., is using an L-2104. TSN visited the Arrowhead Club in Duluth and discussed points of interest in League functions and things, that take up the future of the Amateur Radio Emergency Service. TSN went to the Skyway 8th Ward meeting in Minnesota.
Encompassed in the structure of this new version of the 4E27 are many outstanding improvements that now will guarantee performance-dependability to users of this tube type.

The plate-lead of this new Eimac 4E27A/5-75A pentode is of larger diameter than the prototype providing a low-loss, low inductance, more rugged lead. The plate itself is larger assuring a good reserve dissipation capacity above its 75 watt rating. It is made of Eimac Pyrovac plate material, which lengthens the life of the tube and enables it to withstand high momentary overloads.

Primary grid emission has been eliminated and secondary characteristics stabilized through the use of Eimac processed grids. Perfected beam-action and permanent alignment are assured through well engineered internal-element mounts.

The unique moulded-glass header eliminates a base on the 4E27A/5-75A. This simplifies lead cooling, minimizes lead losses, and provides precision alignment of base-pins.

The stability and high power-gain characteristics of this new Eimac pentode make it an excellent VHF or video power amplifier. It is equally well suited for conventional power amplifier service.

Further information and detailed characteristics concerning this latest product of Eimac engineering research may be had by writing the Application Engineering Department of Eitel-McCullough, Inc.

Follow the Leaders to Eimac TUBES

EITEL-McCULLOUGH, INC.
San Bruno, California

Export Agents: FRAZAR & HANSEN, 301 Clay St., San Francisco, California
enthusiasm and friendly spirit exhibited by this group. Operation on 4-Mc. phone is particularly good around Oak Ridge early in the a.m. The boys have an excellent paging service for the members who might otherwise inadvertently sleep right through on a good long DX day. The QCX is in charge of this enterprise. KKL made two new OBS. LCB moved to Centerville and is now QCX there. He is replaced in Neville by FWX. ABQ is now QCX at Bay City. CAQ has a new OBS, and WW6 has a mobile rig complete with modulator. We have suspected him of using this modulator in connection with his 600-watt relay and his tower. Any fellows who might submit activity reports and renew appointments, AAW and MKB have new stacked arrays on 28 Mc. MKB has added some new antennas in this new QTH. SFA in Des Moines has ten legs in the Upper Peninsula with portable rigs. DLZ extends a hearty welcome to the fellows who might be heard in the Michigan Flea Power Field and who no doubt heard the enthusiasm and friendly spirit exhibited by this group. Operations to YM3 and LXL were heard in the Michigan Flea Power Field and to LXL, who was heard in the Upper Peninsula with portable rigs. YM3 reconnoitered in the Lower Peninsula with his portable rig, and DXW6 was heard in the Michigan Flea Power Field.

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We know of nothing which will cool the average amateur’s enthusiasm for mobile operation more rapidly than a dead battery in the old family jalopy, as a result of an evening of too much talk, and not enough listening.

Those of us who have tried mobile operation are fully aware of the very difficult problem of how to keep the car battery charged adequately for starting purposes, and still provide plenty of juice for a reasonable amount of time on the air. Many schemes involving the use of heavy-duty Police type generators and even the installation of extra batteries to increase the ampere-hour capacity of the auto, have been tried with varying degrees of success in an attempt to solve this problem.

Most hams balk at such drastic measures which consist mainly of replacing or adding to perfectly good standard equipment already found on their automobiles.

Recently, one of our good amateur friends, who is a red-hot mobile fan, told us of a method he used for keeping his battery at top performance and still add no extra equipment to his automobile. His system sounded so practical that we’d like to pass it along.

Here is what he did .. First, he visited his Mallory Distributor’s, and bought a small, inexpensive Mallory 6 volt Battery Charger (the 6AC6) together with a special automobile Cigarette Lighter Plug (Mallory R-655) to be used for inserting the Charger output into the electrical circuit of his car. The Lighter Plug was attached to the Battery Charger cable and the whole business was then mounted conveniently in his garage. After an evening of mobile operation, he simply inserted the Plug into the cigarette lighter socket, turned on the 115V AC line, and the next morning, presto, his battery was ready for heavy starting action.

With this very convenient arrangement, this ham was able to operate his mobile rig the year round, with little fear of even tough winter-time starting.

Year 'round mobile operation which practically disregards winter-weather starting conditions sounds pretty good, doesn’t it?

Incidentally, if your car is not equipped with a cigarette lighter, don’t let that handicap you; simply ask your Distributor for a Mallory Dashboard Receptacle (R-652) which may be clamped to the dashboard without drilling a single hole. It’ll provide the same electrical connection as the lighter socket.

There are Mallory Battery Chargers available from your Distributor’s in capacities from 4 to 60 amperes. One of them should be exactly what you need for your own installation. Also, don’t forget those other fine Mallory parts including ham band switches, push button switches, controls—rheostats—potentiometers—pads, dry electrolytic capacitors, tubular capacitors, ceramic capacitors, dry disc rectifiers, vibrators and Vibrapack* power supplies.

soon. RTZ, CP, promises full activity in NLI from home in OCT. CQ, CP, promises lull activity in NLI from home in OCT.

five-element beam. SUZ and CCC are with WJZ. BUX Traffic Plan and activity really stirring. The Huntington JYR says he has nothing to report but he went out and got t.v. instead of T.V.I. A WY, formerly 8WXA, is reporting regular cw. F is building up good traffic scores on MARS and hopes he clears some of it through local nets. Tt's a real get-together for the local gang. The Bronx Council of the Greater New York Councils is having an exposure program for the week of Sept. 11th, which includes a booth will be operated by W2BRA. Amateur's are asked to look for the signal and special QSLs. Traffic: (Aug.) was a real get-together for the local gang. The Bronx Council of the Greater New York Councils is having an exposure program for the week of Sept. 11th, which includes a booth will be operated by W2BRA. Amateur's are asked to look for the signal and special QSLs.

74
A BRAND NEW LINE OF HARVEY-WELLS TRANSMITTERS

100% BREAK-IN OPERATION!

BANDMASTER JR.
Meet the new streamlined, stripped-for-action version of the well-known TBS-50 at a popular price. We haven't just taken out the modulator to produce a top-notch rig for the CW man—we've added plenty of features which the dit-dah gang consider necessities in their shacks—COUNT 'EM: optional crystal control or VFO input, 100% break-in keying with your external VFO (with one keying lead grounded) and a radically new crystal-oscillator-VFO switching circuit which helps even most sluggish crystals to follow your hugh at 40 per. Old TBS features are included too, including band switching from 3.5 mc to 148 mc, integral antenna coupler and an excitation control to set the output level if you want to drive your gal-lon with the Bandmaster Jr. All this for only $87.50

BANDMASTER JR. MODULATION KIT
You can add this at a later date. Kit is simple to install and comes with complete instructions. This kit makes a BANDMASTER SR. out of your Jr. Only $15.50

BANDMASTER SENIOR
This is the new version of the old TBS-50 with all the new features of the Bandmaster Jr. including the new crystal-oscillator-VFO switching circuit. Phone or CW—Eight bands—80, 40, 20, 15, 11, 10, 6 and 2 Meters. Ideal for either mobile or fixed station use. $111.50

BANDMASTER DELUXE
The last word in a versatile small transmitter for ham or commercial use. Used extensively in foreign countries for important commercial applications. Has built-in three tube pre-amplifier for use with crystal mike and ALL the features of both the Bandmaster Jr. and Sr. $137.50

POWER SUPPLIES & ACCESSORIES

- APS-50
  Deliver 425 v. at 275 ma. and 6.3 v. at 4 amps. May be mounted on rack panel. For 110 Volt A.C. $39.50

- DPS-50
  A dynamotor supply for portable operation. Delivers 300 Volts at 250 ma. For 6 Volt operation $87.50. For 12 Volt operation $54.50

- VPS-50
  A six volt vibrator supply developed specially for use with the Bandmaster line. Delivers 300 Volts at 200 ma. $29.75

- CMA-50
  Crystal microphone pre-amplifier. The unit built-in to the Bandmaster Deluxe which you may add to other Bandmaster models. Simple to install $22.00

SEE YOUR SUPPLY HOUSE NOW. IF THEY CAN'T SERVE YOU, GET IN TOUCH WITH US AT ONCE

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75
EVERYTHING YOU WANT IN "STABILIZED" CRYSTALS

High quality—quick delivery—modest cost! All three are yours when you use James Knights Co. "Stabilized" crystals.

Whether you wish standard crystals, or crystals built to your exact specifications, The James Knights Co. is equipped to supply you promptly.

A special production system is maintained to effect greater savings for you on short run jobs.

The James Knights Co. fabricates a complete line of "Stabilized" crystals to meet every need—precision made by the most modern methods and equipment.

Whenever you think of crystals, think of JK "Stabilized" crystals. They're your best bet—your best buy!

New James Knights Co. Catalog On Request

A tube research laboratory needed a 19 kc crystal to use as a standard. The James Knights Company delivered one in a hurry. A partially assembled H18T hermetically sealed unit on 19 kc is shown at the left. The James Knights Company does many kinds of special work for exacting customers every day.

traffic plan, when details have been worked out. HYF promises a bulletin, probably before you read this, with the complete details. Frequency: W11BH 147.150, W11BB 147.050, K11B 147.950, B11B 53, B11B 54, Q11Q 21, ORP 18, Q11Q 17, R11L 14, HYF 12, KY 12, C11T 5, I1E 4.

MAINE—C.M. Manley W. Haskell, W11YV—New O.S. appointee is BWR. Norman A. Partridge, Augusta. Norm used to be in Maine, then he moved. Now he is back and has three QSOs. Every AM, AMX, GQK, QIO, KAD, C11M, G11A, and HYF SAQ was there for two weeks, with PQI there for all summer. LKP will have an 813 if plans work out. The PAWA entered the Oxford County Radar Net Sept. 10 when the up-State boys were in Portland. A return visit will be made Oct. 6 when the PAWA gang will go to Oxford. JGZ has been appointed EC for the Lewiston-Augusta area and has the mobile units in training on simulated emergencies. COV is the new EC for the Oxford area and already has hooked up with the Forestry Service and other agencies. At Qui has accepted the EC appointment for the Portland area and is working closely with the SRC. There is a large possibility that the Portland Chamber, Red Cross, will have its own radio equipment, same to be operated by a trustee of the local club. Traffic: W11WXX 160, NVY 78, LKP 42, T11Q 2, QA1A 2.

EASTERN MASSACHUSETTS—SCM, Frank L. Baker, jr., W11ALP—QMJ has taken over the job as Route Manager for the 5-A.M. traffic. EUR is on his job. Route Manager for the Net on 5-kc. known as the Eastern Mass. Net. There will be a slow speed section, 15 w.p.m. down, which will meet at 2030 EST. How about some of you old-timers and new hands getting in on this? The other section will meet at 7 P.M. and 10 P.M. Let's hear from any of you. The following is in part a bulletin endorsed by L.P. ANN as EC: LJT and PLQ as O.BS: L.JP as OBS: MNE as OBS: EMG and P11E as ORS: S11M as Co-ordinator and has been applied for O.S. appointment. RBZ is a new ham in Chatham. F11H, in Lexington, is on 3.5 Mc. WI is on the Eastern Mass. Net frequency at midnight. Anyone else home at this time? ER has a new QTH. QQL has a rig on 144 Mc. at Red Cross Headquarters. RAR is an old-timer from back in 1905 and now has Class A. License. HX will have mobile rig on 141 Mc. and 14 Me. HWE is up and around but his Doc won't let him use c.w. but only "phone for a short period. The Yankee Radio Club had a rig on the air at Topseed Field. QRM, keeping schedules and playing chess. Newcomers are 30NB, KOD, and RBZ. QSS is portable rig on 3.5 and 7 Mc. BO has that fine 500 watt rig in his car. The 11-9 Radio Club met at KON's QTH. Skip Dodge just joined. ONB is on 7 Mc. and will have a 42Q7 final. PLQ has a Q-Ser and 150-watt job for several bands. NBS will have a rig on 144 Mc. and also on 3.5 Mc. now that he is in the a.c. district. The South Shore Radio Club held an outing at Riverside. OOU has a certificate for working 28 Mc. FJW, in Boston, is on 144 Mc. KPB and RGG also are on. The T-9 Radio Club held its annual boat ride. SA1 has a rig in his car. LNE is going on 7 Mc. RMU 9 is the new beam rotator. RBK worked a J on 7 Mc. MDU has schedule with his folks in Wisconsin on 28 Mc. New officers of the Framingham Radio Club are QOW, pres., R11Y, vice-pres., G11A, secy., and JUL, treas. RKH, treas. AMK in Roslindale, and SAR, in Randolph, are on 144 Mc. ERK has a workshop built here. 144 Mc. O11M has 522 on 28 Mc. RM is working on ARC-5s. 6RM has Harvey-Wells TBS all-band transmitter. Traffic: (Aug.) W10PQ 677, LM 87, Q11B 44, TY 39, EMG 32, VV 17, RXL 14, HYF 12, Q11Q 21, ORS 16, TY 39, BG 28, M11U 43, RS 8, BDU 6, RBK 5, PU 4. (Jul) W10Q1B 63, RS 56.

WESTERN MASSACHUSETTS—SCM, Prentiss M. Baller, W11AZW—SEC: UD, RM: BVR. Well, gang, here we are back in the active season with our nets in full operation. We are always anxious to have more active stations on the nets so if you want to get into traffic-handling, just drop a line to our RM, BVR. BVR has been appointed manager of the First Regional Net in the new traffic set-up. He has a new 100-watt final for stand-by. GZ leads the section in DX and the DX list. BDY waits GZ appointment. 12Z wants O.S. appointment. 12Z has now 900 watts out and is a 1500-watt final a.m. modulated for all bands. Seems like the summer months have been busy ones for most of us. GZ is starting on a 1 kw. rig with emphasis on 14-Mc. c.w. COI still is looking for a way to beat T.V.I. without resorting to 144 Mc. BHU is ready for 144 Mc. this season. James Chute, old-timer on 144 Mc. still is looking for a way to beat T.V.I. without resorting to 144 Mc. BHU is ready for 144 Mc. this season. James Chute, old-timer on 144 Mc. GZ, still is looking for a way to beat T.V.I. while working on 144 Mc. BHU is ready for 144 Mc. this season. James Chute, old-timer on 144 Mc. GZ, still is looking for a way to beat T.V.I. while working on 144 Mc. BHU is ready for 144 Mc. this season.
No Resistor Trouble for Me! I Insist on Ohmite...

These tiny but rugged insulated composition resistors are both color-coded and individually marked for quick, sure identification. Available in ½, 1, and 2-watt sizes, all RMA values. Tol. ± 5% and ± 10%.

"LITTLE DEVIL" COMPOSITION RESISTORS

"DIVIDOHM" ADJUSTABLE RESISTORS

Sturdy, vitreous-enameled "Dividohm" resistors can be adjusted easily for odd resistance values. Seven sizes— from 10 to 200 watts.

Wire-wound, vitreous-enameled "Brown Devil" resistors are easily mounted by their 1½" tinned wire leads. Proved reliability and small size have made them a favorite with amateurs. 5, 10, and 20-Watt sizes. Tol. ± 10%.

"BROWN DEVIL" VITREOUS-ENAMELED RESISTORS

Write for Bulletin 137
"Ohmite Ham Hints"
and Catalog 21

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Be Right with OHMITE

RHEOSTATS • RESISTORS • TAP SWITCHES
in Springfield. OHQ has changed his position. He now uses his sales technique at Harter and Young. LKO had a tough time with illness during the summer. AZW rebuilt his rig in aluminum to combat T.V. Let's get into the action soon with a bang. West. Mass. Net meets on 3700 kc. Mon., Wed. and Fri., 7 p.m., and 11 p.m. Try to be on the air soon. AZW will handle some traffic! Traffic: W10Z 30, BYR 21, R1YU 20, JE 9, BZG 6, BOE 2.

NEW HAMPSHIRE --- Acting SCM, Clifton R. Wilkins, WIRCW --- The New Hampshire 80-Meter Traffic Net opened September 12th for the winter schedule. We still need stations from the north country. All newcomers are invited. IPVF/1 reports in the Net using BC-474 receiver and three 01's in transmitter. ORN is at back of U. of Kans. SIC, a new ham in Whitefield, will be on the air soon. SIC will have more power soon. Joe does a swell job but it is, EWF hopes to have some 14-Mc. beam finished before it gets too cold. That boy is really after the DXV. A1D does a swell job as 00. Also daughter N.3 is trying to take over. QGU is back in N. Y. C. until next summer. IPV/F1 is back at Hanover, CRW is mobile for the fall, and all bands QRT reported in the traffic outlet. Hope this happens more often. QXQ reports in the Net often. We have no Nashua outlet. How about it, gang? BP is on 3.68-Mc. Appointments are all for now, gang, as there are no more reports. Would like to have reports of anything that you will send me. Traffic: (Aug.) W10Z, R1YU, QY 12, KEG, R1YU, EWF 2, P1V/F1. (July) W1R1L, 20, EWF 4.

RHODE ISLAND --- SCM, Roy B. Forder, W1JCH --- AQ has a net going Sundays at 0500 on 3525 kc. You are invited to drop in on them and get acquainted. Particular invitations are issued to such old-timers as MAD, BOP, BOY, BZI, and CMY. NAARO's new club station is now active on 29.080 kc. the club's net frequency. CPV and BDA now sport the same QTH without QRM. BDA has a new switchless 10/20-meter beam and claims it is the best yet. JMT acquired a surplus Army mill and is copying PX by the hour. ELJ is operating a movie projector but it is a Sunday's net on the AQ. JDR procured radiotelephone fail-safe license in two hours and a half. Something of a record. E7J the old-timer's final is a mechanical beauty and is working 1500 miles. Q0Q is experimenting with beams and promises something hot for the coming DX season. BFWF is planning separate finals for the contests. N0X will give 20-Mc. to N0G W1SAL 20, EWF 4.

Vermont --- SCM, Burtis W. Dean, WINLO --- W1JEN/KINAQ has been appointed EC for Chittenden County and CGW for Franklin County. AVF and IPV have had their 00 appointments renewed for another year.

NORTHWESTERN DIVISION

A LASKA --- SCM, Charles M. Grey, K171G --- With the fishing season just about over activity is picking up. 28 Mc. is showing signs of opening up in Alaska and with it many of the KL7Ns are coming back on the air. QV is leaving for a trip outside and he is including a portable rig with his gear. He will be on 28-Mc. with an RO-68 to 800 kc. JE has been keeping regular schedules with Seattle and his wife. He has been making use of the patch (phone) panels some of the boys have there. The last Juneau ham meeting was at the Thane C.A.A. station and a good time was had by all. The last reports from the county and COW for Franklin County. A VP and BJP has had their 00 appointments renewed for another year. AEC, CT. RM: COH, PAM: CPY, Helena CAP members BES, IKV, JER, and KAI spent four days with Clipperton Islander and have left for a trip outside and he is including a portable rig with his gear. He will be on 28-Mc. with an RO-68 to 800 kc. JE has been keeping regular schedules with Seattle and his wife. He has been making use of the patch (phone) panels some of the boys have there. The last Juneau ham meeting was at the Thane C.A.A. station and a good time was had by all after the boys climbed half a mile of stairs. BE has been doing a fine job in getting the emergency net underway. MONTANA --- SCM, Fred B. Tinting, WTECN --- SEC: CT. RM: COH, PAM: CPY. Helena CAP members BES, IKV, JK, and KAI spent four days with Clipperton Islander and have left for a trip outside and he is including a portable rig with his gear. He will be on 28-Mc. with an RO-68 to 800 kc. JE has been keeping regular schedules with Seattle and his wife. He has been making use of the patch (phone) panels some of the boys have there. The last Juneau ham meeting was at the Thane C.A.A. station and a good time was had by all after the boys climbed half a mile of stairs. BE has been doing a fine job in getting the emergency net underway.

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30 OHM OHM OHM TUBULAR TRANSMITTING TWIN-LEAD OR TV LEAD-IN

Nominal Characteristics of 14-076 Twin-Lead

<table>
<thead>
<tr>
<th>Nominal Impedance</th>
<th>300 ohms</th>
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<tbody>
<tr>
<td>Velocity of Propagation</td>
<td>79%</td>
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<tr>
<td>Attenuation dB/100 feet</td>
<td>30 mc., .85</td>
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<tr>
<td>60 mc., 1.4</td>
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<tr>
<td>100 mc., 2.3</td>
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<td>200 mc., .5</td>
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<tr>
<td>400 mc., .1</td>
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<td>Actual Size 1/16 &quot;</td>
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The two conductors are in opposite walls of a polyethylene tube—surface moisture, snow or ice are held outside the dielectric resulting in extremely low losses—dielectric between conductors is largely air.


(Continued on page 80)
LABORATORY

MODEL 666HH
VOLT-Ohm-MILLIAMMETER

Packs a laboratory of versatile service into a size that fits your hand and weighs only 1½ lbs. Features: Greater scale readability, low contact resistance jack achieved by new banana-type plug-in leads, greater stability evolved through special new type resistors—and others. Delivers better results than many larger, costlier testers. See, try, compare the performance of this thoroughgoing example of dependable Triplette engineering.

U.S.A. Dealer Net Price .... $22.00

New
POCKET SIZE
VOLT-Ohm-MILLIAMMETER
MODEL 666R

Special features include resistance ranges of 0-3000 Ohms to 3 Megohms, self contained; enclosed selector switch, unit construction—parts are housed in molded base integral with switch. Direct connections without cabling. No shorts. Resistors are precision film wound, each in its own compartment. Batteries are easily replaced. Only two controls, both flush with panel. Streamlined handsomely designed pocket-size case.

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TRIPPLETT ELECTRICAL INSTRUMENT CO.
BLUFFTON, OHIO, U.S.A.

In Canada: Triplette Instruments of Canada, Georgetown, Ontario
You Know What Power Wire Wounds Do

DO YOU KNOW
WHY IRC PWW's
DO IT BETTER?

Faster heat dissipation — The coarse, dark coating is designed to the scientific principle that a rough, dark surface dissipates more heat, more rapidly than a smooth, shiny surface.

Safeguarded against injury — Low temperature processing prevents injury to the wire element and loss of temper in the terminals.

No deteriorating necessary — at high ranges. IRC Power Wire Wound Resistors handle full rated power in all standard ranges.

Corrosion-resistant — Special corrosion-resistant cement, pioneered by IRC, is free from salts and chemically active ingredients which attack resistance wire.

Easy to install — Terminals are secured by spot welding—heavily tin dipped for easy soldering. Brackets are designed for easy mounting.

Variety of fixed and adjustable types — IRC PWW's are available in a full selection of sizes—from 10 to 200 watts—each permanently marked with type number and resistance.

IRC Power Wire Wound Resistors give you the most for your money...more watts per dollar. For additional information, write for free catalog DC-5. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa. In Canada: International Resistance Company, Ltd., Toronto, Licensee.

INTERNATIONAL RESISTANCE CO.
Wherever the Circuit Says —

28-Mc. mobile in the car. If you have emergency gear, or any ideas on EC work, drop our SEC a line. Traffic: WICT 31, EGN 8.

OREGON — SCM, J. E. Boden, W7MQ — Baker: FFR is new check-in on OEN with FB signal. Bend: SY covers most of Oregon with his car and mobile rig. GNJ is having trouble getting his mobile to work right. Coos: new EC and soon will have a kw. going. Also a new club is being formed here. Eugene: FRK, our KM, is developing a new Oregon Radio Speed Net on 3984 kc. To get additional members, w.p.m. straight key, catering mostly to new bams and 'phone operators who want to brush up on the code. Medford: HLF, our SEC, reports that the Medford Club has arranged a Girl Scouts-Parents Relay with FB results while the girls were at camp. LaGrande: HBO and KVG with the rest of the Club put on an Eastern Oregon Ham Fest at Emigrant Park, with Baker Club members ably assisting. Pendleton: LUX is new OBS. The Pendleton Club kept two-mile Round. Pendleton parade moving use of mobile equipment. Portland: ESS attended the Vanalas Division Convention and came back with some FB prices. HDN has a second call. N. B. H. E. S. F. lost the roof from his house by fire. KEG is active on MAR'S, OEN, and all Trunks when he has traffic. FB is back on after a siege in the hospital. LT now is mobile on 3.35 Mc. ACZ was maritime mobile at Astoria Salmon Derby. Philometh: APP is showing the bands that he can use a mike as well as a key. Tillamook: IDP works 3.85-Mc. mobile with FB results. Traffic: W7QCN 1673, APF 199, HDN 184, KEG 181, HLF 135, FY 718, JBR 120, DIS 88, GNJ 53, LT 40, HVD 26, KL 26, FY 24, MQ 24, BDN 10, HJ 10.

WASHINGTON — SCM, Clifford Cavanaugh, W7ACF — SEC: KAA, RM: CZY, PAM: GBT, EGR, KRC. Kittitas County EC, sends over the following news: JAR has moved to Ellensburg to attend college. HRU got his license back and is hard at work trying to get his mobile working. FFR has been transferred to Baker. ORE. EG is getting back on the air with JTR-18 exciter. EGR himself spends his spare time on WARTS Net. HM, formerly in Ellensburg, is in Bellingham, where he is on 7 Mc. with a BC-459A. HGC says he is ready to move into his shack again after it has been used for radar purposes. 5EJ is working now on 7 Mc. PWH says a lot of this fall fair traffic is from this stuffing the ballot box business. It makes it tough on all of us. NMR is new WCWNet member. ZU is the new OBS. The Pendleton Club kept running a Girls-Parents Relay with FB results while the girls were at camp. Lt. Knollys is the RM. URI is hard at work trying to get a phone system going in Pendleton. ETT has a new check-in on OEN with FB results. It makes it tough on all of us. NMR is new WCWNet member.
TRANSMISSION LINE CABLES

Every Type for Every Service

Sold Exclusively Through Recognized Wholesale Distributors

Belden Radio WIRE
A JOHNSON "Q" BEAM
FOR MATCHING EASE,
HIGH EFFICIENCY

2-Band Operation

Unsurpassed for gain, efficiency and ease of matching, the JOHNSON "Q" is a natural for beam operation on two adjoining harmonically related bands.

The beam consists of two JOHNSON "Q's" for the lower frequency of the two desired, spaced 1/5 wave and fed 180° out of phase with a 600 ohm line.

In ordering, specify two "Q" antennas for the lower frequency of the two desired. For example, if you want a "Q" Beam to operate on 10 and 20 meters, order two JOHNSON "Q's" for 20 meters.

On both bands, radiation is broadside, with matched impedances - 45° on second harmonic.

Get your JOHNSON "Q" Beam at your dealer's, or write for brochure entitled "The JOHNSON "Q" in Popular Antenna Applications."

"Q" BEAM ADVANTAGES

1. Two band operation with matched impedances on both bands. (Bands must be adjacent and harmonically related.)
2. 4 db gain on fundamental -- 6db on second harmonic.
3. Requires small installation space.
4. Requires no adjustment when changing bands.
5. Uses highest efficiency open wire line.

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* * *

SLX reports the Humboldt Radio Club of Europe is backing up the A.E.C. program. Fine arrangements are being made for the club to publish live 28-Mc. mobile rags from the city to further A.E.C. work. The club's EC membership is growing steadily. B.Y.S. is taking a vacation from ham radio to take up art. Those desiring pointers on interior decoration are urged to contact Bill. Yes, he is remodeling the home 6TH, CHP moved to new location and rig is rig up now. JCP is having transmitter trouble but hopes to be on again soon. He is recovering nicely from surgery and feels the urge to say hello to the gang again. P.S. He is giving the rig the once-over for clicks. Word from K6GDI, Guam, gives the following mailing address for all QSLs and other ham correspondence: Box 120, Guam, Mariana Islands, c/o K6GDI. Although he has been very busy of late and very active in club affairs there he still is holding down his ham club work. Traffic schedule including K6M, Pacific Front to Guam. Our former SEC, SRTY, now is located in Pasadena and can be reached at 635 Hermitage Street. Pasadena 1, where he is practicing radiology. Doc is

(Continued on page 84)

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HYPASS® CAPACITORS
ELIMINATE TELEVISION INTERFERENCE PROBLEMS

Sprague Hypass Capacitors are an exceptionally effective means of by-passing harmonic currents in short-wave transmitters and for eliminating conducted h-f interference from power lines and control circuits. They are also used to eliminate TVI caused by line interference conduction between neighboring television receivers.

Unlike conventional bypass capacitors which are self-resonant at relatively low frequencies and are consequently ineffective for v-h-f filtering and bypassing, Sprague Hypass feed-thru capacitors do not exhibit a resonant frequency if properly connected. Instead they simulate a lossy transmission line with effective broad-band attenuation. This property is the result of an exclusive Sprague internal design, originally developed especially for critical h-f and v-h-f radio frequency interference problems in the military service.

The high-voltage d-c Hypass Capacitors were developed especially to meet transmitter needs outlined by ARRL Headquarters. The circulating current to ground at 14 and 28 mc should not exceed 2 amperes for Types 47P15 and 47P16, 3 amperes for Types 47P13 and 47P14, and 4 amperes for Type 47P12. The Type 48P9 .1 mfd., 250 v a-c unit is recommended particularly for power line, filament and control circuit applications up to 20 amperes line current. In most cases, it is far more effective than an ordinary choke-capacitor filter.

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<td>1 x 1 9/16</td>
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SPRAGUE PRODUCTS COMPANY
North Adams, Massachusetts
### PRODUCTS OF MERIT

**New MERIT Filament TRANSFORMERS** with 10,000 Volts Insulation

**P-3042 for amateur transmitter supply 115 V., 60 cy.,** finding wide preference. P-4049, for amplifier, amateur, industrial use, 115 V., 60 cy., is unrivaled. The answer: MERIT Quality!

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**DIMENSIONS**

- **P-3042:** 10,000 H, 2½ W, 3½ D, 2½
- **P-4049:** 10,000 H, 3½ W, 4½ D, 3

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**Buy these units from your MERIT Jobber NOW!**

---

**ROANOKE DIVISION**

**SOUTH CAROLINA — Acting SOM, T. H. Wood, W4ANK** — The Columbia (S.C.) AMATEUR Net (3.5-Mc. phone) was organized. ABE is Net Manager; BIB is the Net Scribe. The net will meet Tuesdays at 7:30 P.M. and Sundays at 8 A.M. Net frequency is 3540 kc. BFD, FM, and HZ will be the NCS. The S.C. phone and c.w. nets will tie into the NTS. The c.w. net meets Mondays at 7 P.M. and Wednesdays at 9:30 P.M. on 3525 kc. BFD is on 160 meters from Blair. EZO is on 2.85 and 14-Mc. phone and on 3.5-Mc. c.w. occasionally. YA is

(Continued on page 89)
3-UNIT DESIGN FITS ANY CABINET...

The most versatile television chassis yet designed! Three basic units — power supply chassis, RF chassis and deflection yoke assembly — may be placed side by side, one above the other, etc., to conform to any cabinet. Simply plug in the cable connectors. Each unit is soundly engineered, and built to famous National standards of performance.

Price slightly higher west of the Rockies

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Specify either TV-10C or TV-12C when ordering

1. Choice of 10" (TV-10C) or 12½" (TV-12C) chassis. 2. Tunes all 12 channels. 3. Wired, pretuned and tested — not a kit. 4. RF stage employs tuned grid and plate for maximum gain and optimum band width. 5. Unique 36 mc IF minimizes interference. 6. Fine tuning control covers range of 2-3 mc, for maximum tuning accuracy. 7. Improved intercarrier sound. 8. Magnetic deflection and "flyback" high voltage supply. 9. 72-ohm unbalanced and 300-ohm balanced inputs. 10. Supplied with two six-inch PM speakers.
A revolutionary new hand-held magnetic unit that pro­

fits snugly in the hand, sits firmly on a desk without tipping over, or

can be placed on a stand. The "Rex" is recommended where good quality speech reproduction is required, and low cost is an important factor. Burgundy Red metallic finish. Complete with stand adapter. Die-cast case. 2¼ wide, 3½ high, 1¼ thick.

**The New Shure Controlled Reluctance**

**HERCULES**

Only $12.95 List!

A revolutionary new hand-held magnetic unit that provides clear reproduction, high speech intelligibility, high output, and ruggedness—at an amazingly low price! A tough microphone that can be used indoors or outdoors—fits snugly in the hand, sits firmly on a desk without tipping over, can be placed on a stand. Metallic Green finish. Complete with stand adapter. Die-case cost. 2¾ wide, 3½ high, 1¼ thick.

**The New Shure Crystal**

**REX**

Only $10.00 List!

A striking-looking low-cost crystal microphone. The "Rex" is a high output, hand-held microphone that fits snugly in the hand, sits firmly on a desk without tipping over, or can be placed on a stand. The "Rex" is recommended where good quality speech reproduction is required, and low cost is an important factor. Burgundy Red metallic finish. Complete with stand adapter. 2¾ wide, 3½ high, 1¼ thick.

---

**NO OTHER MICROPHONES OFFER YOU SO MUCH FOR SO LITTLE!!!**

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**COLORADO** — SCM, M. W. Mitchell, W6LQZ — SEC: C KHQ, RM: IC, 7WVZ, ex-9WVZ, is back in Colorado after being on break for World War II. The OHS, as is ZJO, ZJO rang the BP¥ bell this month with a score of 21451 He handled KBQ this month. The Colorado Slow Speed Net will operate 3540 kc. on the 14th, 20th, and 26th. KBQ is manager of the 144-Mc. Net in the Colorado area. KVM and LQF operate K3NRW during hurricane emergency period. IA PT has been transferred to an OHS position in the Charleston area. KW3 worked on 3.5 Mc., which included a visit to yours truly.

---

**ROCKY MOUNTAIN DIVISION**

**WEST VIRGINIA** — SCM, Donald B. Morris, W8JM — VAN has been transferred to Virginia by his company. Munnell, formerly SEC, now is on 28-Mc. phone from Topeka signing 60Q/7. BDL maintains consistent schedules on 14-Mc. phone with Atlantic stations. VHF, formerly of Bluefield, is back on Swan Island. BWD is moving to Weston and creates another town for the 144-Mc. gang. EHA has left 144 Mc. and is on 3.5-Mc. e. OME, the MARA held its annual fall picnic at Jackson Mills for members and their families. MOP spent the summer vacation working his rig over for fall activities. Traffic: W4KVM 87, CVO 20, YEJ 5, KFC 4, LMB 1.

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**SHURE BROTHERS, Inc.**

Microphones and Acoustic Devices

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Address: SHUREMICRO
WORLD FAMOUS SIMPSON HAMMETER
IS FIRST WITH RADIO AMATEURS

The famous 240 Hammeter—named by the radio "ham"—is world renowned for its ruggedness and accuracy. It was designed for the additional voltage and sensitivity required in radio testing.

A favorite with "hams" because of its maximum voltage range of 3000 AC or DC, the 240 was the first self-contained pocket portable built expressly to check high voltage and all component parts of transmitters and receivers.

A worthy companion of the Hammeter is the Model 230 volt-ohm-milliammeter, with a maximum voltage of 1000 AC or DC. Its ranges are adequate for most line voltages, for telephone, teletype, and general purpose testing.
FIELD DAY...EVERY DAY!

PRECISION Series 85
AC-DC Circuit Tester
(20,000 Ohms per Volt)

will help YOU to STAY on the AIR

Self-Contained to
6000 volts, 60 Megohms, 12 Amperes, +70 DB

A compact, laboratory type, high sensitivity test set indispensable for test and maintenance of modern amateur communications equipment.

20,000 Ohms per Volt D.C. — 1000 Ohms per Volt A.C.

VOLTAGE RANGES:
0-3-6-9-12-15-20-30-60-120-600-1200-6000 A.C. & D.C.

CURRENT RANGES:
0-120 microamps; 0-1.2-12-120-MA; 0-1.2-12 Amps D.C.

RESISTANCE RANGES:
0-600-600K-6 Meg-60 Megohms.

DECIBEL RANGES:
From -26 to +70DB.

Complete with batteries and test leads..............$3875

PLUS superior physical features:

★ 4¾", 50 microamps, Easy Reading Meter.
★ Heavy duty bakelite case 5½ x 7½ x 9½.
★ Deep lidded, coiled aluminum panel.
★ Recessed 6000 volt safety jacks.
★ Only two pin jacks for all standard ranges.

LC-1 LEATHER CARRYING CASE—Custom designed, top-grain cowhide case with tool and test lead compartment. 58.75
See Series 85 and other famous "Precision" instruments, on display at leading radio parts and ham equipment distributors. Write for latest catalog.

SOUTHEASTERN DIVISION

LABAMA — SCM, Dr. Arthur W. Woods, W4GJW — A JYB handled AENP control in a capable manner during the operation of LEN, who is regular on all bands. LEN has 5000 watt. JYB has 1000 watt, 50 Mc. with K4AF and W9DVC. The Taylor super-modulated rig is now in operation at JYB on all bands, 3.5-28 Mc., and power inputs varying from 5000 watts down to 1000 watts. JYB has 3.5 Mc. again with a new rig that required much bug extermination. He regularly operates on 7200 kc when he can, and if he gets away from his 3.5 Mc. commitments. WOJ has had his PAM, OBS, and OBS certificates endorsed. DXB took an old 100-meter crystal and ground it down to the 3.5-meter band. When 3.85 Mc. changed to 3.7 he ground it down and still further into that band. Bad luck overtook him and he didn’t get stopped until he overstepped the net frequency and wound up on 3960 kc. If everybody at the section can introduce a good reason for continuing this column in the face of having only one or two station activities reports, I’ll cooperate. Otherwise this is the last column that will be written by this SCM.

EASTERN FLORIDA — SCM, John W. Hollister, W4FZF — From the activity of the Miami Radio Club stations handled 165 damaged during the hurricane it appears that some of you got busy but quiet, just in case another blow was around the corner. To many of the operators it was such a hang-up job during the storm that it is difficult to single them out. MVJ sent in recommendations for meritorious service awards for quite a number. There is no doubt that the c.w. net really was in the groove and running according to the plans contained in the Florida Emergency Manual. The phone net on 3000 kc was the means for sending FM, FM, as regards information on highways, railroads, truck lines, and weather, especially the broadcast frequency of W4JIP. However, a couple of stations did write that they could not get into the ‘phone net with the low power they were using because of non-compliance with the prescribed listening periods and that they were unable to break through the higher-powered stations. All in all some good communications work was accomplished under the most difficult conditions. Eau Gallie: JWG reports PL6 on 28 Mc. at Melbourne. JWG lost his beam and 75-meter feeders. Lake City: IQV has VFO on 14-Mc. c.w. so what’s the details. All Miami: MFP has radiotelephone 1st-class license now. BXL, with USCGA flotilla Nr. 10, is second operator at W4ES, ES reports “W4RD(WPFB) lost his mother, roof, fell off the roof, and got FCC warning, all in three days of storm.” Our sincere sympathy on the loss of your mother. Tarpon: TWP says DES said he stood by during the storm and worked with the Red Cross since the c.w. net was going good without everybody and his brother reporting in every 3 minutes or so. The Dade Radio Club stations handled 165 messages for the Miami Weather Bureau. WZF was re-appointed as SCM. Traffic: W4IQV 452, PBY 227, W4KBR 166, W4SJ 113, W4M 90, W4L 66, ZG 32, JWG 25, DES 13, LMG 13, BYR 4, OBW 4, WZF 3

WESTERN FLORIDA — SCM, S. M. Douglas, Jr., W4ACB. Fellows, the handling of traffic during the recent hurricane was most gratifying. The stations that participated in this section were WXJ, K4B, W4D, OCL, and GQM. In Perry, KQP was active on 3.5-Mc. phone. A swell job was done, especially when Net Control shifted to Tallahassee from the section. Contact OKD for further information regarding reactivating the Suwannee Net. Let’s get our emergency nets functioning 100 per cent. OGR is a ECQ with radio trouble (new car). JV has been in Atlanta with the USMMC. PAA is very active on 7-Mc. c.w. We need more activity there! OUC is leaving for Columbia, S.C., to attend school and hopes to set up 7-Mc. rig there. PBY also has been heard on 7 Mc. PRP, new proxy of Goslin Club at NAS Pentagon, is getting new life in the club. MS is getting near his 20-Mc. WAS. ACB is getting the 50-Mc. rig ready. Traffic: W4NN 245, ORD 85, AXP 81, ACB 5.

GEORGIA — SCM, Clay Griffin, W4DZI — Albany: HXA has moved 12 miles south of Albany; IPY has a kw. on c.w.; POJ, PGK, and KQO are all new hams on 7 Mc.; HHE has 160 watts on 28-Mc. ‘phone; JYW has a full-changing 30-Mc. DXCC with all countries confirmed; ATO built a t.v. receiver; ATP has a rotary dipole on 14 Mc.; the Albany Club has 20 members and is holding code classes with LPV and DIA as instructors. Camilla has a new ham, OTD, CCA, of Bainbridge, is looking for 144-Mc. stations. Columbus: KEJ was home for a visit; CVY and DDI are on the go; J4O has a new 32-12-Vo. beam; DDQ exchanged his 32-12-Vo. for a new 32-12-Vo. mobile rig; KDZ has a new HP-140 transmitter. FOR was on the go on 28 Mc. with S11a on 14-Mc. c.w. MCM is a new GO for Georgia. We are sorry to lose IRA, who is moving to Denver, JNL, and MCM were active during the Florida hurricane emergency. Also KGI, of Valdosta, put some time in on 3.5-Mc. c.w. during this emergency. Traffic: W4MMQ 183, KGI 88, MCM 22.

WEST INDIES — SCM, Everett Mayer, KP4ED — DJ, GP, FJ, and CP are new EIs who are sending in activity. We are now sending W4M as liaison between all EIs.

(Continued on page 80)
How much of a warehouse do YOU think it would take to supply the electronic needs of the nation? How many manufacturers' lines would have to be stocked? How many thousands of items carried?

Actually, there is such a warehouse. A composite picture of it would stretch across the country, and show the amazingly diversified stock of the members of NEDA, the National Electronics Distributors Association.

As the representative of the industry's "blue-ribbon" manufacturers, the NEDA Distributor serves thousands of industrial plants, schools and institutions; and hundreds of thousands of amateurs, radio dealers and repairmen.

Both the growth and the direction of that growth in the electronics field, have put a premium on the NEDA Distributor's knowledge, experience, business integrity, and distributing organization.

To move surely and safely in this new world, remember that the NEDA Distributor in your city is your best source for radio parts and electronic equipment.
HAMMER BLOW POWER

MODEL H75
7½" THROAT

$16.95 NET

Punch and Die Extra

NOW chassis punching in almost every size and shape may be done in your own workshop with the unique New Pioneer Broach "Ham-R-Press". Punch mounting hole for ANY electronic part. Easily. No drilling. May be done in your own workshop with the unique New Pioneer Broach "Ham-R-Press".

SOUTHWESTERN DIVISION

LO S ANGELES - SCM, Vincent J. Haggerty, W610X, August fairs and hobby shows galore helped CE build up a tremendous traffic score which will be the all-time high for a single operator station in this section. DE and IXO visited CE in mid-August and watched the build up at work. YLZ and DAE also made the BPL. The Paso Robles Radio Club had a portable set-up at San Luis Obispo County Fair with FYW, HIF, and SAF doing the bulk of the operating at the traffic booth. The club thanks all operators and nets for the efficient help rendered on this project. TFC is looking for Kansas stations on 14 and 28 Mac. who knew him when he was 9NOP. DAW has an ARC-5 with 100 watts input on 7 Mc. in search of DX WKO is preparing antennas for the new 40-foot lattice tower. BUK visited YLZ during August. MU is on his usual vacation. The SCMs visited PAM MVK, and SEC ESR during the month. JQB says traffic work is his first love but business hours prevent maintenance of regular schedules at the moment. JQB says he has a new rig almost ready for the ether. Thanks for the imposing list of traffic reports again this month; an increasing number of these reports are being handled by the VHF operators and the VHF radio to demonstrate the usefulness of the communications lines within the section. Traffic: W8CE 3460, YLZ 660, DDE 618, FYW 196, HIL 166, GWB 149, IFY 130, QAE 73, ZM 52, JQ8 37, IDX 50, H1G 43, ZQV 28, CMN 49, TFC 14, DAG 11, AM 8, NAZ 5, AJJ 3.

ARMOUR - SC, Gladden MC, Elliott, W7ML - The Tucson Hamfest picnic was attended by 134 hams and their families with a good time being reported. One of the highlights of the meeting was the exchange of 144 mobiles at a meeting of 7 of the State's XYL operators. The Arizona gang regrets the passing of W7WUD, Rita Lemieux. UPR has a new call, N2K, for operation in Douglas. This Club reports a membership of 15 and an emergency mobile net on 26,460 kc. LHM reports good DX with a 75-ft. tower. DJB has a new rig almost ready for the ether. Thanks for the imposing list of traffic reports again this month; an increasing number of these reports are being handled by the VHF operators and the VHF radio to demonstrate the usefulness of the communications lines within the section. Traffic: W8CE 3460, YLZ 660, DDE 618, FYW 196, HIL 166, GWB 149, IFY 130, QAE 73, ZM 52, JQ8 37, IDX 50, H1G 43, ZQV 28, CMN 49, TFC 14, DAG 11, AM 8, NAZ 5, AJJ 3.

ARIZONA - SC, Gladden MC, Elliott, W7ML - The Tucson Hamfest picnic was attended by 134 hams and their families with a good time being reported. One of the highlights of the meeting was the exchange of 144 mobiles at a meeting of 7 of the State's XYL operators. The Arizona gang regrets the passing of W7WUD, Rita Lemieux. UPR has a new call, N2K, for operation in Douglas. This Club reports a membership of 15 and an emergency mobile net on 26,460 kc. LHM reports good DX with a 75-ft. tower. DJB has a new rig almost ready for the ether. Thanks for the imposing list of traffic reports again this month; an increasing number of these reports are being handled by the VHF operators and the VHF radio to demonstrate the usefulness of the communications lines within the section. Traffic: W8CE 3460, YLZ 660, DDE 618, FYW 196, HIL 166, GWB 149, IFY 130, QAE 73, ZM 52, JQ8 37, IDX 50, H1G 43, ZQV 28, CMN 49, TFC 14, DAG 11, AM 8, NAZ 5, AJJ 3.
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Fair and the San Diego City Recreation Hobby Show. The Orange County Fair booth was sponsored by the Orange County Amateur Radio Club, spearheaded by CQF, QZQ, EOV, BAM, and DEY. Operating are FCT, DEY, GWO, and QZQ, each operator signing his own call, thus aiding his own traffic score. RAM took all the traffic from the fair on 3.85 Mc and relayed it on, mostly to WBF and BGF. A total of 104 messages was filed. The San Diego Hobby Show booth was sponsored by the San Diego Council of Amateur Radio Clubs and was operated under the call W6XLD. The ARRL Antenna Book, 6FDX/6, KQJ furnished the 32-V-1 and 75-A, ZKZ, and then the traffic operators routed the traffic, XYZ station also put in a lot of time and effort. Here again CE and BGF took a big share of the traffic, with a total of 251 messages filed. FMZ is rebuilding for the winter season and is on the BNF with a 3.85-Mc SSB Shifter and 18 watts. DBZ is back from a Naval Reserve cruise to K16 Land. He has a new modulator and a better antenna for 3.85 and 3.8 Mc. By spent three weeks in St. Louis visiting his folks and ham friends. RGF has new "coffee can" VFO without the coffee cans. It works FB, too. BZE has applied for the DXCC. YV is contesting from Costa Rica. GTM is rebuilding his Field Day rig. Traffic: W8BGF 437, BAM 274, FMZ 63, BWO 45, EOV 28, FCT 22, DBZ 18, DEY 9, GTM 1.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, Joe G. Buch, W5CDU
- FTR has completed rebuilding and now has in the final and works 3.85-Mc, 'phone, 28-Mc, 'phone, and 7-Mc, c.w. LGY has her receiver in the service shop. I'W QST has opened up. TX'K's most active neighbor W6GKL... the only one with 3.85-Mc 'phone. W 6GKL has WBE, of Marshall, will remember the 1941 Convention for a long time — he held the lucky number and carried home the 75A Collins. We enjoyed having our QST furnished the 32V-1 and 75-A. W6BGF 437, BAM 274, FMZ 63, BWO 45, EOV 28, FCT 22, DBZ 18, DEY 9, GTM 1.

Waco Invitation: Clubs, their members and unattached hams! Nov. 20, Dec. 18 and Jan. 16, the third Sunday of each month, a sign a hidden 75-meter 'phone transmitter within 15 miles of Waco will go on the air at 1:30 P.M. This station will stay in contact with a station in Waco until the transmitter is found then its location will be given. The W5RAU trophy ($25.00) cash will be awarded the winner (licensed amateur) at each hunt. If enough participation is encountered perhaps others may offer prizes for those arriving after the winner. Collaboration between several mobile stations by communication will be allowed.

OKLAHOMA — SCM, Frank E. Fisher, W5AH/T/AST - SEC: AGM, RM; MBV, PAM, ATJ, AGM, Oklahoma City, replaces HGC as SEC. Let's all join in making AEC preparedness 100 per cent in our section. ATJ takes on the PAM job and we are looking for much activity among the 'phone boys as a result of new licenses. AEC is cooperating with the new EC c.w. nets to operate on 3830 kc., Sundays at 0700 CST. NTX Traffic Net will cooperate with the new traffic plan. The traffic net needs help from the 'phone nets in dispatching traffic in the Northern Texas section. MIF, Mr. Handy, with us at the Convention, The Heart of Texas Amateur Radio Club, Gatesville, has a membership of 25, including 6 licensed members. HOF is president; MBR is vice-president; MBS and QFI, technical directors; FQB and HQZ, social activities committee. Thanks to HOF for the nice report. BPA, Bozor, is the new NCS for North Texas EC Net and BKH will serve as Alternate NCS. Our SEC, AAO, and BKH have worked out details for a supplemental EC c.w. net to operate on 3830 kc., Sundays at 0700 CST. NTX Traffic Net will cooperate with the new traffic plan. The traffic net needs help from the 'phone nets in dispatching traffic in the Northern Texas section. MIF, Mr. Handy, with us at the Convention, The Heart of Texas Amateur Radio Club, Gatesville, has a membership of 25, including 6 licensed members. HOF is president; MBR is vice-president; MBS and QFI, technical directors; FQB and HQZ, social activities committee. Thanks to HOF for the nice report. BPA, Bozor, is the new NCS for North Texas EC Net and BKH will serve as Alternate NCS. Our SEC, AAO, and BKH have worked out details for a supplemental EC c.w. net to operate on 3830 kc., Sundays at 0700 CST. NTX Traffic Net will cooperate with the new traffic plan. The traffic net needs help from the 'phone nets in dispatching traffic in the Northern Texas section.

The Pampa hams are working the 75-mile hop to Durham, Okla., on 28 Mc. GXK and ELO are waiting for 28 Mc. to open up, HBD, of Marshall, will remember the 1941 Convention for a long time — he held the lucky number and carried home the 75A Collins. We enjoyed having our QST furnished the 32V-1 and 75-A. W6BGF 437, BAM 274, FMZ 63, BWO 45, EOV 28, FCT 22, DBZ 18, DEY 9, GTM 1.

Costa Rica. GTM is rebuilding his Field Day rig. Traffic: W6BGF 437, BAM 274, FMZ 63, BWO 45, EOV 28, FCT 22, DBZ 18, DEY 9, GTM 1.

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(Continued on page 84)
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rebuiding, KHF has new beam and Zepp, 9KIP is new Ardmore ham, CWH writes 283, 28, and 50 Mc. with high power. QP has Class A license and is on 3.5-Mc. phone. NLZ, DFO, and LGW on 144 are interested in Class B QSOs.
Traffle: K9NHP 1052, W3WV 78.
SOUTHERN TEXAS—SCM, Ammon O. Young.
W6BDI—PCO is new EC for El Paso. JIP and MDA are very active in keeping the El Paso Emergency Corps going.
K9JB is active on 50 and 144 Mc. N1Y is back on STEN c.w. net. MN is handling traffic on 7 Mc. K5W has new tower for 14-Mc. beam. O1T is new 5th district chairman.
OQRS reports from YLRL and requests reports from YLRL members in the 5th area. HBM has 650-watt rig on 20-, 14-, and 28-Mc. phone. KOBES is now QIC. SB8R is rebuilding QTH, not the rig, HBM requests that those in the West Gulf Division who have old Call Books forward them to him for shipment to some of our districts.
ACL is having TX troubles. The Austin gang is having fringe area T.V. I problems. FNA is nearing 170 countries confirmed.
JY is working 14-Mc. e.w. and is due to sleep on 14-Mc. phone DX. NMA, LZY, JWM, and BDI are all very near getting their DXCC. NN has kw. on 7- and 14-Mc. e.w. Thanks to the PB convention in Dallas, I was able to meet quite a number of the Southern Texas gang. I hope to see all of you in San Antonio next year.
Traffle: W5MN 25, HBM 10.
NEW MEXICO—SCM, Lawrence R. Walsh, W5SMA Sec.; ZD, PAM: FAG, RM: NXL, AFU and ORM have ORS appointments. JXX and WSX are ECs. KAO is in his new home at 2530 Melton Road, Albuquerque, MSG will have charge of the amateur station at the New Mexico State Fair. JYW reports the Hobbs Amateur Radio Club has been assigned the call KJH. BHF has a “new” SX-10 receiver. BIH is giving New Mexico contacts to DX stations. NKG is on 3.5- and 7-Mc. e.w. A.200-Mc. phone. BXX it is hoped that the car-letter license bill pushed so that we can get our call letters next year. If you are not contacted in the near future, chances are BR, will drop me or Bill a postcard. JXH is putting up a vertical antenna for 3.5-Mc. KEN and BYX are on 144-Mc. trying to work New Mexico stations. W5D, with 93 Mc, with 25 watts, MSG, CO, reports sending seven station notices for bad notes. ORM is on 144-Mc. phone he has 500 watts and 200 Mc. with 250 watts to a 4-125A. On Aug. 21st New Mexico held a state-wide emergency field test. Stations participated were JYW, M54, of the DXA, K5X, OKX, C6, for 3.5 Mc. after doing some FB traffic work on 7 Mc. during the summer. The Kirkland Lake Club would like to swap club bulletins. PH has WAC and AZZ has a wife. DD reports that he is very busy and is thinking of giving up PAM appointment. BUR is assistant manager for Eastern Area Net for 13th region. All CO appointees are reminded to study carefully the new set-up for nets; also the new method of reporting. Our hats are off to W1NJM, of the Head- quarters staff, for a fine job in the new net set-up. We are finally tutoring the OM to his ticket. BUG is experimenting with low-power transmitters. DEB is on with Miller exciter. GN and GG hold regular license. PS is rebuilding

(Continued on page 98)
to higher power for both 'phone and c.w. CAR is back on operating all bands. 'Phone and c.w. also have XYLs. A schedule of Official Bulletins. VR is now in Hamilton on 28 Mc, QM is using n.f.m. HB, NJ, and HK, three of our oldest members, enjoy their various hamsprobably the most, even if they are making no new contacts. It is suggested that any clubs or individuals operating rigs at the present time consider the new contacts and pass the word around. "The" second frequency, is QO with 2AT on 144 Mc, which is to be heard on 28 Mc. The same individual reports that this frequency is "the" second frequency. EG reports the Quebec Phone 'Phone at 3.8 Mc, and 6A1 has been heard for the first time on 3.8 Mc. NW is operating on 6A1, and 6M is operating on 3.8 Mc. EW is operating on 3.8 Mc, and 6A1 is operating on 3.8 Mc. "The" second frequency, is QO with 2AT on 144 Mc, which is to be heard on 28 Mc. The same individual reports that this frequency is "the" second frequency.
Calibrated electrical bandspread for 6, 10-11, 20, 40 and 80 meter amateur bands! Automatic noise limiter effective on both phone and CW, with adjustable threshold! Highly flexible crystal filter provides 6 steps of selectivity! S-meter for both phone and CW! Temperature compensation and voltage regulation assure exceptional stability! Accessory socket for NFM-73 adaptor! Trimmer control permits panel adjustment of RF stage! Tone control. Phono input jack also provided.

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<th>Power (kw.)</th>
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A 0.005-second pulse may be heard as a faint tick every second, except the 59th second of each minute. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted at precisely one minute before each hour and each five minutes thereafter (59th minute: 4 minutes past hour, 9 minutes past hour, etc.), resuming after an interval of precisely one minute. This one-minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric-disturbance warnings applicable to the North Atlantic path are given at 19 and 49 minutes past each hour. If a disturbance is in progress or is anticipated within 12 hours, the time announcement is followed by 6 Ws; if conditions are quiet or normal, the time announcement is followed by 8 Ns. The announcements of the station's services and call are given by voice at the hour and half hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second.

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NATIONAL NC-183 • Sixteen tubes (including rectifier and voltage regulator) are employed in a modern high-gain, superheterodyne circuit in National Model NC-183. The push-pull audio stage delivers 8 watts of undistorted audio power to an efficient ten-inch PM speaker. The wide range crystal filter with phasing control, adjustable-threshold automatic noise limiter, tone control and C.W. oscillator pitch control afford exceptional flexibility of performance characteristics, enabling the operator to cope with a wide variety of receiving conditions. Frequency coverage: 540 kc. to 31 mc. and 48 to 56 mc. Available in table model or rack model. Price: Receiver, $268.00; Speaker, $14.00.

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The Selectoject
(Continued from page 17)

Another amusing demonstration is to set the Selectoject in the “reject” position and eliminate a particular signal. When the switch is thrown, there is the same signal, boosted above the rest!

It might be expected, on the basis of experience with regenerative detectors, that the effective selectivity of the Selectoject would be less for strong signals than for weak. Regenerative detectors are notorious for their tendency to be blocked by strong locals. It turns out, however, that the two cases cannot be compared directly as the method of operation is quite different. If the Selectoject does have a tendency to broaden out with strong signals, it is hardly noticeable in practice, and certainly quite difficult to measure. When signal levels are kept small, this effect should be negligible in any event.

Further design information on the Selectoject may be found in an article by one of the authors.

The Selectoject is a useful gadget for SWLs because it provides a means for heterodyne elimination without the reduction in fidelity that occurs when a crystal filter is switched in. It is also useful as a variable-frequency response equalizer. By setting the peak at, say, 80 cycles, one can give the home receiver more “woof” than a Wurlitzer juke-box. Alternatively, the slot may be used to eliminate record scratch attributable to needle resonance.

It is useful to the ham owning an inexpensive communications receiver as a means for obtaining much of the performance of a crystal filter, without major and expensive modifications.

It is just as useful to the advanced amateur in that it provides additional flexibility and performance for any receiver. Here is the answer to the ‘phone man’s prayer: “If I only had a second crystal filter!”


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Break-In with One Antenna
(Continued from page 50)

Some precautions should be observed with the quarter-wavelength stub. It should be kept several inches away from the wall and metallic objects, but it can be folded back on itself if good separation is maintained. As for the relays, a check on whether or not ；) opens too soon can be made by connecting a neon bulb across the contacts. If the bulb lights, the contacts open too soon. I have left my neon bulb permanently in the circuit as added protection, although it is unnecessary.

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Here is a push-button controlled single sideband selector that permits you to instantaneously select either sideband, or to cut in an oscillator that reinforces the carrier approximately 20 times. Or you can cut the selector out entirely!

.. LOOK AT THESE FEATURES ..

- Single sideband reception of modulated, unmodulated (CW) or single sideband transmissions.
- Provides the effect of extreme selectivity without restriction of audio fidelity.
- Push-button selection of either sideband—other sideband attenuated.
- Audio distortion associated with selective fading is greatly reduced.
- Intelligibility of fading signals is improved.

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- Can be connected to practically any communications receiver having an intermediate frequency of approximately 455 KC.
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"City Slicker" Array
(Continued from page 35)

is shown in detail in the sketch of Fig. 2. It is of interest to note that W3CUM had just erected a single-section City Slicker when he broke the 2-meter record by working W9BIP on July 23rd. We can't quite guarantee duplication of this feat to anyone erecting a City Slicker, but we do guarantee that, if he has been using a small parasitic array heretofore, he will experience a very worthwhile improvement in his transmission and reception of 144-Mc. signals.

Happenings
(Continued from page 84)

See the election notices appearing in August and September QST for additional details on standard election procedures and eligibility of candidates, or write the Headquarters for a copy of the Constitution and By-Laws; a copy will be sent to any member upon request. If on December 20th there is but one eligible nominee, he will be declared elected. If there is more than one nominee, ballots will be sent to Full Members of the division the first week in January. Members of the division are urged to take the initiative and file petitions promptly.

For the Board of Directors:
September 15, 1949
A. L. BUDLONG, Secretary

Single-Sideband Exciter
(Continued from page 43)

uation that will reduce the modulation you hear in the receiver. Once you get it as low as you can, juggle $R_{10}$ a bit to bring it down still a bit more. If you are using a 'scope to look at the output, work toward a signal that looks like a pure unmodulated carrier. (See footnote 2.) The developed biases at the balanced-modulator grids will be close to equal after adjusting the r.f. phasing.

When you have the modulation as weak as you can get it, you can check the performance on the receiver in another way. Switch in the crystal filter and tune slowly around the frequency. You may find a number of little kicks, but the only big ones should be the carrier and the two sidebands. Cut the audio modulation for an instant to identify the carrier frequency, and then tune off about 1500 cycles. Cut in the audio from the audio oscillator and wobble the audio frequency a bit until you are peaked, as indicated by the S-meter. Now switch 81, and the S-meter reading will either go down a lot or up a lot, if you have single sideband. Find the setting of $S_1$ that gives the weaker signal and work on $L_{4}/L_{5}$ and $C_{28}/C_{29}$ a little more. If you have a real sharp crystal or frequency drift anywhere in the system, it may be necessary to wobble the audio frequency slightly during each check. Finally check the setting of $R_{10}$ to see if it will make an improvement. If $R_{10}$ ends up at one end of its range, interchange the two modulator tubes.

(Continued on page 104)
**HARRISON SAYS—**

**“TVI ELIMINATED—OR YOUR MONEY BACK!”**

**HARRISON’S TVI CHASER PACKAGE**

Our special “TVI Chaser Package” has proven so spectacularly effective that we now confidently offer it with this unconditional warranty!

**if your transmitter:**
1. Is in a metal cabinet, with metal panels.
2. Has low impedance output to coaxial transmission line, or to an external coupling of 50 ohms.
3. Is on any frequency near TV interference between 40 and 50 MC.
4. Is not more than 1 KW input.
5. Transmission line does not leave excessively high voltage.

**IF THE TV receiver has an outdoor antenna—** then, we guarantee that this package, installed in accordance with the simple instructions, will eliminate TVI to your complete satisfaction or you may return it to TVI to your complete satisfaction or your $21.25, within 10 days for a cash refund of your $21.25. Fair enough? Let’s get it!

Complete package with money-back guarantee, for less than the regular price of the items alone! Only $21.95

**THE SIDESWIPER**

Harrison brings back the Old Timers’ favorite—the Bunnell Speed Chaser Keyer! Improved, and better than the adjustable spring tension, movable controls, brass base, attractive brushed finish, heavy nickel plated lever bar.

Smooth effortless sending—fast or slow. Beginners’ “snap” is no knock to handling. Lasts a lifetime—nothing to wear out or get out of adjustment.

Almost every CW man $9.00 trying it, bought it, used it today!

Special two-circuit Sideswiper for Electronic Keyers, isolated contacts, no shorting switch. $11.70

**ONLY HARRISON HAS IT!—ORDER NOW!**

**THE DASH-BUG** by ELECTRONIC WORKSHOP

Here’s your key to faultless sending. Electronic timing—self-completing dots and dashes! Single contact adjustable transmission speed and automatic timing maintains perfect relation of dots, dashes and spaces. No extra thing to tape transmission on the air!

Complete gray cabinet 4” x 7” x 4½” deep. Complete with tubes, for operation on 110 volts AC. Works with any circuit key such as your “bug”, special sideswiper, or similar key.

Dash Bug
Electronic Keyer

**$24.95**

**NEW HIGH VOLTAGE “HYPASSES” FOR EFFICIENT TVI REDUCTION**

Developed by Sprague with cooperation of QST Tech. Staff (See story, Pg. 48, QST ’62)

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*For AC power line filter

**VFO for MOBILE RIGS**

You’ll get more QSO’s per mile when you QSY to the other station’s frequency with this new $29.95 Mobile VFO doubler 6½” “Clapper” Oscillator. 6AK6 Buffer, 6AK6 Double-Intermediate. Convenient size 2” x 6” x 2½”. Two select reject tubes on 25 MA DC! Precision for keying (FB for home station, too!)

Complete with tubes, ready to operate. Lyco Model 310
A HARRISON EXCLUSIVE—ONLY HARRISON HAS IT!

**FLASH**

Lyco Model 310 VFO adapted for remote VFO control for 15 circuit mobile antenna installation. VFO mounts on dash. Receives only 400 kHz to 400 MHz. Item 380R...

**$21.95**

**MASTER MOBILE MOUNTS**

Exciting new commercial mobile mounts with one-piece, taper-ground, police type whip at half of what you would normally expect to pay! Complete with stainless steel 30′ whip and duct taper spring on insulated mounting. No extras to buy!

With Bumper Support Mount (it’s long enough)
Complete System $10.00
With pulley, output to body, Fedex, etc.
Complete System $12.00
With Bumper above and dual taper spring for varying antenna height from 5½” to 9½”
For exact operating on 10 and 11 meters Add to prices above $2.40
(Master Mobile Antennas and Mounts are fully guaranteed for one year against defective material or workmanship)

**IN NEW YORK, ONLY HARRISON HAS IT!**

**THE NEW TIMING DEVICES COMPANY’S**

**24:00 HOUR CLOCK**

Incorporates features not found in similar clocks—
- World time disk shows time in every time zone with principal cities indicated — Indispensable for the DX man!
- Sturdy, quiet, self-starting clock motor — Operates on 110 Volts, 60 Cycle AC!
- Easy-to-read figures — Sweep second hand!
- Gives the “slack” a professional look!

**Price Only** $12.50

See Timing Devices Company’s ad this issue of QST for illustration and send your order to HARRISON today!

**HARRISON**

NEW YORK 7, N.Y.

225 GREENWICH STREET
(10 West Broadway, near Barclay St.)

IN NEW YORK, ONLY HARRISON HAS IT! THE NEW SIZE HARRISON HAS IT! THE NEW TIMING DEVICES COMPANY’S HARRISON HAS IT! THE NEW TIMING DEVICES COMPANY’S

IN NEW YORK, ONLY HARRISON HAS IT! THE NEW TIMING DEVICES COMPANY’S

**1134X Xtal IDIO Diodes** — Individually matched in matchbook packs. For home or mobile operation. 3 for $2.49

Ask for booklet, “21 Circuits for Germanium Crystal Diodes” with each order for Sylvania HN4’s 

**IN NEW YORK, ONLY HARRISON HAS IT!**

**NEW HIGH VOLTAGE “HYPASSES”**

**FOR EFFICIENT TVI REDUCTION**

Developed by Sprague with cooperation of QST Tech. Staff (See story, Pg. 48, QST ’62)

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*For AC power line filter

Beginners! — Newcomers! What help in getting started? Our special Beginner’s Edition of the HARRISON HAM-A-LOG has plenty of good info for you. A postcard will bring you a copy without obligation. Send for it, today!

Club Secretaries — How many can you use?
ATTENTION

MOBILE HAMS

Complete mobile package — nothing else to buy. Outstanding mobile signals use motorola equipment — backed by years of communication equipment experience — World's largest producer of 2-way mobile equipment.

A mobile transmitter with a double feature FM or AM at flip of the switch, the MOTOR.

OLA FMT-30-DMS

(27-30 MC.)

$130.00

P-7253 spring base rear mount antenna $22.50

3-30 famous Gon-set converter complete to connect to the P-69-13-ARS receiver.... $39.95

MOTOROLA P-69-13-ARS receiver with special noise limiter for use with any converter having 1500-3000 KC. $60.00

P-327-E Fire wall loud speaker... $5.00

The above comes complete with all necessary accessories and mounting hardware. Order direct or through the Motorola National Service Organization member in your area.

For further information write to:

MOTOROLA INC.
Amateur Sales Dept. QST-OCT.
1327 W. Washington Blvd. Chicago 7, Illinois
Attention Harry Harrison W9LLX
Telephone—Taylor, 9-2200 Ext. 161

U. H. F. RESONATOR CO.
224 SEVENTH STREET
RACINE, WISCONSIN

Dear Customer,

I am glad to acquaint you with the fact that I have sold the U. H. F. Resonator Co. to Donald A. Eklund of Racine, Wisc., who is going to enlarge all departments of this company. I am sure that you will benefit by this move, and I will continue to design all new possible beams for Mr. Eklund.

Thanking you for all past and future considerations and interest.

Yours very truly,

W. F. HOISINGTON

Unless you know the calibration of your S-meter at various gain settings of the receiver, it is useless to suggest any desired readings. However, checking with the crystal filter should show the desired sideband considerably above the carrier level and the undesired sideband below the carrier, unless you did a whopping good job of balancing out the carrier. Using single-tone modulation and looking around the signal with the crystal filter, you may find several other signals on either side, but these shouldn't even move the S-meter when the desired sideband sends it off scale.

If you can't get the thing down to the point where the desired sideband is larger than the carrier and the carrier is larger than the undesired sideband, you are probably off in the r.f. phasing circuit or you might be overloading the audio phase-shift network. In our case, the addition of $R_{22}$ was necessary to make up for some stray reactances that crept in somewhere, and it may be necessary to do some experimenting with the value of this resistor or the coils $L_4/L_5$. If you have a 'scope, it is a simple matter to connect one horizontal plate to the arm of $S_4$ and one vertical plate to the arm of $S_3$ and work for a circular pattern on the 'scope. Tie the 'scope ground to the chassis of the exciter, of course. It isn't sufficient to leave the r.f. adjustment as you get it with the 'scope, but it will put you very close to right and only a little touch-up will be required.

Don't expect a lot of output from this exciter. By cranking up the gain, you can get a small flashlight lamp to show color when connected to the output, but you will be overloading the system and your single sideband will be something else. The lower you can run things, consistent with staying above your carrier level, the fewer chances there will be for distortion and the better will be your sideband suppression. However, as mentioned earlier, it only takes one stage to boost the output to the point where it will start to drive something substantial. Once the r.f. phasing adjustments have been completed, changing bands requires throwing $S_3$, $S_2$ and $S_4$ and changing $L_8$ and $L_9$. If you are a one-band man, you can leave out the unnecessary stuff and simplify the rig a little. However, we won't guarantee that the values for $L_8$, $L_7$, $L_6$ and $L_9$ will stay the same under those conditions.

There isn't enough output from the exciter to do you much good on the air, but for local tries you can follow it with a neutralized 6AG7 in Class AB1, just to get the feel of things. And the 6AG7 can be used to drive some larger tubes in Class B5 when you want to try some real power. To reinsert carrier, for the benefit of first raising someone who doesn't recognize single sideband and is unfamiliar with the tuning procedure, it is necessary to take some of the r.f. drive to the exciter and feed it directly to the stage following the exciter.

---

SIMPSON 380 Wavemeter
 Handy wavemeter-modulation indicator. Accurate bandwidth wavemeter with 0-100 microamp to indicate resonance. 1° field strength meter. Reads modulation directly to 110%. Headphone lacks for monitoring. Complete with collars for 80, 40, and 10 meters, 2 ft. plug-in antenna and individually calibrated charts.

37$5

ROYAL DR. TVI Filters
TV-52-40LP Low pass transmitter filter. For use in 52 ohm coaxial line. Cuts down harmonics, SW broad cast, QRN and other interference below 500K. Suggested by ARRL for hams troubles with 48, 20, and 10 meters, 2 ft. plug-in antenna and individually calibrated charts.

30 Mc., without loss of signal strength on 10 meters and lower frequency band. Handles 1K.

12$9

HALLICRAFTERS
S-72-Communications portable for standard broadcast and short wave. 4 bands, 540 Kc. to 32 Mc. AC, DC or batteries, with collapsible whip and loop antenna, 8 tubes plus rectifier. 79$95

S-38A ... 39.95 S-42 .... 275.00
S-40A ... 79.95 S-43 .... 159.50
S-51 ... 149.50 S-52 .... 269.50
S-52 ... 79.95 HT-18 .... 110.00
S-53 ... 69.50 HT-19 .... 359.50

New TRIPLETT METERS
666-R-Features flush knobs and enclosed molded unit construction. AC and DC ranges: 0-10/50/250/1000/5000 volts at 1000 ohms per volt, 20/100/1000 milliamperes at 250 microvolts sensitivity. Resistance: 0-3K/300K/3 Megohms. Complete with test leads, self-contained batteries and instruction book.

2401

630-Flush knobs, molded unit construction. 9½" square case. Super-sensitive meter for accurate AC and DC measurements. AC and DC volts: 0-3/120/600. DC current: 0-60 microamperes; 0-12/100 milliamperes; 0-12 ampere. Resistance: 0-1K/10K/1 Meg/100 Megohms. With test leads and self-contained batteries.

36$75

MALLORY Products
COMPLETE LINES IN STOCK

GUARANTEE—Every item sold by Terminal Radio Corporation is fully guaranteed.

TERMINAL offers you MORE in QUALITY VALUE SERVICE! NOVEMBER SPECIALS SAVES $ All our specially priced items are guaranteed to be new and as described. When ordering by mail, please include shipping charges as outlined in the U.S.A.

U. T. C. UNIVERSAL DRIVER TRANSFORMER, type 5-10. P.P. 56, 660 triode 6X5 or similar plates to 45's, 2A3's or 6L6's, self or fixed bias. Shpg. 36c 99c

G.E. METERS, 3½" round bakelite case
0-15 volts A.C. 2.89 each
0-200 Ma. D.C. 2.50 each

S-38A 2.15 S-40A 2.15
S-51 2.65 S-53 2.65

MALLORY KENYON Transformers

AMPHENOL FOLDED DIPOLE ANTENNAS
Folded dipole section twin-lead conductors are copper-clad steel. The 75 ft. lead-in (300 ohm twin-lead) is joined to the antenna with a weatherproof molded polyethylene "T" junction.

ANTENNA LENGTH PRICE SHIPPING
10 meters 3 ft. 4.33 30c
20 meters 3 ft. 6.04 35c
40 meters 7 ft. 7.94 41c
80 meters 13 ft. 12.20 46c

See the new Johnson ROTOMATIC amateur beam antenna in operation at TERMINAL!

VECTORSocket TURBETS in stock. Ask us for complete Vector Catalog.

1.20

With the new JOHNSON "Instant Crystal Selector" you can QSY with the speed of an ECO and still enjoy all the advantages of stax control! Unit accommodates all crystals with 1/2" spacing. With adaptors you can also use up to six of your upright 3/4" spaced crystals, plus four with 1/2" spacing. Extra position on switch for ECO.

Unit comes complete, ready for mounting on the front panel of your rig. Bracket permits vertical or horizontal mounting of staxs. Mounting board available separately at $1.86.

JOHNSON
E. F. JOHNSON CO. WASECA, MINN.

MM-2 MODULATION MONITOR

ONLY $24.95

ADD SIGHT TO YOUR SOUND

with this basic oscilloscope featuring calibrated modulation percentage scale, linear 60 cy sweep with return trace blanking, trace intensifier window, complete controls, reversible panel, rack mounting provisions and many other outstanding features. See the MM-2 at your dealer or write Dept. 10-9 NOW—ALSO AVAILABLE IN COMPLETE KIT FORM FOR ONLY $14.95

Send for Descriptive Literature

LAMBDAL ELECTRONICS CORP.
BOX No. 55
CORONA, N.Y.

U. S. N. R.

(Continued from page 44)

fare Company 8-45 at Harlingen to attempt contact by radar. This was established at a distance of 22 miles. From there in, the Harlingen tower was advised of the plane's progress and the tower control operator relayed instructions to the pilot, directing him over the field and eventually to a successful landing.

Electronic Warfare Company 8-45 at Harlingen, Texas, was again in the limelight when in July it received the Commandant's Trophy as the outstanding Electronic Warfare unit in the Eighth Naval District during the year 1 July 1948 to 30 June 1949. As a further reward to the Harlingen unit, a week-end cruise aboard the PCE874 was granted. A total of 12 officers and 55 enlisted members of EWC 8-45 made the cruise.

Lieut. John W. Fouch, USNR, officer-in-charge, Electronic Warfare Platoon 11-11 (K6NRQ), Twenty-Nine Palms, Calif., illustrated one of the many ways in which the Naval Reserve may be of immediate assistance in time of local emergency when he provided power for the illumination of emergency hospital quarters.

Electronic Warfare Company 11-8, Pomona, Calif., was selected as the outstanding volunteer Electronic Warfare unit in the Eleventh Naval District, and placed second among all volunteer Naval Reserve units in a recent District inspection.

Radio amateurs who are members of the Naval Reserve and who are not participating in the Electronic Warfare Program are missing out on interesting and profitable activities. If there is no regular Reserve unit in your vicinity, you may enter into the program from your own home, utilizing your amateur station equipment. A postal to the District Reserve Electronic Warfare Program officer for your Naval district will bring full details.

Naval Reserve members are invited to send items suitable for these QST notes. Address them, via official channels, to the Chief of Naval Communications (Attention: Op-204V).
NEW! S-72 ALL-WAVE
3-WAY Portable Receiver
ONLY $79.95*

Wherever you go, this sleek new S-72 portable will
bring in those hard-to-get ham, foreign and domestic
stations sharp and clear as a bell. With a $40 io to
its credit, S-72 is chock full of features; 31 mc range in 4 bands, S-72 is a
follower of all the fun are dis-
appreciated by radio amateurs and shortwave lis-
teners; 1 stage of tuned RF; separate
tuning. automatic noise limiter; built-in loop an-
tenna for short wave; panel phone; 9 tubes —
14F3, 1SA5, 1A5, 1V4, 2 —15U4, plus selenium
rectifier. Includes power cord for operation on
115 or 230 volts DC or 50-60 cycle AC. Battery pack operation available.

NEW! SX-71 10-TUBE
COMMUNICATIONS RCVR
ONLY $179.50

Extra sensitivity, selectivity and
stability; superior image rejection
with double superhet circuit plus built-in NBFM reception! All
tubes and more are what make
the new SX-71 a bigger ham value than many receivers priced up to $100 more. SX-71 features continuous tuning
from 638 kc to 35 me and 46-66 me. One RF, 2 conversion and 3 IF (3 IF above 44 Mc). 3 watt output. 7 Bands. 4-position selectivity,
23½x9x9¾ in. deep. Ship. wt. 32 lbs. 115 V. AC. 8 tubes plus rectifier. Internal speaker.

SX-43 $159.50 Widest coverage in its
class. AM 640 kc to 55 Mc.; FM 44—45
Mc and 81-108 Mc. Temp. comp. One
RF, 2 IF (3 IF above 44 Mc). 3 watt output. 7 Bands. 4-position selectivity. 18½x8x9½ in. deep. Ship. wt. 44 lbs. 115 V. AC. 10 tubes plus rect. Less speaker.

SX-40A $79.95 Medium priced. 540 kc
to 45 Mc; 40-49 Mc., Temp. com- pensated. One
RF, 2 IF, 3 watt output. 4 Bands. 3-position selectivity. 18¼x8x8 in. deep. Ship. wt. 32 lbs. 15 V. AC. 8 tubes plus rectifier. Internal speaker.

S-38A $69.95 Moderately priced. Comp.
Recvr. 2 Mc IF improves image rejection, 640 kc—31 Mc. 46-64 Mc. Two IF, 5 Bands. 12½x7x7¾ in. deep. Ship. wt. 19 lbs. 115 V. AC. 7 tubes plus rect.
Learning Telegraphy & Wireless is \textit{EASY}

Keying fundamentals, codes—learn it all quickly, easily with Signal's new booklet, "Radio Keying and Telegraphy for Beginners". Performance-proven practice keys and two-way learner sets are also available. Mail 15c (stamps or coin) today for your instruction manual and equipment catalog.

\textbf{Signal ELECTRIC MANUFACTURING CO.}
DEPT D-2, MENOMINEE, MICHIGAN

\textbf{MORE SIGNALS PER DOLLAR From Money Invested in an Antenna}

\textbf{Self Supporting STEEL TOWERS For Rotary Beams, FM, TV}

\textbf{ATTRACTION—NO GUY WIRES!}
- 4-post construction for greater strength!
- Galvanized steel—will last a lifetime!
- SAFE—Ladder to top platform
- COMPLETE—Ready to assemble
- Easy to erect or move
- Withstands heaviest winds

\textbf{(We will supply stress diagrams for your building inspector)}

\textbf{EASY MONTHLY PAYMENTS}
Up to 12 Months to Pay!

All Vesto Towers are available on a special monthly payment plan which requires only \$48.50 down. Write for free details.

\textbf{How's DX?}
(Continued from page 47)

of 108 Park Rd., Redhill, Durban, where he'll probably take care of any queries along the verification line. KM6AO is contemplating an 18-month siege on Midway and vows to keep the QSLs rolling thick and fast during this time. His artillery consists of a BC-610-E on 20 c.w. and a home-built 50-watt on 10-meter phone. Chuck likes his 11-meter practice phone (3030-0820 G0T and tries 30-Mc. whenever the band is open. That's fair enough.

A few items on the hook in the Grrrr-r Department: GDS2B asserts through W7TLQ that GDS1X is unmade and W7TQL's name is from the ARRL. We hear that FNRDC is definitely likewise, EA6EG, who QSLs with dispatch, tells W4MR that EA6AZ is not known there, and the VK gang have scouted rumors of possible recent legitimate activity in the Canarajia islands. We've received reports from W2FM and others regarding one UYSAK's assertion that UY5 is the prefix for a so-called new U.S.S. Republic of Roumania but we'll take a few grains of salt with this line. Excerpting from the NARA News, JAZZG's last contact in Japan was his 162nd country, SP2DD. Lloyd vacates the top of the DX standing, leaving JAA3A head man with 160 in the log and 83 in the bag. Band allocations in Japan seem pretty closely with our own with the exception that mobile work is not yet sanctioned below 28 Mc.

HC2JR reports HC2BRC and HC2KB as involved in a friendly battle to see who first completes his 28-Mc. 'phone WAS. We'd wish there were more of these private contests in progress! [Nuts, boss, we're running out of head room here.]

The VESTO Company
101 Main St., Parkville, Mo.
NEWARK'S OWN

630-TYPE

16" TV RECEIVER

Completely Wired

With 30 RCA Tubes, 16" Brackets, Voltage Doubler

$174.50

17.45 Down - 12 Months at 8.87

America's Finest TV Receiver Not a Kit, but a Completely Wired, Tested, and Aligned Receiver, with all the famous original RCA features...and 100% guarantee.

No coils to plug in...No extra coils to buy! 6AG7 xtal. osc. circuit. Requires 6AG7, No. A20058, and 6L6 tubes. Complete kit less tubes, $29.50...

$174.50

NEWARK'S OWN

13-CHANNEL TV

FOLED DIPOLLE ANTENNA

Complete with 8 Ft. Mast for $5.45

In Lots of 6 Ea. $5 

Terrific Value! An excellent, high gain, high quality antenna at a Sensational Low Price. Mechanically perfect from base to tip. Sturdy aluminum tubing...folded dipoles and adjustable reflectors for both high and low frequencies. Improves performance of any TV receiver. Complete with hardware and 5 ft. mast. 9 lbs.

No. A30400. Each $5.45

NEWARK 13-CHANNEL TV

CONICAL ARRAY

Complete with 10 lbs. mast, 6 ft. mast to 15 lbs. - $12.95


BLILEY CCO-1C

Crystal Controlled Oscillator

Now $29.50

Regularly $69.50

Save $40.00 Bliley CCO-1C provides 7 xtal controlled frequencies: 175, 262, 370, 455, 465 plus 200 and 1000 Kc. Harmonics available up to 50 Mc. Can be used with external xtal. 5-step attenuator with max. output of 7 watts. Internal or external modulation. Complete with 7 Bliley crystals, tubes and coax cable. No. S-119...Reduced to $29.50

MICA MOLD XTR-1 TRANSMITTER KIT

Now $14.50

Regularly $34.00

Save $19.50 on this 45 watt Telegraph Xtr Kit! Complete from power supply to antenna matching network. Puts you on 3.5, 7, 14 mc. with suitable xtal. No coils to plug in...No extra coils to buy! 6AG7 xtal. osc. circuit. Requires 83, 6AG7, and 6L6 tubes. Complete kit less crystal, key. No. S-1152. 10 lbs...Reduced to $14.50

RCA PM SPEAKERS

Superior quality PM Speakers for general replacement work, quality installations and for PA use. All have Alnico V magnets. Fine construction throughout entire field. Excellent performance! Less output transformers.

12" RCA PM Speaker. Will take up to 18 watts. Extra heavy magnet. Exceptional frequency response. For custom installation, 12" speaker. Wt. 8 lbs. $5.45

No. S-5105. 12" RCA PM Speaker. Will take up to 18 watts. Extra heavy magnet. Exceptional frequency response. For custom installation, 12" speaker. Wt. 8 lbs. $5.45

No. S-5105. Each $4.25

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Antenna-Matching Networks
(Continued from page 61)

elements have greater spacing, measured in wavelengths, and consequently a different tuning condition on \( f_2 \) than on \( f_1 \), resulting in a different value of complex impedance (reactive) reflected into the driven element.

From this we see that greater accuracy in finding the values of d.p.i., the antenna should be self-resonated on \( f_1 \) and \( f_2 \), separately, when measuring the s.w.r. on the unmatched line, if the above simple formulas are used. Then, before tuning up the network, we can compromise by placing the final physical dimension between the two self-resonant dimensions. The small remaining reactance can, as mentioned before, be largely balanced out when tuning the network. This procedure shows promise of putting the minimum s.w.r. of the finished project well near unity on both bands. When the transformer ratios are high in the network of Fig. 6, a better method is to operate in a self-resonant condition on \( f_1 \) and let \( f_2 \) take care of itself; the parallel capacitor tends to balance out the \( f_2 \) reactance without having any noticeable effect on the \( f_1 \) s.w.r.

Notes on Application

The points brought out in the past few paragraphs enable us to obtain optimum performance from the networks, but seem to require quite a bit of effort which won’t be necessary in all installations. Satisfactory transmission-line efficiency doesn’t necessarily require an s.w.r. of unity, depending upon the construction and length of line. Since tuning the capacitors reduces the effects of errors both in determining the d.p.i.'s and in constructing the inductors, by tuning them as one lump sum, so to speak, a satisfactory s.w.r. on the finished project might be had by fixing the antenna length from formula and disregarding any reactance which happens to be in the d.p.i. This procedure will be satisfactory in many installations, especially if an s.w.r. of around 2 or 3 is acceptable. It seems to be worth a try in any installation.

Many directional arrays will lose their \( f_1 \) directivity when operated on \( f_2 \), unless some means is provided to preserve it, such as, when \( K = 2 \), individually center feeding each radiating element, or inserting suitable networks in their centers. When \( K > 2 \), it would be very difficult to secure directivity on \( f_2 \) similar to that on \( f_1 \). Networks for this purpose would be quite involved. But even if no effort is made to retain some of the \( f_1 \) directivity on \( f_2 \) the system will radiate power at \( f_2 \), and one of these two-band antenna networks will permit flat-line operation on both bands.

When the borderline cases of \( Z_1 = Z_0 < Z_2 \) and \( Z_1 < Z_0 = Z_2 \) occur, we have the choice of two networks. The network of Fig. 5 can be used for the first and the network of Fig. 7 can be used for the latter, while the network of Fig. 6 will suffice for either of them. In their present

(Continued on page 118)
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form the formulas for the networks of Figs. 5 and 7 will present some difficulty if $Z_0$ is held exactly equal to $Z_1$ or $Z_2$. From a practical standpoint, this isn’t necessary, and furthermore, we probably couldn’t determine $Z_1$ or $Z_2$ to be exactly equal to $Z_0$. So if one is changed just enough to destroy the equality, these formulas are readily applicable to these two borderline cases. Of course, to be perfectly correct, a different set of formulas should be derived for these two cases, involving the use of basic formulas (5), (6) and (7), but they wouldn’t justify their space, since the above compromise is quite satisfactory. Then, too, the formulas for the network of Fig. 6 handle these two borderline cases nicely, just as they are. A typical antenna system falling into the borderline case of $Z_1 = Z_0 < Z_2$ is a half-wave doublet at $f_1$, also operating on any harmonic, $f_2$, of $f_1$, using 75-ohm line.

An effort was made to keep the formulas as simple as possible. With two exceptions, this resulted in the necessity of solving two simple formulas in order to arrive at the actual value of each of the network’s reactors. This procedure requires the least effort, however, since single formulas for doing this, containing only the terms of $Z_0$, $Z_1$ and $Z_2$, turned out to be quite cumbersome.

In all of the formulas, strict observance of the sign affixed to any quantity is necessary in order to avoid serious error. When “$L$” and “$C$” appear in the subscript of any term, such as $X_{LP}$ or $X_{CP}$, it means that the quantity is either inductive or capacitive, respectively, and thus, is self-explanatory as to the type of reactance. All formulas are arranged so that the quantities of such terms carry no sign with them into the formula; their respective signs have already been taken into account when deriving the formulas. Terms not containing “$L$” or “$C$” in their subscripts, such as $X_{P1}$ or $X_{B2}$, can be either inductive or capacitive, and the quantities of such terms must carry their respective signs right along with them into the formulas.

The networks described here are of the balanced type, and are not suited for either grounded or end-fed antennas.

Methods of establishing resonance in the antenna, and of measuring s.w.r., have been covered in previous articles.1, 2, 3, 4, 5, 6

1 In a subsequent article the author will show how the formulas can be applied to specific cases, working out examples for a number of popular antenna systems. — Ed.

Bibliography


(Continued on page 114)
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50 Mc.
(Continued from page 68)

minated with 750 ohms, it was fed with 75-ohm coaxial line, through a matching section of 300-ohm line at the feed. This rhombic is the only antenna thus far tried that has made it possible to work out from his location, which is down between two ridges of low foothills.

Masephc, N. Y. — Final results of the First 2-Meter Mileage Contest, sponsored by the Amateur V.H.F. Institute in New York, were announced last week. Certificate awards for the highest score in each ARRL section from which reports were received went to W1s RMZ, QYV, QRS, W2e QED, ORL, BY, DHB, DFV, W3s MRQ/3, EKP, W6s ZOE, EKP, AJP, W6s ZOE, EP, W6s ZOE, AJP, W2s EKQ, W6s ZOE, AJP, and W2s EKQ, W6s ZOE. W2s EZ and W6s EZ were given certificate for the longest distance worked in a single contact.

Beeler, N. H. — As the 50-Mc. band is probably the best frequency on which to work the distance encountered in emergency work it is used by a group of stations in New Hampshire and Southern Maine. Fourteen stations on the roster of this net meet each Wednesday at 9 a.m. To prepare for contingencies that might develop in any part of the area served, and also to keep interest up, net control is rotated throughout the group from week to week.

Wausau, Wis. — This complaint from WA5JBF will strike a responsive chord in the hearts of others who are at one edge of an activity zone. He reports that stations far to the south are heard often, but that contacts are usually difficult, probably because of competition from stronger stations in Illinois and Southern Wisconsin. The schedule between WA5IF, Willard, Wis., and WA5IF, Wausau, Ill., has been maintained solidly, and W5KIF is copied at Wausau at least half of the time.

Champlain, N.Y. — A continuous line of 2-meter stations, separated by distances that can be covered under normal propagation conditions now stretches all the way from Millbank and Watertown, S. D., to Boston, Mass. WA5JHS suggests that attempts to promote a 2-meter relay across this route would help to keep 2-meter interest alive. Your conductor has been attempting to do this, but more stations are needed to keep it going. Unless conditions are good, we find it difficult to get a message started, though almost everyone we talk with seems to be interested in the idea, and it is mentioned frequently in correspondence. Perhaps messages originated regularly from the western end would help.

Rochester, N. Y. — A number of 522 users have refrained from using e.w. (especially needed when low-power rigs are used) because of lack of a way to key the rig. Obviously, the way to do this is to break the cathode lead of the final, which W2UHI is doing with good results.

Three-a-week schedules with VE5ANT, dropped during the summer months, will be resumed this fall, to check the reliability of the path during the winter period.

San Mateo, Calif. — Amateur radio once more provided communication for the annual Chico-to-San Mateo Air Races. W6GHD and W6PJJ were on duty at the Chico starting point. W6KGL, Willows, and W6LGF, Corning, served as standby stations. W6MYL acted as relay station from his home in Camino. W6ZBS was in charge of the San Mateo end, relaying information to W6GCG, operating portable at the Bay Meadows Airport. W6WSE and W6AEV forwarded reports as the races passed over an intermediate check point. Though mountainous terrain is involved, necessitating the relay stations to cover a 150-mile path, everything went smoothly as planned.

(Continued on page 118)
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olidate our 220- and 420-Mc. antennas and the bedspading
pictured on this month's front cover is the result. Six half
waves in phase for 220 Mc., and 16 in phase for 420 are
mounted on either side of a screen reflector six feet square.
Except for the wooden supports for the 420-Mc. elements,
the entire structure is made of metal. The frame is of 3/4-
inch dural tubing, as are the supports for the 220-Mc.
driven elements. All elements are mounted at the middle
(low-voltage point) so no insulation is required on either
side. The screen is chicken wire of 1-inch mesh. Wire
netting of finer mesh could, of course, be used, but wind
resistance may be troublesome if the screen is too dense.
The central vertical support is 13/4-inch dural tubing.

(Continued on page 118)
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Model 221-K
Build it in one evening—but it lasts a lifetime! Has 15 different ranges: 0–5–10, 100–500, 1000 volts, AC & DC, .2 ohms to 10000 ohms. Features Zero Center for TV discriminator alignment, and big 4½" meter that cannot burn out. Etched 3-color steel case. Widely used in use, production, research, etc. Simplified assembly instructions included.

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SAVE 50% With this LABORATORY QUALITY

Electrical properties of the supporting frame are made rigid through the use of angle inserts made by bending 4-inch lengths of 1/4-inch copper tubing at right angles and then inserting these angles in the ends of the frame members and fastening them in place. In deference to the taste of W1YV in last month’s QST, we painted all the dissimilar metal parts with grey outside paint.

We wouldn’t hazard a guess at the feed impedance of the 420-Mc. side, as an adjustable matching device was included. The two-element sections are equipped with the customary phasing wires, as in a conventional 16-element array. These phasing sections are connected by means of two pieces of 300-ohm line, one wavelength (214½ inches, because of the propagation factor), and this junction is fed with 300-ohm line by means of an adjustable “Q” section. This is made of 3½-inch tubes 8½ inches long, mounted on a slotted polyethylene block, so that the spacing between them can be varied for lowest standing-wave ratio on the line.

Spacing between the driven elements and the screen is 0.15 wavelength in each case. It is unimportant in the case of the 420-Mc. side, as the matching device is adjustable. The standing-wave ratio on 220-Mc. shows room for improvement, so a matching device would be advisable here also. It is not severe, however, and the array works very well in its present condition, with the 300-ohm line connected directly to the center pair of elements. Performance data have not been taken as yet, but we’re getting better signals over the Talcott Range into the Hartford area on 420 than we did with a 16-element array, and we’ve had several contacts up to 150 miles on 220 since we put the "secret weapon" up on the temporary support pictured on the cover.

A considerable volume of correspondence regarding 420 Mc. keeps coming to Headquarters, indicating that experimentation on this band has an appeal that reaches many types of amateurs. The beginner likes it because it represents an opportunity to engage in communication with the simplest forms of equipment, yet the more advanced amateur sees in it an unequalled opportunity for interesting experimental work. The only disadvantage in all this, from the standpoint of the v.h.f. man, is that almost all our present-day recruits to 420 Mc. are taken from the occupants of the other bands from 50 Mc. up. WSNQ suggests that, particularly in the fall and winter period, these 6- and 2-meter stations can hardly be spared. Perhaps this may not be wholly harmful, however, as conversation, crossband work, and arrangements for tests on 420 may provide incentive for activity on 6 or 2 that would not otherwise exist.

Some 420-Mc. enthusiasts start young. W6CFL writes that W6GTJ is only 16, but he uses entirely homebuilt gear on the band. He has worked W6KKG, a distance of approximately 70 miles, running only 8 watts to a pair of 6Js.

From Baltimore, Md., W3KUW writes that W3JPX, W3GHQ, W30UX, and W3KWU are active on 420 each Monday and Thursday at 8 p.m. They would like to hear from fellows in the Washington, D. C., area who are set to operate on 420. Horizontal polarization is used by these stations.

Five stations were active on 420 in Hartford County during the September V.H.F. Party. These included W1QVF, operating from the W1WF shack at ARR Lq., W1HDG, Elmwood, W1PNB, Bristol, and W1HQD, Canton. Tests with W1CCF at Springfield have yet to work out successfully, but improvements all around are aimed at this objective.
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OSCILLOSCOPE, 2" Waterman Pocketoscope. Reg. $66.50. Only. $95.00.

RECORDING MOTOR AND TURNTABLE, Professional 33 1/3 and 78 RPM with 10" aluminum alloy casting table, famous make. Reg. price $165.45. Brand new, reduced to $116.00.

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POTENTIOMETERS, 20 assorted, singles, duals, pas, etc. Some with switch. $3.95.

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Correspondence

(Continued from page 87)

inductors would save a lot of wire, but how does one calculate the amount that the powdered-iron slug increases the inductance? For that matter, not all permeability-tuned coils use a powdered-iron slug, as I have a lot of small porcelain coil forms which are tuned by a silver-plated copper tube about 3/4 inch long by 3/4-inch diameter which is mounted on a small plastic rod which in turn is mounted on the adjusting screw. I'd like to know, or be able to calculate, just how that would affect the inductance, or rather, how to go about winding a predetermined value of inductance on such a form.

There must be some frequent contributor to QST who would be capable of preparing such a topic. I, for one, would be able to use that information right this minute.

— Rest Cyril Bute

TVI

712 Avenue E, Bayonne, N. J.

Editor, QST:

I have been an SWL for quite some time and read QST from cover to cover. I was particularly interested in your article on high-pass filters for TVI reduction in the May, 1949, issue.

Never having attempted making anything of this nature before, I was somewhat skeptical as to the results, but as I was experiencing similar interference on Channel 4 to that pictured in the top of column 3 on page 46, QST, May, 1949, I purchased the coil forms and a half-pound spool of #14 wire at a cost of $1.50 and set to work. Though I shouldn't call it work. It was fun, and after less than an hour I had the filter installed. Since its installation I have had no slant bars (which were the worst type of interference on my set) or other defects in my pictures. In fact, Channel 7 comes in perfectly clear and that is something as my neighbors are all having difficulty with this station. Before connecting the high-pass filter there was quite a bit of "snow" on all channels. Now it is practically all cleared up.

— Roy Owen

TRIBUTE

Champlain, N. Y.

Editor, QST:

We wish to extend our sincere thanks and gratitude to Mrs. Clara Reiger, W2RUF, of Buffalo, N. Y., as well as to W2AOR here in Champlain for the wonderful services they both rendered us with their amateur radio stations while our four-year-old little boy "Larry" was confined in the Roswell Memorial Institute in Buffalo, N. Y. Clara and John kept us in daily contact with the hospital. Their kind services will long be remembered.

— Mr. and Mrs. Mills Lambert

OR WASHINGTON

Washington, Michigan

Editor, QST:

The letter from W7NL in October, 1948, QST reminds me of something that recently happened to me, although under different circumstances. I had changed rooms for the ham shack and was off the air for a few weeks. When I got the receiver set up again, I just had to give a listen to 14-Mc. c.w. and the first thing I heard was "WSKPL DE W7BT GB BILL UR SIGS 589 IN SEATTLE WASH GLAD TO CUAGN HAVE UR QSL ON WALL ETC" — and me with no transmitter! Everything must happen in Seattle.

— Bill Simpson, W8KPL

(Continued on page 188)
Variable Center Link Inductors ... for matching impedances

B & W pioneered the variable link coil several years ago and today, it is a standard, not only with most amateurs, but in many commercial applications. This type inductor is ideal for stages where variable loading is required and may be adjusted easily for matching impedances.

Introduction of the new B & W Plug-in Links, increases the flexibility of this type coil and makes matching a wide range of impedances just a matter of pulling out one coil, and plugging in one having the required number of turns.

Write for information on B & W Variable Link Inductors and Plug-in Link Coils to: Dept. Q-119

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The "TYPICAL AMERICAN HAM"
You would have to show him with an ASTATIC D-104 MICROPHONE

- So great a majority of amateurs prefer the Astatic D-104 Mike, over any other model or make, that it has become an identifying symbol of the American Ham in operation. Only top instrument quality and performance could win and HOLD such acceptance. The new Ceramic Model, D-104-C, is a duplicate of the Crystal Model except for employment of a ceramic element, which is immune to extremes of temperature and humidity. Performance is comparable except for slightly lower output. Write for additional information.

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Level</th>
<th>Range</th>
<th>Response Characteristics</th>
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<tbody>
<tr>
<td>D-104</td>
<td>-48 db.</td>
<td>30-7,500</td>
<td>Rising</td>
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<tr>
<td>D-104-C</td>
<td>-58 db.</td>
<td>30-7,500</td>
<td>Rising</td>
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MCN—scaled down dial, ideal for mobile installations and small converters, 2\%\" H. x 3\%\" W. $2.70 net.

VALUES

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Editor, QST:
I think the real values go to the technical training that amateur radio affords. Code was taught in the Army in a matter of 3 to 6 months, but the technical-trained men were in school from 2 to 4 years to get the equivalent of a good amateur operator's technical background.

I think single sideband is an excellent field in which to give the amateur a new technical training and I for one hope to give it a try. I do feel it should be given space outside of the present 'phone bands with c.w. also excluded from that part.

— Paul Rosenberg, W8GXI

Box 1221, Southern Pines, N. C.

Editor, QST:

Wish that W8GXI would give us, in detail, his idea of what it takes to be "of value to radio and the public welfare."

Several times I have heard the expression, "value to radio and the public welfare" used; however, this mere statement means nothing, unless defined.

In the absence of definite information, I am led to believe that there are two kinds of people in ham radio—the righteous—and the unrighteous; the righteous making the classification.

— Calvin H. Burkhead, W4GTI

Hints & Kinks

(Continued from page 59)

MODULATION MONITOR

HERE is a simple modulation-monitor idea for owners of panoramic adapters. A small d.p.d.t. relay operating from the transmit-receive switch in the transmitter is installed at the base of the 'scope tube in the adapter. The leads to the vertical deflection plates of the 'scope tube are disconnected and transferred to the normally closed pair of contacts on the relay. A pickup loop and a link line with a 0.001-µfd. condenser in series is then connected to the normally open pair of contacts, and is brought out so that it may be coupled to the final tank coil. The vertical deflection plates are then connected to the moving-arm contacts of the relay. No other changes are necessary.

The panoramic adapter operates normally in reception, but when the transmitter is turned on, the modulated r.f. envelope appears on the screen, permitting continuous monitoring of modulation. The position of the coupling link must be adjusted to give the correct pattern height. — Earl E. Ferguson, W5PAG

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Beautiful Man Sized Microphone Ash Tray

with call letters in satin-finished aluminum against a black crackle-enamelled background on top of the polished microphone. The lustrous black Daka-Ware base is fire and acid resistant and will retain its sheen indefinitely. 3-inch diameter, 6-inches high. Accommodates up to five letters. The perfect gift for your fellow ham.
Type AT-80 $5.00 Postpaid

Bronze Ash Tray

Solid cast ornamental bronze ash tray with silhouette call letters. Antique finish, with edges of tray and letter faces highly polished. Sizes: 3" x 2½", Accommodates up to six letters, eight 1/4", or ten 1/8" high letters.
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Silhouette Desk Plate

The cut-out satin-silver letters on the beautiful desk plate stand out in relief against the crackle-enamelled back bar, with the edges of the letters also painted to accentuate the silhouette effect. Accommodates five 1/4" high bold block type letters.
Type D-21 $3.95 Postpaid

W8DCJ WHIO-TV

W8FUN

W9HKZ

Gold Plated Silhouette Call Letter Pins

These beautiful gold plated pins with fine safety catch are the ideal gift for the XYL or the girl friend. The OM will be pleased to receive one, too - for year-round wear. Illustrations are actual size.
We suggest B-72 for 4 or 5 letter calls and the smaller B-71 for longer calls and names, such as WHIO-TV or W8VE2M-XYL. Price includes 5 letters only - for each additional letter, dash, etc, add 20¢.
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Lapel Buttons

An attractive metal button with highly polished raised letters against a black background. Other colors 50¢ extra.
Type A-26F With Pin Backing
Type A-36L With Screw Backing

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A large sturdy cast aluminum plate with satin-finished letters and border against a black baked enamel background. Red, green, dark blue, light blue, or gray - 50¢ extra. Size 2½" x 8¼" with 1½" letters.
Type A-18 - For Your Car
Type A-19 - For Panel Mounting

NOTE - The letters on our 4½" Auto Plate can be inverted for mounting below the license plate on 1949 Fords and other cars. Plate measures 3-1/8" from center of mounting holes down to bottom when inverted. Specify type A-4½

Send remittance with order. Allow three weeks for delivery. No orders accepted for Christmas delivery after December 1.
HAM-ADS

(1) Advertising shall pertain to radio and shall be of

interest of nature to radio amateurs or experimenters in the

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any special typographical arrangement, such as all or part

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advertisement stand out from the others.

(3) Closing date for Ham-Ads is the 25th of the second

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(4) Ham-Ads apply to advertising which, in our judgment, is obviously non-commercial in

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Provisions of paragraphs (1), (2) and (3), apply to all

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(5) Because error is more easily avoided, it is requested

signature and address be printed plainly.

(6) No advertisements of 100 words in any one issue or more than one ad in one issue.

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QLSLS, SWL's, SWL's. $1 each. SWL's, SWL's, SWL's. 15th Ave.

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New York City.

QLSLS, SWL's, SWL's. $1 each. SWL's, SWL's, SWL's. 15th Ave.

New York City.
SELL: Hammontund SP-400-X Super Pro, complete with matching power and speaker, excellent condition, $245.00, F.O.B., M. B. Rothem W9CQG, 613 13th Street, Menomonie Wisconsin.

FOR sale: One BC-435-B 27 mc. to 39 mc. receiver with dynatron transformers, in working condition but with dynatron and 90-sta. Best offer over $75.00. Robert G. Wagner, 1025-21 Avenue S.E., Cedar Rapids, Iowa.


FOR sale: SX-42. Good set. Need money. First $150.00 gets it. If you are interested, call Bob 2323 on South Dakota.

2 V, BC-284 (BC224) converted A.C. with manual $70.00. Pair of BC-275-E's complete, 220 volt. $125.00. two 2-TCM-V, 600 watt mult-match transformer modification, $25.00. buyer, $35.00, 600 v. 750 ma. power supply, $15.00. 20-25 meter Prexas 349 V. $15.00. Sell in pairs or individually. Write for list. XX 1, Lane Sware, 5041 SW 4th Street, Miami, Florida.

COLLINS 15-A receiver in top condition. First $295.00 or best offer era, Hammarlund, RME, Millen, Meissner, Sonar, Ambeck, etc.

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**Variable Frequency Oscillator**

The No. 90711 is a complete transmitter control unit with 6SK7 temperature-compensated, electron coupled oscillator of exceptional stability and low drift, a 6SK7 broad-band buffer or frequency doubler, a 6AK5 tuned amplifier which tracks with the oscillator tuning, and a regulated power supply. Output sufficient to drive an a07 is available on 165, 190 and 40 meters and reduced output is available on 20 meters. Close frequency setting is obtained by means of the vernier control arm at the right of the dial. Since the output is isolated from the oscillator by two stages, zero frequency shift occurs when the output load is varied from open circuit to short circuit. The entire unit is unusually solidly built so that no frequency shift occurs due to vibration. The keying is clean and free from all annoying chirp, quick drift, jump, and similar difficulties often encountered in keying variable frequency oscillators.
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