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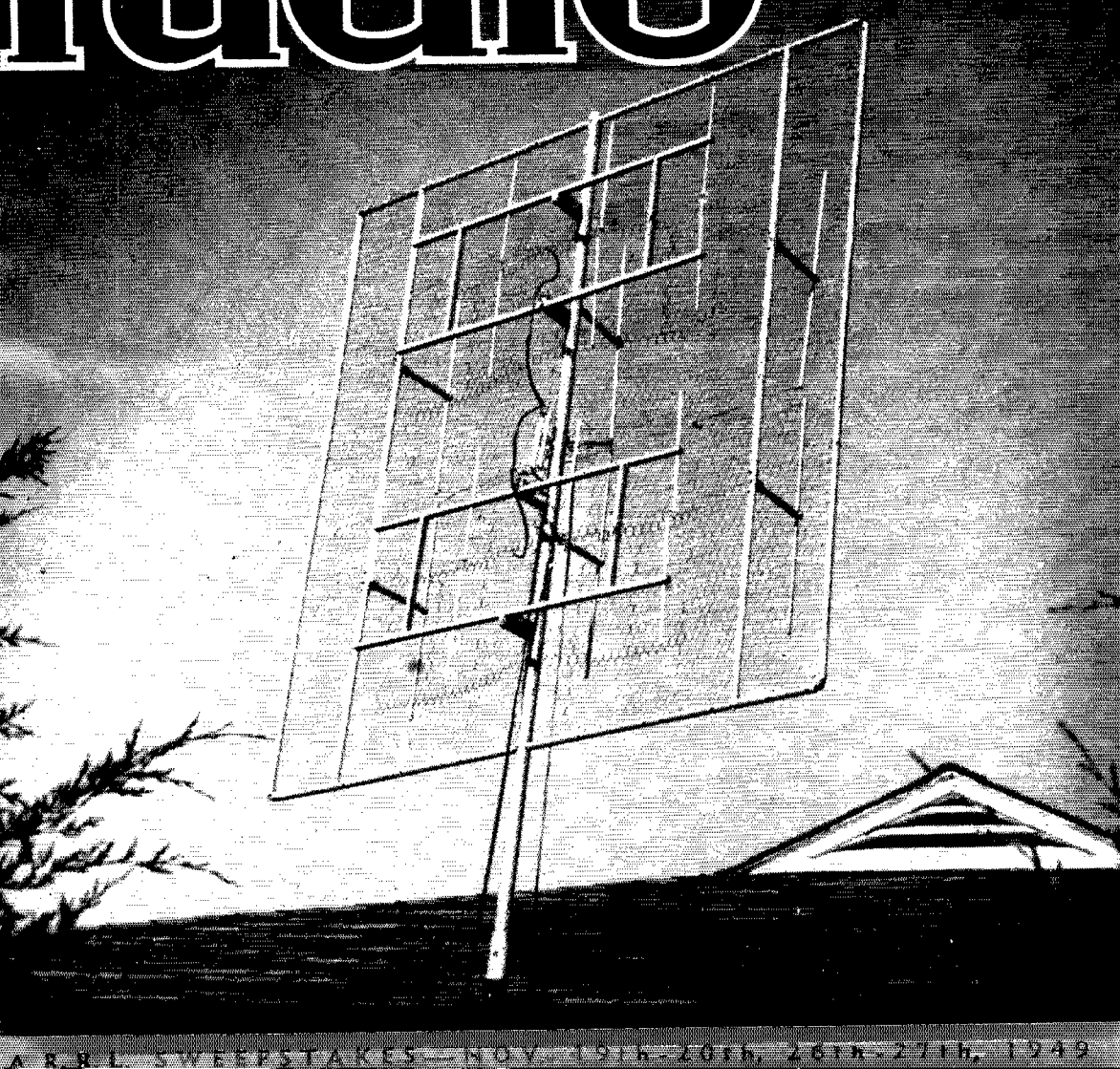

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Model 628. Complete with E-V 605-8 Hi-Z Dynamic Mike, 8 ft. cable. List Price **$37.00**

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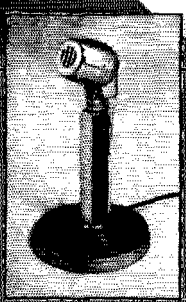
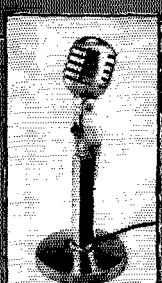
(Double Pole, Double Throw available on special order at $1.00 list extra.)





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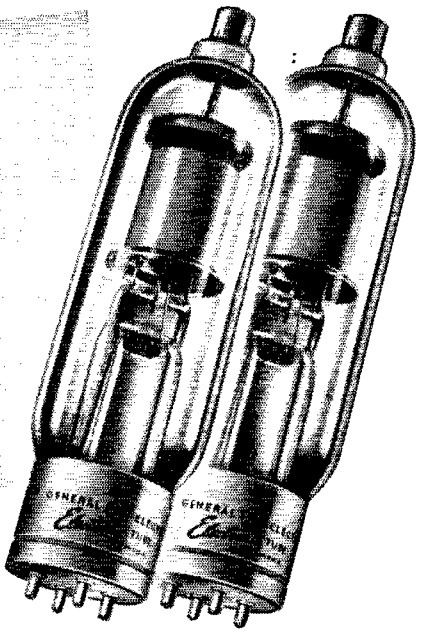

TYPE GL-872-A

Filament voltage	5.0 v
Filament current	7.5 amp
Typical operating conditions, full-wave circuit (two tubes), choke input:	
a-c voltage, plate-to-plate	7,070 v
d-c output voltage (approx)	3,180 v
d-c output current	2.5 amp

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.

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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:

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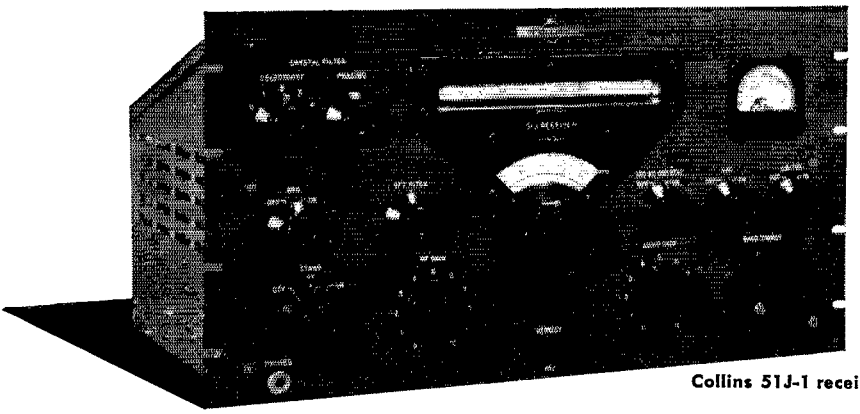

Collins 51J-1 receiver

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.

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QST

NOVEMBER 1949

VOLUME XXXIII • NUMBER 11

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38 La Salle Road
West Hartford 7, Connecticut

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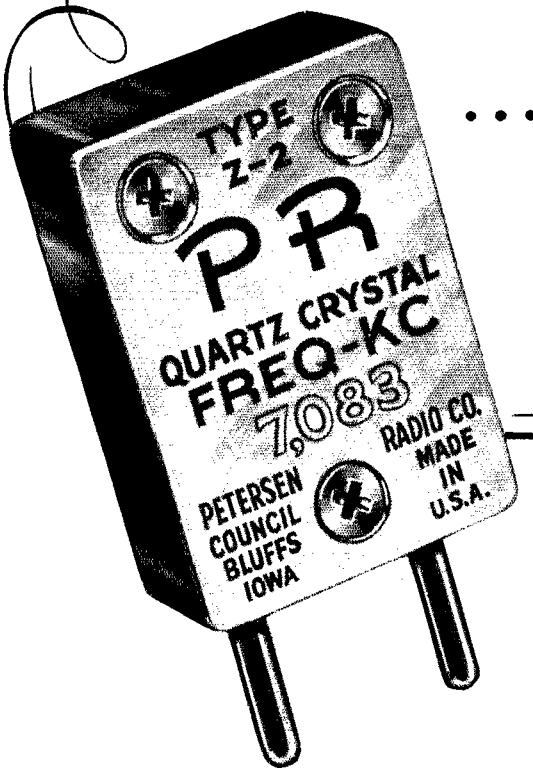

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Section Communications Managers of the ARRL Communications Department

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, OO 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 experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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

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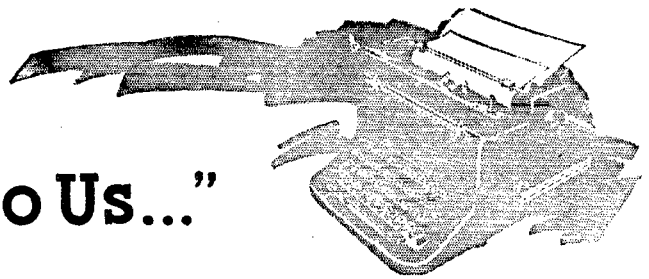

"It Seems to Us..."

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 be, of course, 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 20½. 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 coöperate 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 reiterating 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 3800–4000 kc. but vigorously opposed the idea of bandwidth-limitation regulations in this or any other amateur band. The Board rejected all FCC proposals relating to the 14-, 28- and 50-Mc. bands, except the extension of n.f.m. throughout 50 to 54 Mc. The proposed Technician Class license met with Board approval; so did the Novice Class, but with suggested privileges of c.w. only in 3700–3750 kc., 26.96–27.23 Mc. and c.w. and 'phone in 145–147 Mc., all crystal-controlled and 75 watts maximum input. Vigorous opposition was expressed to the establishment of an Extra Class license, to the proposed code-speed test of 20 words per minute, to the reëxamination of Class A operators, to the proposed activity requirements for renewal, and to the idea of a compulsory control station for roundtables. The Board also decided to request the Commission, as of the time U. S. amateurs get the 21-Mc. band under Atlantic City Regulations, to extend the Class A 'phone privileges throughout 14,200–14,350 kc. Minutes will appear in the next issue.

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.

25 Years Ago this month

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. Schnell announces another Daylight Transcon 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 superheterodyne, featuring geared variable condensers and inductances.

. . . The schooner *Bowdoin* of the MacMillan Arctic Expedition has returned home safely. ARRL's representative on the 14-month trip, Don Mix, 1TS, 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-Zenith Circuit" is intimately described by Healdon R. Starkey of the Zenith research department.

. . . A new name appears on the *QST* masthead — L. W. Hatry, 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. Kroger, 3APV, and P. M. Hargis, 5AIJ, the 12-meter "1DH" 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 1CMP, Bridgewater, Mass., operated by Clance and William Jackson, 8JY, Cleveland, Ohio, operated by S. B. Browne, 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.

The "Selectoject" shown in the operating position beside an NC-57 receiver. The unit is mounted on rubber feet to raise its controls to the same level as the receiver's. The toggle switch changes operation from adjustable rejection filter to variable-frequency selective amplifier or oscillator. The center knob is the frequency control; the small knob at the right sets the depth of the null in one position of the switch, and serves as a selectivity or feed-back control in the second. Settings of the two knobs are independent of each other.

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-

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

[2] R. W. Woodward, "Heterofil — An Aid to Selectivity," *QST*, Sept., 1939, p. 11.

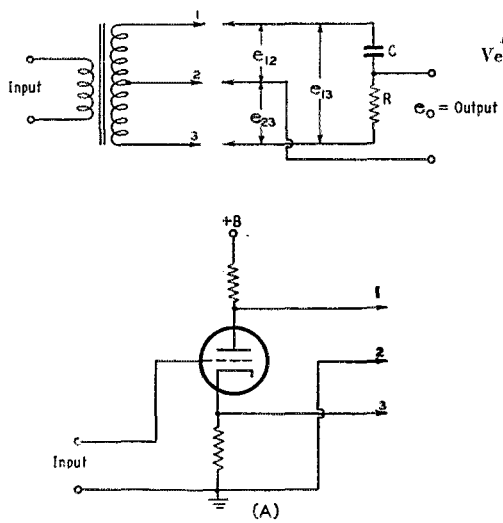
• It isn't often that as much versatility is packed into a small box as in the case of the "Selectoject." Whether you're a beginner or old-timer, have the simplest or more elaborate station, 'phone or c.w., you'll find this gadget a most useful addition to your equipment.

ple 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. It turns out to be easier to control this phase shift than it is to control amplitude of transmission directly as in conventional circuits. 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_{23} 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 applied voltage, e_{13}. 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



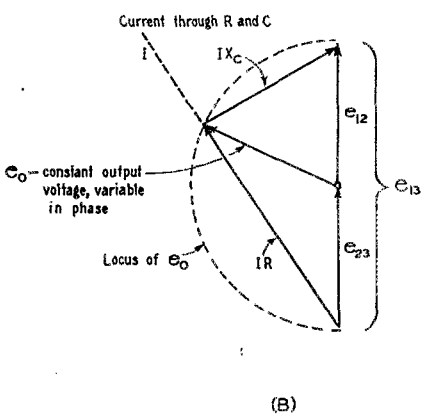


Fig. 1 — A — Basic phase-shifting circuit. B — Vector diagram of basic phase-shifting circuit.

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 then 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

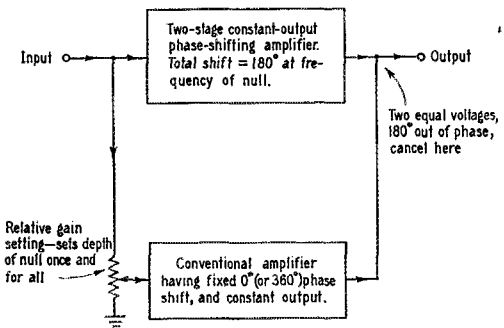


Fig. 2 — Block diagram of rejection-filter connection.

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.*

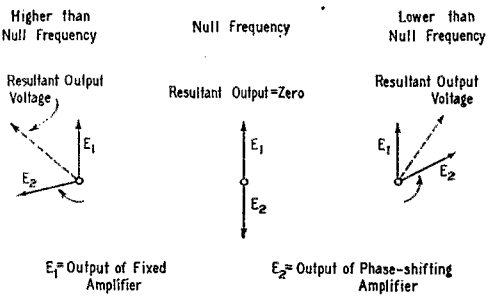


Fig. 3 — How the null is achieved, for a given setting of the tuning control.

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

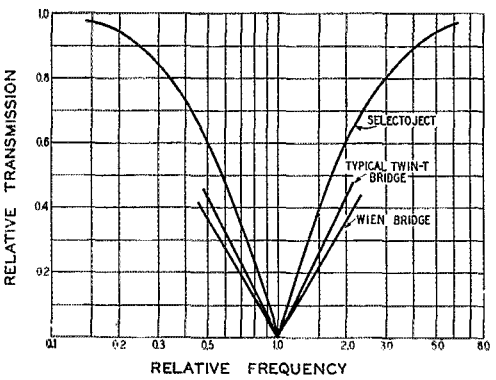


Fig. 4 — Frequency response of rejection filter compared with Wien and twin-"T" bridges.

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

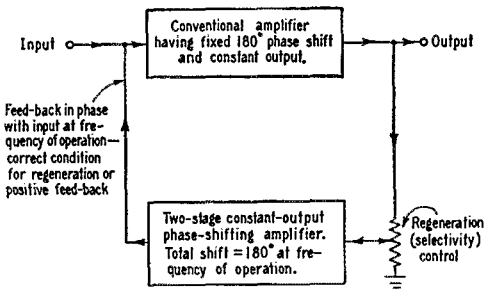


Fig. 5 **— Block diagram of selective amplifier and oscillator connection.**

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 R_6 and R_{10} 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 (R_{11} and R_{12}). 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 C_4 and C_5 equals the resistance of R_{11} and R_{12}, which in this case is about 160 cycles. To make it operate at 80 cycles, C_4 and C_5 could be made 0.004, or alternatively R_{11} and R_{12} could be made 1 megohm, and so forth. For reasons of circuit performance as well as economy, C_4 and C_5

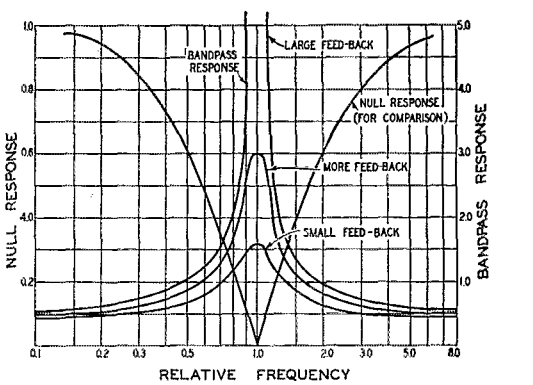


Fig. 6 **— Frequency response of selective amplifier, for different degrees of selectivity.**

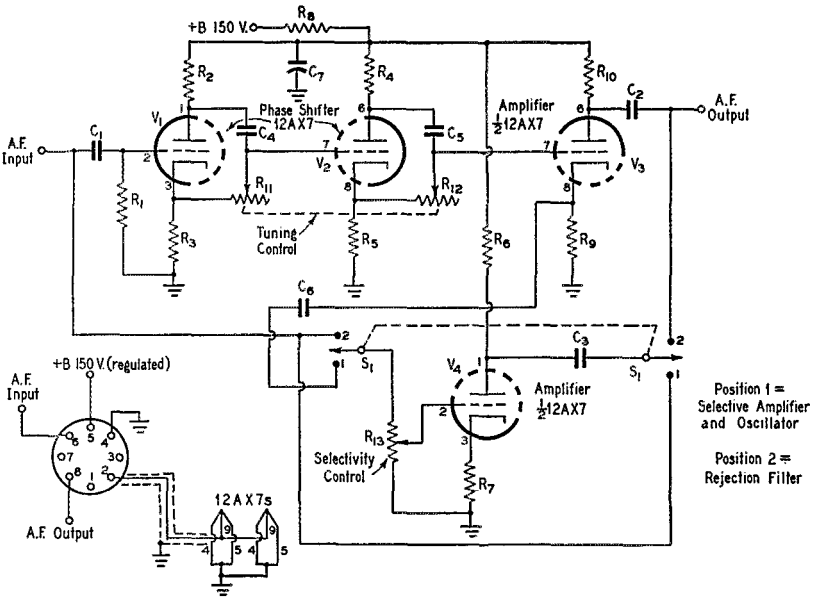


Fig. 7 — Complete schematic of Selectoject using 12AX7 tubes.

C_1 — 0.01-μfd. mica, 400 volts.
C_2, C_3 — 0.1-μfd. paper, 200 volts.
C_4, C_5 — 0.002-μfd. paper, 400 volts.
C_6 — 0.05-μfd. paper, 400 volts.
C_7 — 16-μfd. 150-volt electrolytic.
R_1 — 1 megohm, ½ watt.
R_2, R_3 — 2000 ohms, 1 watt, matched as closely as possible (see text).
R_4, R_5 — 4000 ohms, 1 watt, matched as closely as possible (see text).
R_6 — 20,000 ohms, ½ watt.
R_7 — 2000 ohms, ½ watt.
R_8 — 10,000 ohms, 1 watt.
R_9 — 6000 ohms, ½ watt.
R_{10} — 20,000 ohms, ½ watt.
R_{11}, R_{12} — Ganged 0.5-megohm ½-watt potentiometers, standard audio taper (tuning control).
R_{13} — 0.5-megohm ½-watt potentiometer (selectivity control).
S_1 — D.p.d.t. toggle.

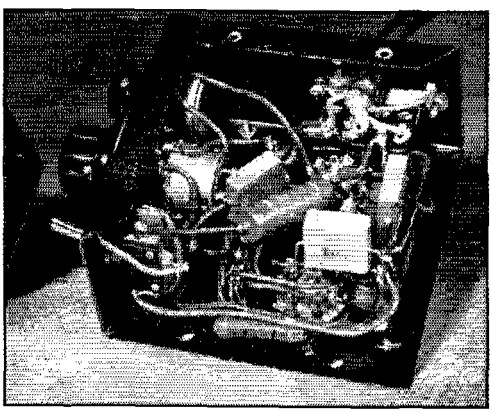
should be kept small, and R_{11} and R_{12} large. However, C_4 and C_5 should probably not be smaller than 500 μμfd., and R_{11} and R_{12} not larger than 5 megohms. Within these limits, the choice is up to the designer.

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_3, 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-



View of the Selectoject with the bottom half of the box removed. Note how cutting the diagonal edges makes the interior more accessible. There is ample room if moderately small-sized components are used.

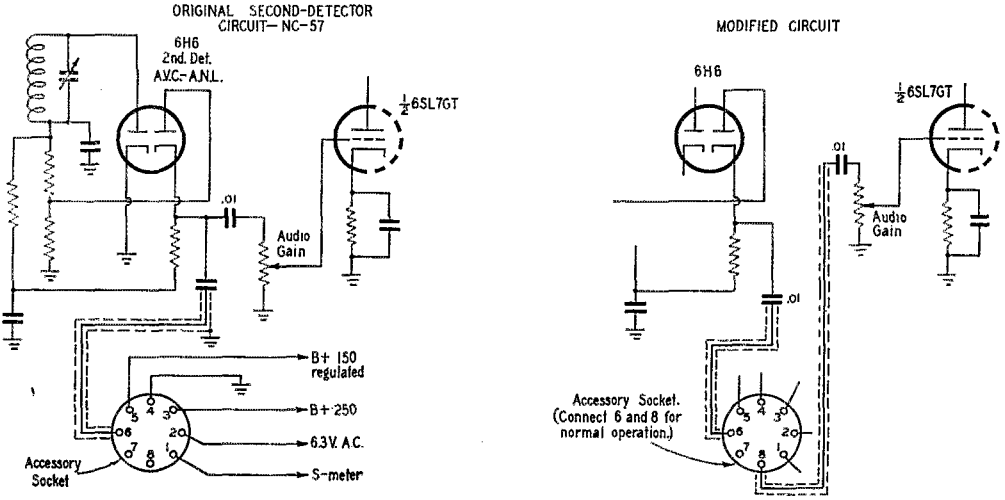


Fig. 8 — These circuit modifications to the NC-57 receiver to use the Selectoject are typical of the method of connection to the average communications receiver. The essential modification is to open an audio lead and insert the Selectoject.

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 feed-back 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-

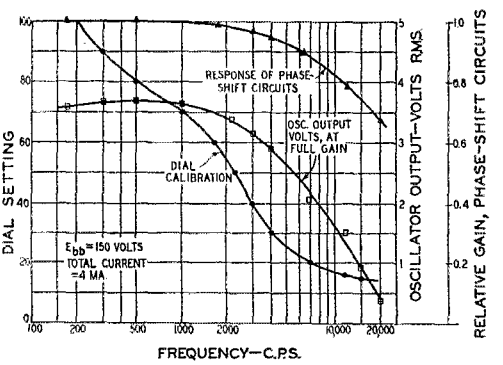


Fig. 9 — Measured performance of model using 12AX7 tubes.

tivity position, it functions as an auxiliary receiver-tuning control. By turning the frequency knob, the narrow passband may be swept through the audio range thus bringing signals in and out as effectively as if the audio selectivity were fixed at one frequency and the receiver b.f.o. knob or tuning control had been turned. This gives a very nice vernier tuning action. Interestingly enough, when tuning this way it is easier to keep track of stations in a crowded band because each has a particular pitch which remains the same and is not affected by the "tuning" process.

(Continued on page 100)

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,

$$E_{max.} = \sqrt{PZ_0e}$$

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. $E_{max.}$ 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

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

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

$$I = 3500/300 = 11.7 \text{ amperes.}$$

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

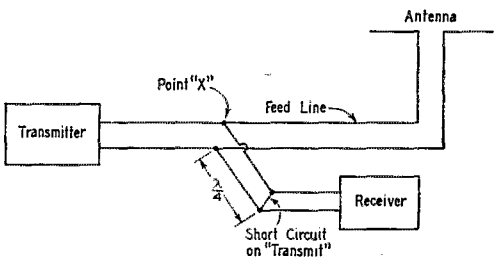


Fig. 1 — This arrangement will permit use of the same antenna for transmitting and receiving if the quarter-wavelength stub is shorted during "transmit" periods. It will be recognized as the "T-R" circuit used in radar systems.

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

* % Broadcast Transmitter Engineering, Transmitter Division No. 7, General Electric Co., Electronics Park, Syracuse, N. Y.

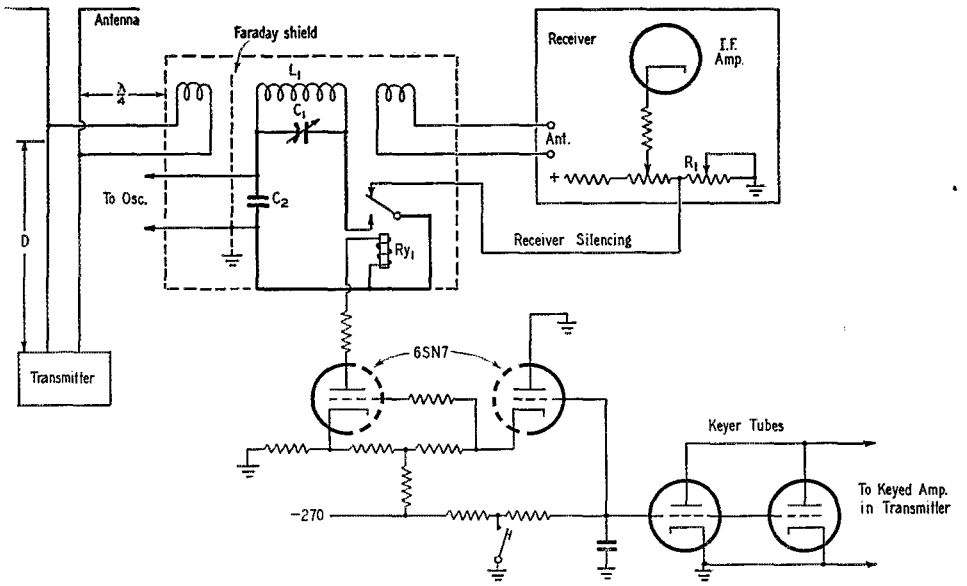


Fig. 2 — A practical amateur application of the "T-R" system. The short circuit is obtained with relay Ry_1, and the job is made easier by the step-up in impedance. L_1C_1 tunes to the frequency in use, C_2 is a 0.001-μfd. mica receiving-type condenser. Constants associated with the 6SN7, keyer tubes and receiver can be found in the reference under footnote 1 or on page 255 of the 1949 edition of *The Radio Amateur's Handbook*.

large one and can be met by a number of different relays.

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.

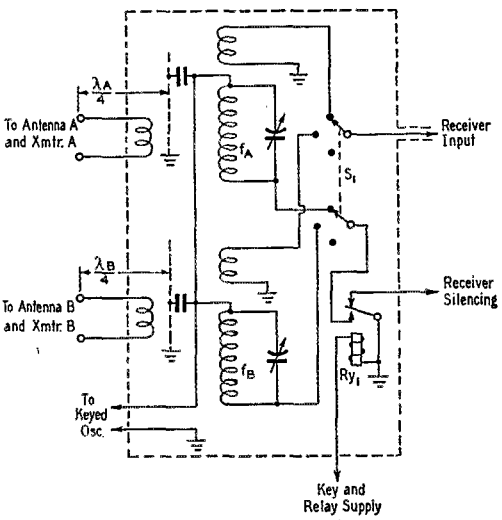


Fig. 3 — For operation on several bands, with separate antennas and transmitters for each band, the circuit of Fig. 2 can be modified to include separate tuners for each band. The 2-pole switch makes band-changing a simple matter. The circuit is shown here for oscillator keying.

A method for doing this electronically was described in *QST*,[1] 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 $178/f$ 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 Ry_1 should be a fast one, as prescribed in the reference.[1]

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.

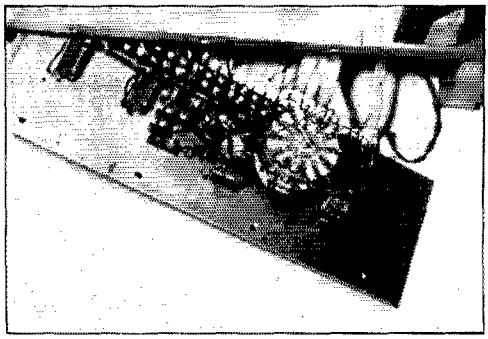
[1] Goodman "Improved Break-In Keying," *QST*, March, 1948.

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 Ry_2 are bent to close before the *B* contacts, so that the receiver will be protected before the transmitter goes on. Ry_1 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 Ry_2 to arc as they opened, burning the contacts and causing a heavy click in the receiver. Ry_1 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 Ry_2. 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)



The control panel at W2SO, unfastened to show the ceramic switch that selects the proper antenna for the circuit shown in Fig. 4. At the same time, the switch turns on the corresponding transmitter and VFO. The two keying relays can be seen on either side of the switch.

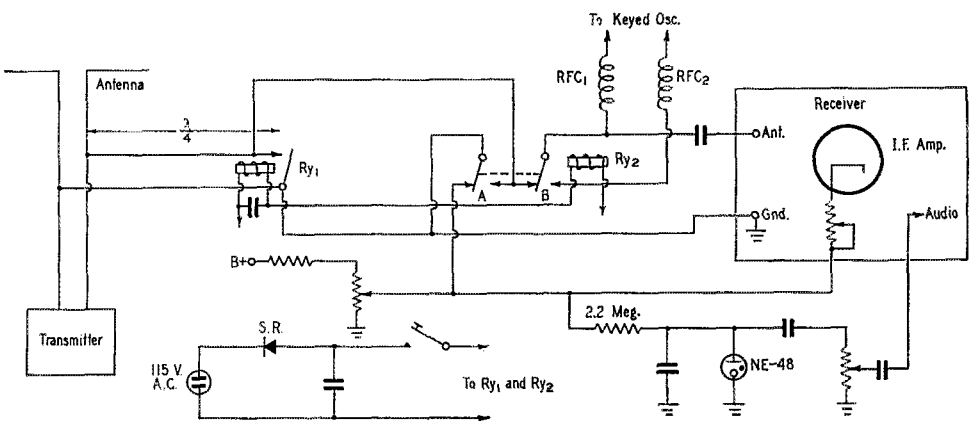


Fig. 4 — A mechanical version of the break-in system, requiring two relays. The s.p.s.t. relay Ry_1 "holds in" longer than Ry_2 because a large condenser (value depending upon coil resistance of Ry_1) is connected across the coil. This circuit uses oscillator keying in the transmitter and a small audio oscillator of the "Monitone" variety for a keyed sidetone. W2SO uses small surplus relays (Clare Type K, 300-ohm coil) and a selenium-rectifier supply.

Harmonic Reduction in a 500-Watt All-Band Rig

A Practical Example of Present-Day Requirements in Transmitters

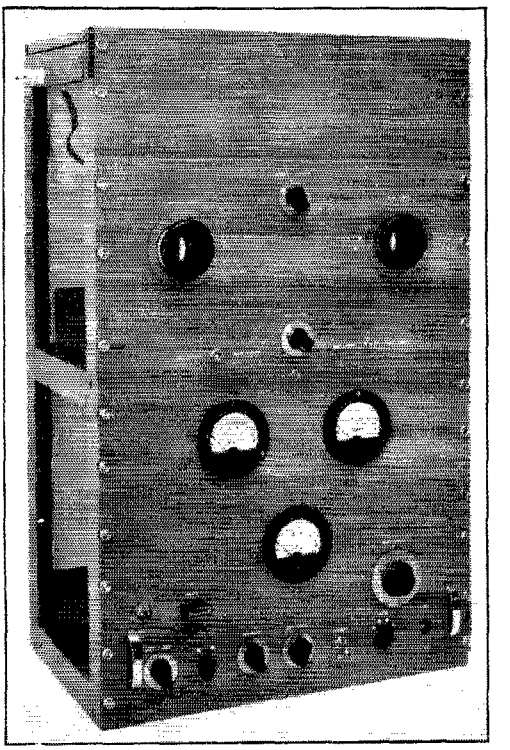
BY DONALD H. MIX,* W1TS

• 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



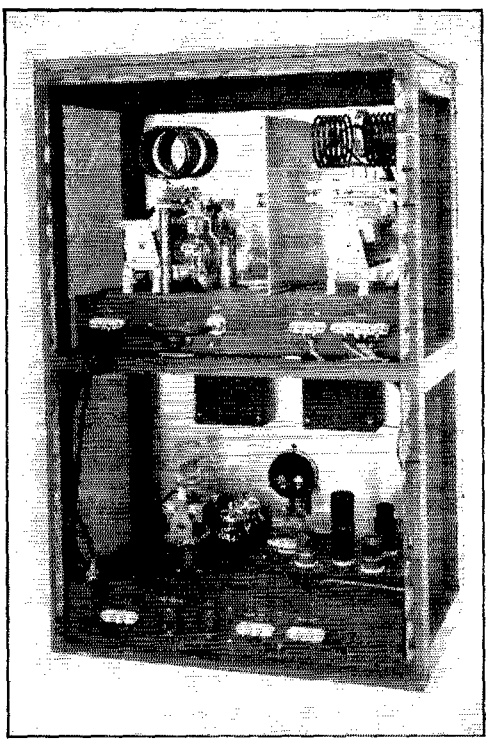
Front view of the completed transmitter. The 6L6 input tuning control, crystal-VFO switch, 6L6 output tuning control, 807 input control, 807 filament switch (S_2), meter switch and key jack are equally spaced along the bottom edge of the exciter panel. The VFO input connector and crystal socket are above to the left and the 807 output tank-condenser control to the right.

On the amplifier panel above the two amplifier meters is the final-amplifier grid tuning control, flanked by the two meter switches. Between and above the antenna and plate-circuit tuning controls is the antenna link-coupling control. The 10½-inch exciter panel is dropped below the lower edge of the chassis to cover the bottom strip of the wood frame. The meter panel is 5¼ inches high and the final-amplifier panel 15¾ inches. All panels should be of metal or metal-backed Presdwood.

*Assistant Technical Editor, *QST*.

through my windows?" 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 ogler 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.



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 × 4 × 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

Output	XTAL	VFO	L_1	L_2/ /L_4	L_3	L_5/ /L_6/ /L_7	S_2
3.5	1.75	—	1.75	3.5	Y-Z	3.5	Open
7	1.75	—	3.5	7	Y-Z	7	Open
14	1.75	—	3.5	7	Y-Z	14	Closed
21	1.75	—	3.5	10.5	Y-Z	21	Closed
3.5	3.5	—	None	3.5	Y-Z	3.5	Open
7	3.5	—	3.5	7	Y-Z	7	Open
14	3.5	—	3.5	7	Y-Z	14	Closed
21	3.5	—	3.5	10.5	Y-Z	21	Closed
28	3.5	—	7	14	Y-Z	28	Closed
7	7	—	None	7	Y-Z	7	Open
14	7	—	7	14	Y-Z	14	Open
28	7	—	7	14	Y-Z	28	Closed
3.5	—	1.75	1.75	3.5	Y-Z	3.5	Open
7	—	1.75	1.75	3.5	Y-Z	7	Closed
3.5	—	3.5	—	—	X-Z	3.5	Open
7	—	3.5	3.5	7	Y-Z	7	Open
14	—	3.5	3.5	7	Y-Z	14	Closed
21	—	3.5	3.5	10.5	Y-Z	21	Closed
7	—	7	—	—	X-Z	7	Open
14	—	7	7	14	Y-Z	14	Open
21	—	7	7	21	Y-Z	21	Open
28	—	7	7	14	Y-Z	28	Closed

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.

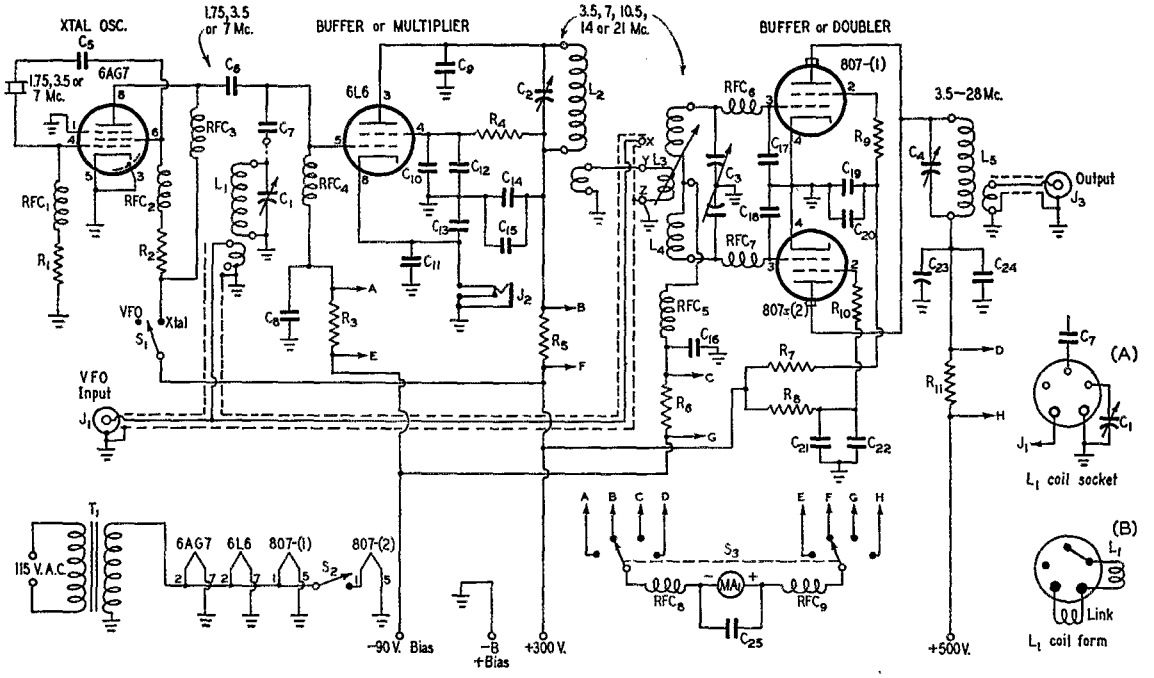


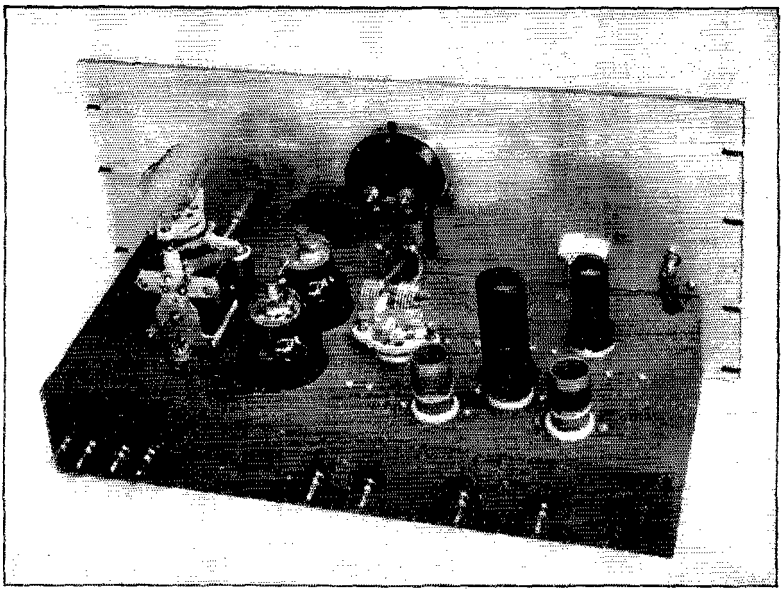
Fig. 1 — Circuit diagram of the exciter for the 500-watt all-band transmitter.

C_1, C_2 — 140-$\mu\mu$fd. variable (Millen 22140).
C_3 — 100-$\mu\mu$fd.-per-section variable (Millen 23100).
C_4 — 250-$\mu\mu$fd. variable (National TMK-250).
C_5 — 0.0022-μfd. mica.
C_6, C_7 — 100-$\mu\mu$fd. mica.
C_8, C_{12}, C_{13}, C_{14}, C_{16}, C_{19}, C_{22} — 0.0047-μfd. mica.
C_9, C_{10}, C_{11}, C_{15}, C_{20}, C_{21} — 22-$\mu\mu$fd. ceramic.
C_{17}, C_{18} — 12-$\mu\mu$fd. ceramic.
C_{23} — 15-$\mu\mu$fd. air tubular (see text).
C_{24} — 0.001-μfd. 1200-volt wkg. mica.
C_{25} — 470-$\mu\mu$fd. mica.
R_1 — 47,000 ohms, ½ watt.
R_2 — 4700 ohms, 2 watts.
R_3, R_6 — 100 ohms, ½ watt.
R_4 — 2500 ohms, 10 watts.
R_5, R_{11} — 10-times meter shunt (see text).
R_7, R_8 — 10,000 ohms, 10 watts.
R_9, R_{10} — 100 ohms, ½ watt, noninductive.
L_1, L_2, L_4, L_5 — See table.
L_3 — See line-up table for connections.
J_1, J_3 — Coaxial fitting.
J_2 — Closed-circuit jack.
MA_1 — Milliammeter — 25-ma. d.c. scale.
RFC_1 — 2.5-mh. 125-ma. r.f. choke.
RFC_2, RFC_3, RFC_4, RFC_5 — 2.5-mh. 50-ma. r.f. choke (National R-50).
RFC_6, RFC_7 — V.h.f. parasitic choke — 12 turns No. 16, ¼-inch diam., 1 inch long, self-supporting.
RFC_8, RFC_9 — 7-μh. r.f. choke (Ohmite Z-50).
S_1 — S.p.d.t. ceramic rotary.
S_2 — S.p.s.t. toggle.
S_3 — 2-pole 4-position 2-section ceramic rotary.
T_1 — Filament transformer: 6.3 volts, 6 amps.
Figs. 1A and B show the wiring of the coil socket and form for L_1.

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,



Top view of the exciter unit. The multiplier input and output coils flank the 6L6 with the 6AG7 oscillator tube and crystal socket to the rear. The 807 grid coil is at the center of the chassis with the submounted tubes to the left. The plate tank coil is mounted on top of the output tuning condenser. A clearance hole in the chassis permits the tubular by-pass condenser, C_{28}, to be mounted below with its top terminal close to the rotor of the tank condenser. The meter-filter components are fastened to the terminals of the meter. The external power connections are made through the banana plugs at the rear.

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-

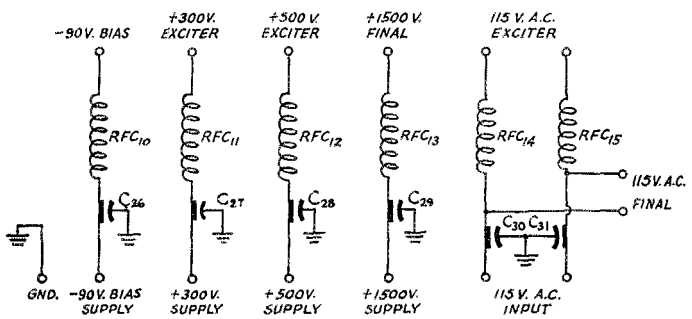
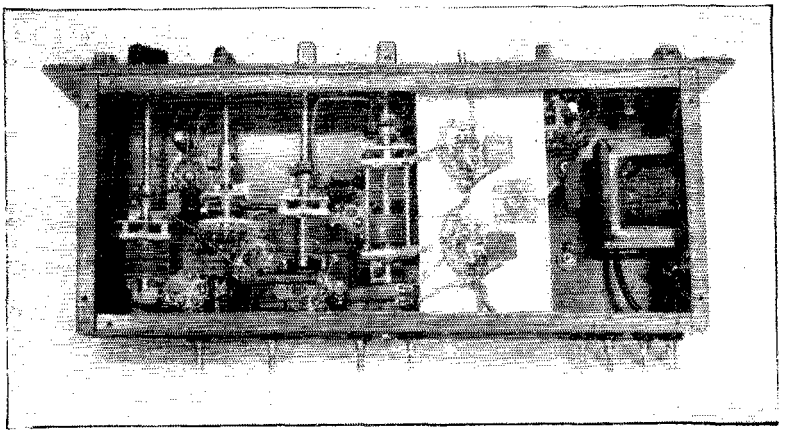


Fig. 2 — Wiring diagram of the harmonic-filter unit for the 500-watt all-band transmitter.
C_{26} — 0.005 μfd., 600 volts (Sprague Hypass).
C_{27}, C_{28} — 0.01 μfd., 600 volts (Sprague Hypass).
C_{29} — 0.002 μfd., 5000 volts wkg. (Sprague Hypass).
C_{30}, C_{31} — 0.1 μfd., 250 volts (Sprague Hypass).
RFC_{10-15} — 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.

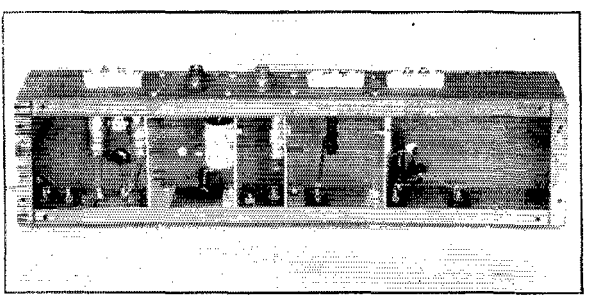
nents must be shielded from r.f. pick-up from the tank circuits. To this end, the filters have in this instance been placed in a separate shielding chassis. The wiring of this chassis, which includes the filters for the final stage, too, is shown in Fig. 2. These filters are far from complex, consisting only of a v.h.f. choke in combination with a by-pass 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-$\mu\mu$fd. postage-stamp unit actually may be more effective than a condenser of larger capacitance. In this connection, tests have shown that the Sprague Hypass 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. RFC_8, RFC_9 and C_{25} 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 RFC_6, RFC_7, R_9 and R_{10}, 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.

♦

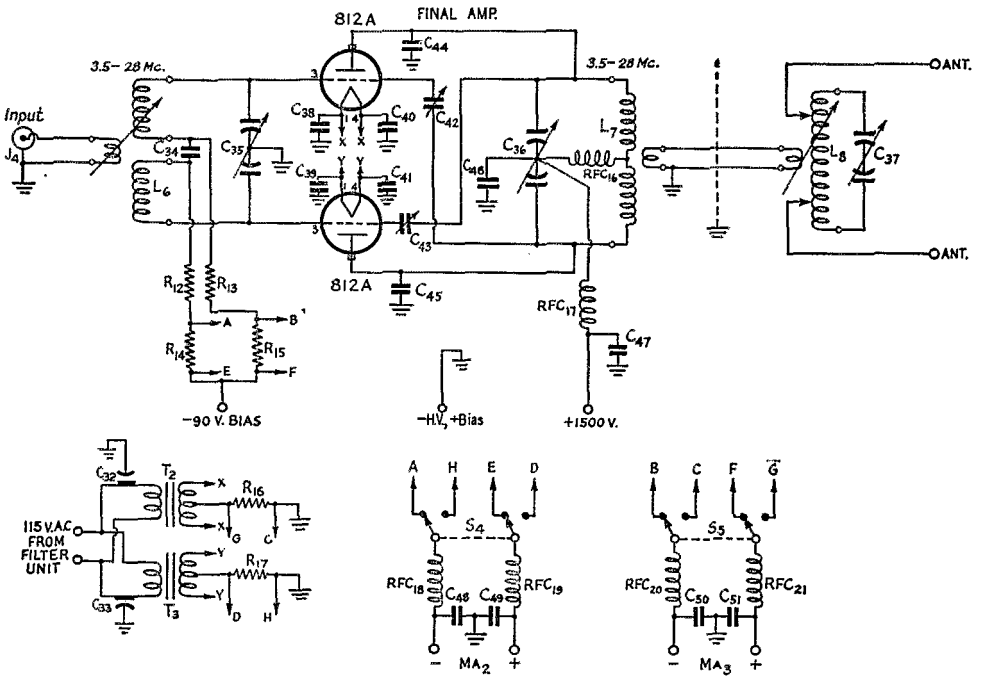


Fig. 3 — Circuit diagram of the final amplifier and antenna tuner of the 500-watt all-band transmitter.

C_{32}, C_{33} — 0.1 μfd., 250 volts (Sprague Hypass).
C_{34} — 0.0022-μfd. mica.
C_{35} — 100-$\mu\mu$fd.-per-section var. (Johnson 100HD-15).
C_{36}, C_{37} — 100-$\mu\mu$fd.-per-section variable (Johnson 100ED30).
C_{38}, C_{39}, C_{40}, C_{41}, C_{48}, C_{49}, C_{50}, C_{51} — 47-$\mu\mu$fd. mica.
C_{42}, C_{43} — Neutralizing condenser — 4-14 $\mu\mu$fd. (Millen 15005).
C_{44}, C_{45} — 12-$\mu\mu$fd. 8000-volt tubular air condenser (see text).
C_{46}, C_{47} — 470-$\mu\mu$fd. 2500-volt wkg. mica.
R_{12}, R_{13} — 1000 ohms, 10 watts (for 812As).
R_{14}, R_{15} — 10-times meter shunt (see text).
R_{16}, R_{17} — 100 ohms, ½ watt.
L_6, L_7, L_8 — See coil table.
J_4 — Coaxial connector.
MA_2, MA_3 — Milliammeter — 25-ma. d.c. scale.
RFC_{16} — 1-mh. 600-ma. r.f. choke (National R154).
RFC_{17}, RFC_{18}, RFC_{19}, RFC_{20}, RFC_{21} — 7-μh. r.f. choke (Ohmite Z-50).
S_4, S_5 — D.p.d.t. toggle switch.
T_2, T_3 — Filament transformer: 6.3 volts, 8 amp.

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 C_{44} and C_{45} 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. R_{12} and R_{13} 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.

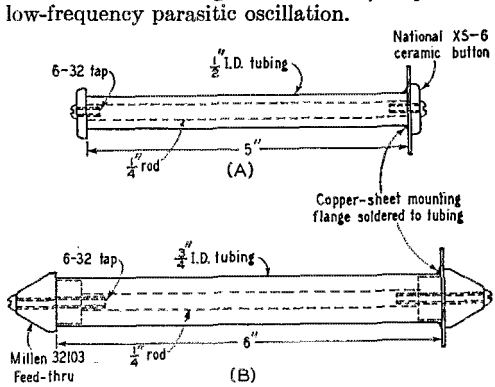
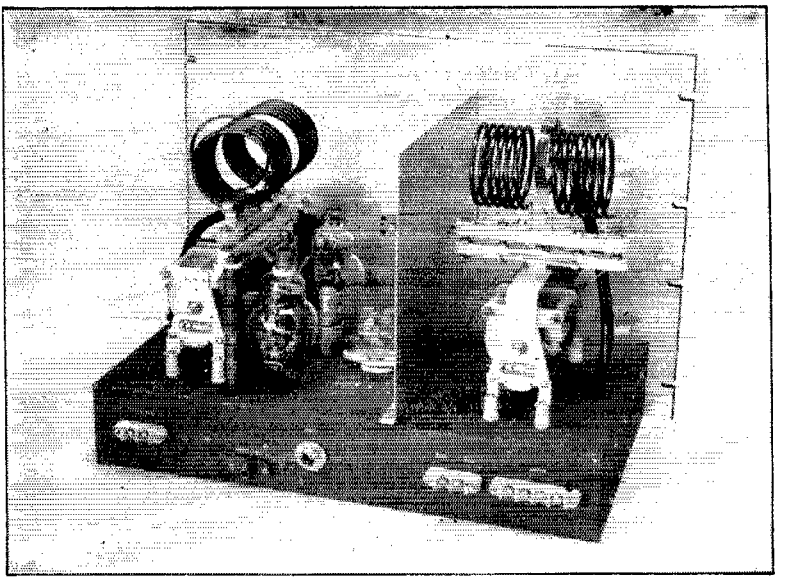


Fig. 4 — Sketches showing method of constructing the tubular air condensers. A for the 807 plate by-pass condenser and B for the plate-to-ground condensers in the final amplifier. The outer tubing and the inner rod may be of aluminum or copper.

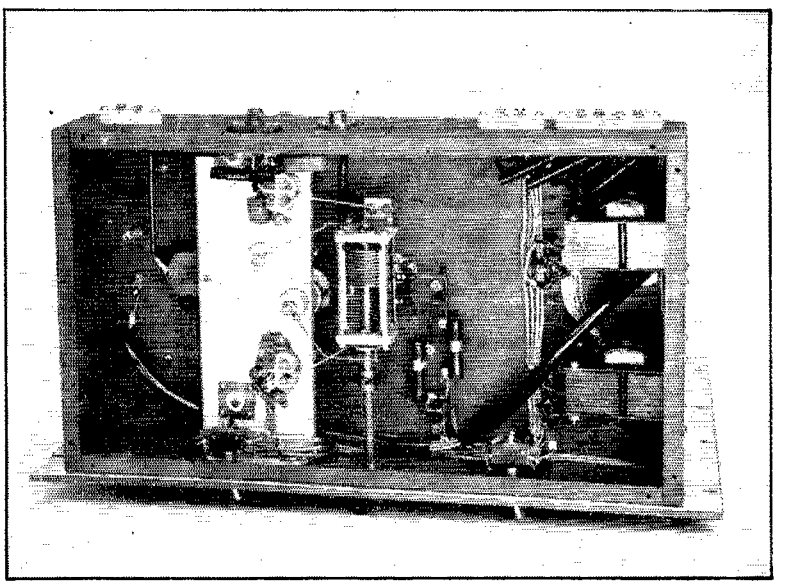


Rear view of the amplifier section. The original mountings of the neutralizing condensers are replaced with large feed-through insulators. Clearance holes in the chassis permit these condensers to be mounted with their top terminals close to the tube plate caps. The jack bar for the plate tank coils 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 × 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 × 17 × 3-inch amplifier chassis. The tube sockets, the tubular condensers (C_{44} and C_{45}) 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

Coil	Band	Lμh.	Turns	Wire	Diam.	Lgth.	Link	Manufactured Type
L_1/ /L_2	1.75	58	60	28 d.s.c.	1"	cw	8	Wound on Millen 45005 1-inch 5-pin bakelite form. See circuit diagram for pin connections.
	3.5	19	34	24 d.s.c.	1"	cw	6	
	7	7	18	22 d.s.c.	1"	cw	3	
L_2	10.5	4.4	16	22 d.s.c.	1"	⅞"	3	
	14	2.5	10	22 d.s.c.	1"	5/8"	3	
	21	1.2	7	18	1"	½"	2	
L_4	3.5	40	46	24	1¼"	1⅝"	10	National AR-17-80S
	7	11	22	22	1¼"	1¼"	5	National AR-17-40S
	10.5	8	18	22	1¼"	1"	5	National AR-17-40S 2 turns off each end.
	14	2.9	12	18	1¼"	1⅛"	3	National AR-17-20S
	21	1.3	6	18	1¼"	1⅛"	2	National AR-17-10S
L_5	3.5	10	22	16	1½"	1⅛"	3	B&W JEL-40
	7	3	12	14	1½"	2"	2	B&W JEL-20
	14	2.3	10	14	1½"	2¼"	2	B&W JEL-15
	21	0.8	6	14	1½"	2"	2	B&W JEL-10
	28	0.5	4	14	1½"	1¼"	2	B&W JEL-2 turns off
L_6	3.5	55	56	18	1¼"	1¾"	4	National AR-17-80C
	7	11	22	22	1¼"	1¼"	5	National AR-17-40S
	14	7	14	22	1¼"	⅞"	5	National AR-17-40S 4 turns off each side
	21	2.5	10	18	1¼"	1"	3	National AR-17-20S 1 turn off each side
	28	0.7	4	18	1¼"	½"	2	National AR-17-10S 1 turn off each side
L_7	3.5	40	40	14	2½"	5"	6	Johnson 500 HCF-80
	7	15	24	12	2½"	5"	6	Johnson 500 HCF-40
	14	3.7	12	6	2½"	5"	3	Johnson 500 HCF-20
	21	1	8	6	2"	5"	3	Johnson 500 HCF-10
	28	0.7	6	6	2"	4"	3	Johnson 500 HCF-10 1 turn off each side
L_8	Same as L_7 with swinging link							Johnson 500 HCS

tal frequency. Care should be taken to check the frequency of each stage with an absorption wavemeter until the proper dial settings for each band have been determined and logged. The objective should be to obtain rated grid current to the final amplifier with a minimum of drive to the 807 stage. The coupling between the driver and the final should be adjusted to the optimum point, while the link at the input of the 807s should in each case be set to produce rated final-amplifier grid current.

The grid current to the 6L6 should run 1 ma. or less on all bands. The combined screen and plate current should vary from 10 ma. or less, when the output circuit is untuned, to 45 ma. when the 6L6 is doubling. To obtain rated grid current to a pair of 812As in the final amplifier, as an example, the grid current of a single 807 should be about 3 ma. When the two tubes are in use as a doubler, a total grid current of 2 ma. or less should be sufficient. The respective plate currents under these conditions are 100 ma. and 140 ma. The 807 screen current will run between 5 and 7 ma. for single-tube operation and a total of about the same for the two tubes when they are operating as doublers. If tubes of other types are used in the output stage, R_{12} and R_{13} must be changed to suit.

Actually, when everything is summed up, very little has been done in this transmitter that should not be done as a matter of good practice, regardless of TVI. In this respect, we may find that TVI has forced us into building gear the way it should be built to be stable. Attention given to the points outlined here should be all that is necessary to take care of harmonics in a good share of the cases where TVI is hampering ham operation. Overload of the TV-receiver input by the fundamental is another matter and something in which the TV-set owner must assume at least an equal share of the responsibility.

Strays

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

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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-W8CSE) on page 37 of January, 1942, *QST* and by William D. MacGeorge (W3GHR) on page 12 of September, 1941, *QST*.

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.

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.

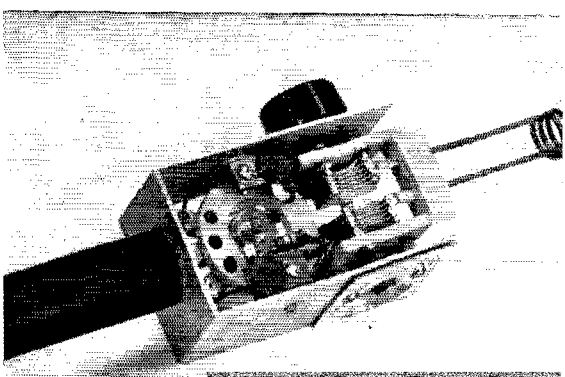
Regenerative amplification, as is well known, is greater on weak than on strong signals. In contrast, a plain diode without a high-resistance load tends to follow a square-law characteristic. This gives a false impression of the success of harmonic-reduction measures because if the harmonic strength 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.[1] 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 50–250 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.

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 $\mu\mu$fd. 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

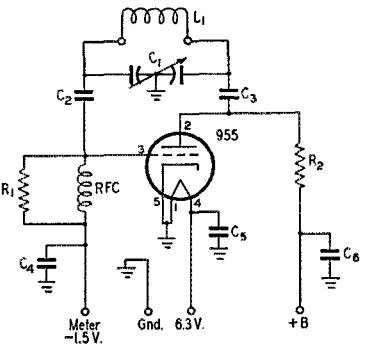
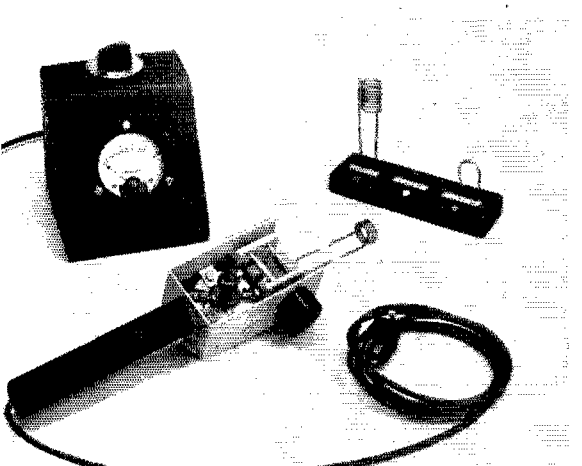


Fig. 1 — Regenerative wavemeter circuit.
C_1 — Double-section midget, app. 36 $\mu\mu$fd. per section (Millen 21100 modified as described in text).
C_2, C_3 — 50-$\mu\mu$fd. ceramic (Centralab Hi-Kap).
C_4, C_5, C_6 — 0.001-μfd. ceramic (Sprague disc ceramic).
R_1 — 22,000 ohms, ½ watt, carbon.
R_2 — 68,000 ohms, ½ watt, carbon.
L_1 — 48–98 Mc.: 7¾ turns No. 12, ½-inch diam., 1 inch long, with 3½-inch leads.
— 76–156 Mc.: 2¾ turns No. 12, ½-inch diam., ⅜ inch long, 2½-inch leads.
— 130–265 Mc.: "U"-shaped loop, No. 12, 1½ inches long, ½ inch between sides.
RFC—Ohmite Z-144.



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.

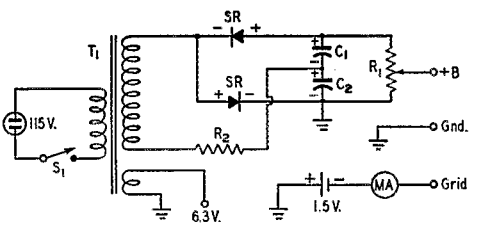


Fig. 2 — Power supply and meter circuit.
C_1, C_2 — 16-μfd. 150-volt electrolytic.
R_1 — 0.1-megohm potentiometer.
R_2 — 1000 ohms, 2 watts.
MA — 0–1 ma. (or smaller range for greater sensitivity).
S_1 — S.p.s.t. toggle (mounted on R_1).
SR — Selenium rectifier.
T_1 — Power transformer, required to furnish 6.3 volts at 0.3 amp. and app. 5 ma. at 115 volts (Millen 00011).

When using the instrument for harmonic checking it must be remembered that the maximum sensitivity is secured only when the circuit is just on the verge of oscillation. A higher setting of the regeneration control will have to be used when the wavemeter coil is tightly coupled to a lead or circuit than when the coupling is loose. The tuning is very sharp at maximum sensitivity, which is one reason why it is desirable to restrict the tuning range to the minimum needed to cover the important low-frequency group of TV channels.

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

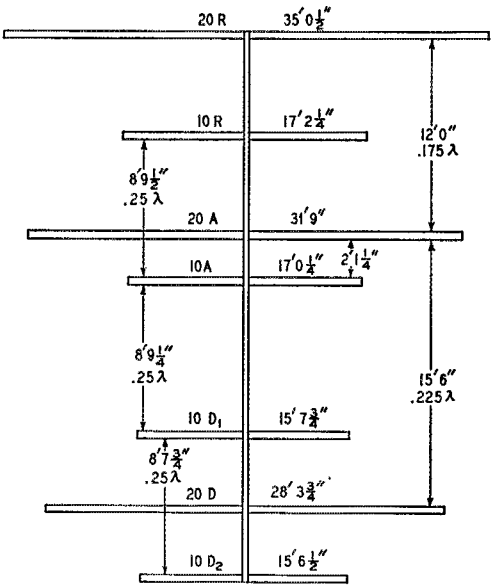


Fig. 1 — "Super-Interlaced Beam" dimensions.

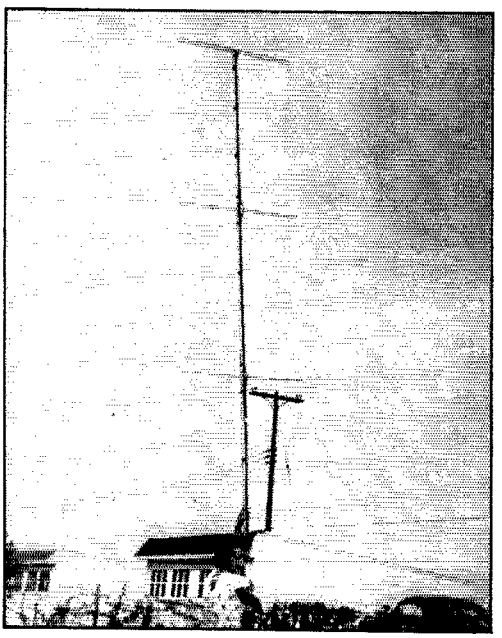
of our readers almost as much up in the air as the ZS6Z beam is, we hasten to correct the situation with the sketch of Fig. 1. The beam is tuned for 28,250 and 14,300 kc. For further particulars on the beam, see the original article.

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 City Slicker array is light in weight and low in wind resistance.

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.

* R.D. 1, Pope Rd., Burton, Ohio.

In its basic form, the "City Slicker" consists of four stacked folded dipoles, spaced 5/8 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

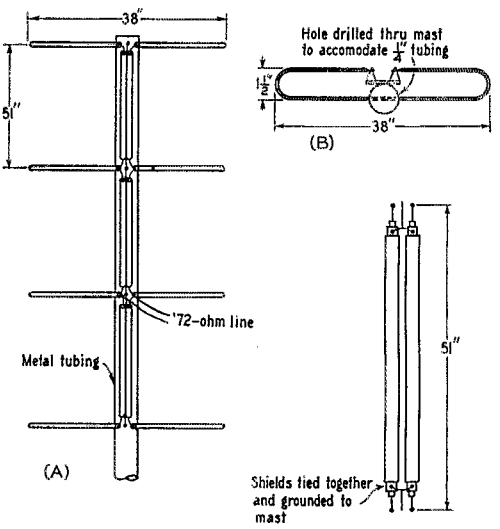


Fig. 1 — The City Slicker array for 144 Mc. described by W8UKS consists of 4 folded dipoles stacked 5/8 wavelength apart, as shown at A. Details of the individual dipoles are given in B. The phasing sections, C, are electrically one wavelength long. Their outer conductors are connected together and bonded to the mast. Feed-point impedance is 72 ohms, but any type of line may be used with a suitable matching transformer.

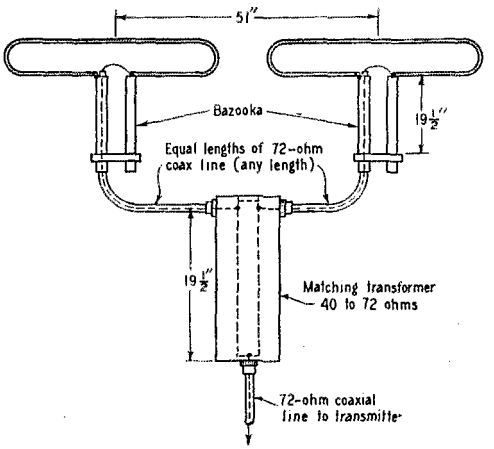


Fig. 2 — Two or more sets of dipoles may be placed side to side and fed in phase, for increased gain and directivity. A bazooka, or line balancer, is connected at the fed dipole in each set, and these are connected to the inner conductor of a coaxial matching transformer. The system may then be fed with 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 ⅝ 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

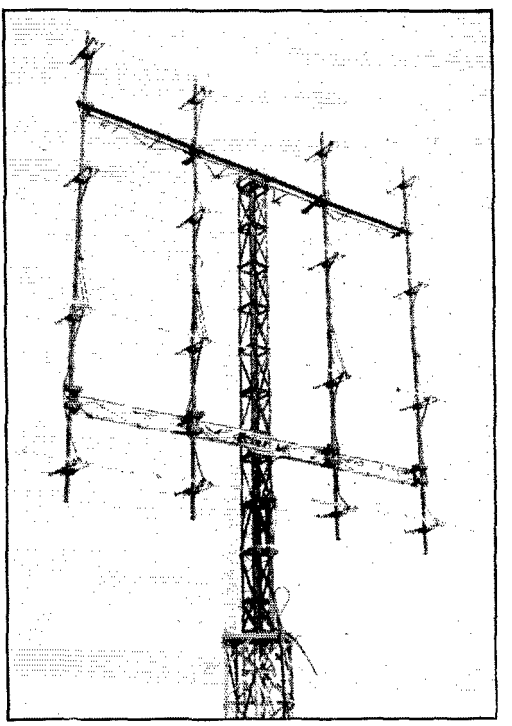
The dipole arrangement and feed system of the City Slicker provide an excellent basis for more complex arrays of higher gain and directivity, where these characteristics are desired. Reflectors may be added to the system in the conventional manner, and if they are made approximately 41 inches long, and 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 [1] for screen reflectors.

Two City Slickers mounted side by side, ⅝ 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 102*)

[1] "The Corner Reflector Antenna," Kraus, *Proc. I.R.E.*, Nov., 1940, Figs. 4 and 6.



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.

Happenings of the Month

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 reëlected, as the only nominee, as director of the Atlantic Division for the coming 1950–1951 term. Similarly as lone nominees, Robert A. Kimber, WØBLK, has been reëlected as alternate director, Dakota Division; George S. Acton, W5BMM, elected as alternate director, Delta Division; and Alvin G. Keyes, WØKTQ, re-elected 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, W3IU
Henry W. Wickenhiser, W3KWA

DAKOTA DIVISION
Director: Goodwin L. Dosland, WØTSN
Willard D. Nelson, WØYPN

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

GREAT LAKES DIVISION
Director: Harold C. Bird, W8DPE
John H. Brabb, W8SPF
Alternate: George H. Goldstone, W8MGQ
Harold E. Stricker, W8WZ

MIDWEST DIVISION
Director: Leonard Collett, WØDEA
Walter B. Jennings, WØYQA

PACIFIC DIVISION
Director: Harry Engwicht, W6HC
Kenneth E. Hughes, W6CIS
Alternate: C. Porter Evans, W6BF
Ronald G. Martin, W6ZF

SOUTHWESTERN DIVISION
Director: Richard H. Alford, W4BOC
Lamar Hill, W4BOL
Anthon Litschauer, W4JQ
William C. Shelton, W4ASR
Alternate: William P. Sides, W4AUP
A. H. Stakely, W4FKE

CANADA
Canadian General Manager: Thomas Hunter, jr., VE3CP
Alexander Reid, VE2BE
Alternate CGM: William M. Butchart, VE6LQ
Ronald J. Healer, VE1KS
Leonard W. Mitchell, VE3AZ

BATTEY RESIGNS

Everett L. Battey, W4IA, has resigned as director of the Roanoke Division effective September 1, 1949. Commander Battey 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. Battey, 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 ..... of ..... as a candidate for director from this division for the unexpired remainder of the 1949–1950 term.

(Signatures and addresses)

(Continued on page 108)

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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, W6VQV; Dr. Sweetland; Kenneth 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.

QST for

The Story of FP8AA

A Sojourn on St. Pierre

BY JOHN H. DU BOIS,* W3BXE

• What DX man hasn't wondered about that little group of islands off Nova Scotia where the prefix is FP8, and thought about operating from there? There must be hundreds, but up to this summer no one ever did anything about it. Then, in the latter part of August, part of the 7-Mc. band erupted with the concentrated kilowatts calling "FQ8AB" and, later on, "FP8AA." Here is the story of the first legitimate FP8 station, and how one W3 managed to do what many Ws have dreamed about.

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.

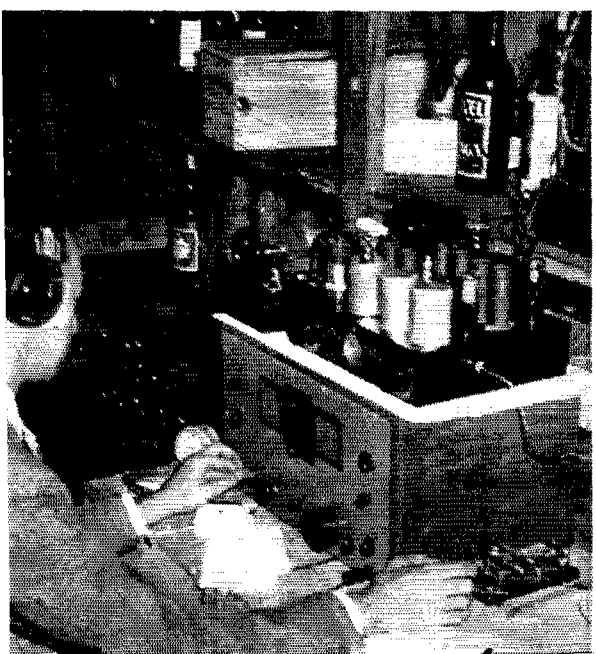
same station. By the time this is in print all contacts will have been confirmed, with both calls appearing on the card.

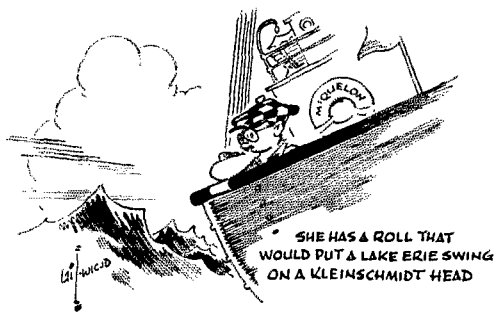
While the red tape requirements were being satisfied, the gear was put in shape. We included 100 per cent spares on tubes, some extra meters, tools, logbooks and everything else that could be anticipated. Since I was planning to pass through a foreign country (Canada) to get to FP8, all of the radio 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 3500.) 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-kc. 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 FP8AA 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

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". . . the operating table consisted of eight cases of French champagne, with three more for the operator's chair!"

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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 FP8AA were so weak, "LM" 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 800 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 anyone 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 (136 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.

A.R.R.L. SOUTHWESTERN DIVISION CONVENTION

San Diego, Calif., Nov. 12th

Balboa Park, in San Diego, the home of two 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, 4327 Santa Cruz Avenue, San Diego 7, Calif.

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

Time	*Start* Nov. 19th & 26th	*End* Nov. 21st & 28th
EST	6:00 P.M.	3:01 A.M.
CST	5:00 P.M.	2:01 A.M.
MST	4:00 P.M.	1:01 A.M.
PST	3:00 P.M.	12:01 A.M.

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 807s and 6L6s 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 places 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.

EXPLANATION OF "SS" CONTEST EXCHANGES

Send Like a Standard Msg. Preamble, the	*NR*	*Call*	*CK*	*Place*	*Time*	*Date*
Exchanges	Contest info. numbers, 1, 2, 3, etc., for each station worked	Send your own call	CK (RST report of station wkd.)	Your ARRL section	Send time of transmitting this NR	Send date of QSO
Sample	NR 1	W1AW	589	CONN	6R12 PM	NOV 19

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. Segregate 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

Freq. Band (Mc.)	*Time On or Off Air*	*Sent (1 point)*				*Time*	*Date (Nov.)*	*Received (1 point)*				*Time*	*Date (Nov.)*	*Number of Each Different New Section as Worked*	*Points*
		NR	*Stn.*	*CK-RST*	*Section*			*NR*	*Stn.*	*CK-RST*	*Section*				
3.5	On 6:10 P.M.	1	W1AW	589	Conn.	6:12 P.M.	19	7	W8JIN	589	Ohio	6:14 P.M.	19	1	2
"	"	2	"	589	"	6:15 "	"	6	W1BFT	599	N. H.	6:17 "	"	2	2
"	"	3	"	579	"	6:20 "	"	6	W1BJP	579	Vt.	6:21 "	"	3	2
7	"							24	W5KIP	479	Ark.	8:05 "	"	4	1
"	"	4	"	479	"	9:15 "	"	38	W5HJF	579	N. Mex.	7:15 "	"	5	2
"	"	5	"	579	"	9:28 "	"	45	W7KEV	479	Nev.	6:20 "	"	6	2
"	"	6	"	589	"	9:33 "	"	59	W8RSP	589	Ohio	9:34 "	"	. .	2
"	Off 9:35 P.M. Time: 3 hrs. 25 min.														
	On 6:45 P.M.														
14	"	7	"	569	"	7:15 P.M.	20	94	KL7AD	569	Alaska	2:18 P.M.	20	7	2
"	"	8	"	569	"	7:25 "	"	127	W7ZN	569	Idaho	5:28 "	"	8	2
"	"	9	"	469	"	7:35 "	"	114	W7HRM	569	Utah-Wyo.	5:30 "	"	9	2
3.5	"	10	"	579	"	9:10 "	"	130	WØLHS	579	N. D.	8:05 "	"	10	2
"	"	11	"	589	"	9:12 "	"		W5KIP		Ark.				1
"	Off 9:15 P.M. Time: 2 hrs. 30 min.														

Total Operating Time: 5 hrs. 55 min. 3.5, 7 and 14 Mc. used. 10 Sec., 22 Pts. 85 Watts Input Power

Assisting person(s): name(s) or call(s), etc.:.....

Claimed score: 22 points × 10 sections = 220 × 1.25 (85 watts input) = 275

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

Signature.. .....

Address.....

Tube Line-Up.....

Number Different Stations Worked.....

A 75- and 20-Meter Single-Sideband Exciter

BY BYRON GOODMAN,* W1DX

• 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 [1] 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 [2, 3, 4] 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.[4] 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. by-passes. 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,

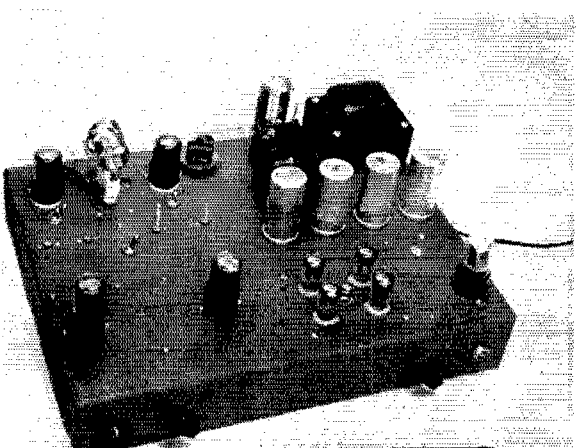
* Assistant Technical Editor, *QST*.

[1] Canoga Corp., Van Nuys, Calif.; Millen Manufacturing Co., Malden, Mass.

[2] Norgaard, "New Approach to Single Sideband," *QST*, June, 1948.

[3] Dawley, "S.S.S.C. Transmitter Adapter," *QST*, July, 1948.

[4] Rust, "Single Sideband for the Average Ham," *QST*, Aug., 1949.



This two-band single-sideband exciter uses a manufactured audio phase-shift network (four miniature tubes at right front) to obtain the 90-degree audio phase shift. The controls along the front, from left to right, are sideband selector switch, output tuning, and audio gain control. The knob at the center rear controls the r.f. input tuning, and the three toggle switches change the r.f. phasing networks when changing bands.

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 W6DHG[3] 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.

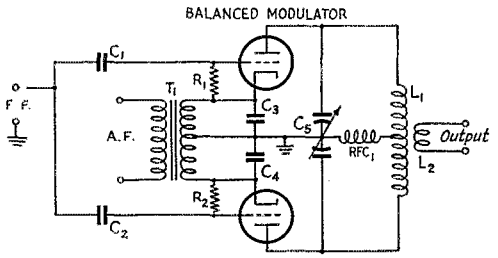


Fig. 1 — The plate-modulated triode balanced-modulator circuit. The r.f. excitation is fed to the grids in parallel and the output is taken in push-pull. The audio modulation is applied in push-pull in the negative plate lead.

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 Circuit

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 Millen 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 90 ± 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_8 and tuned by C_{27}. 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.

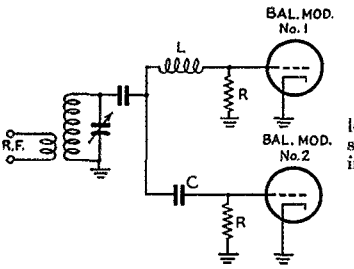


Fig. 2 — The low-Q r.f. phase-shift circuit used in the exciter.

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_{18},

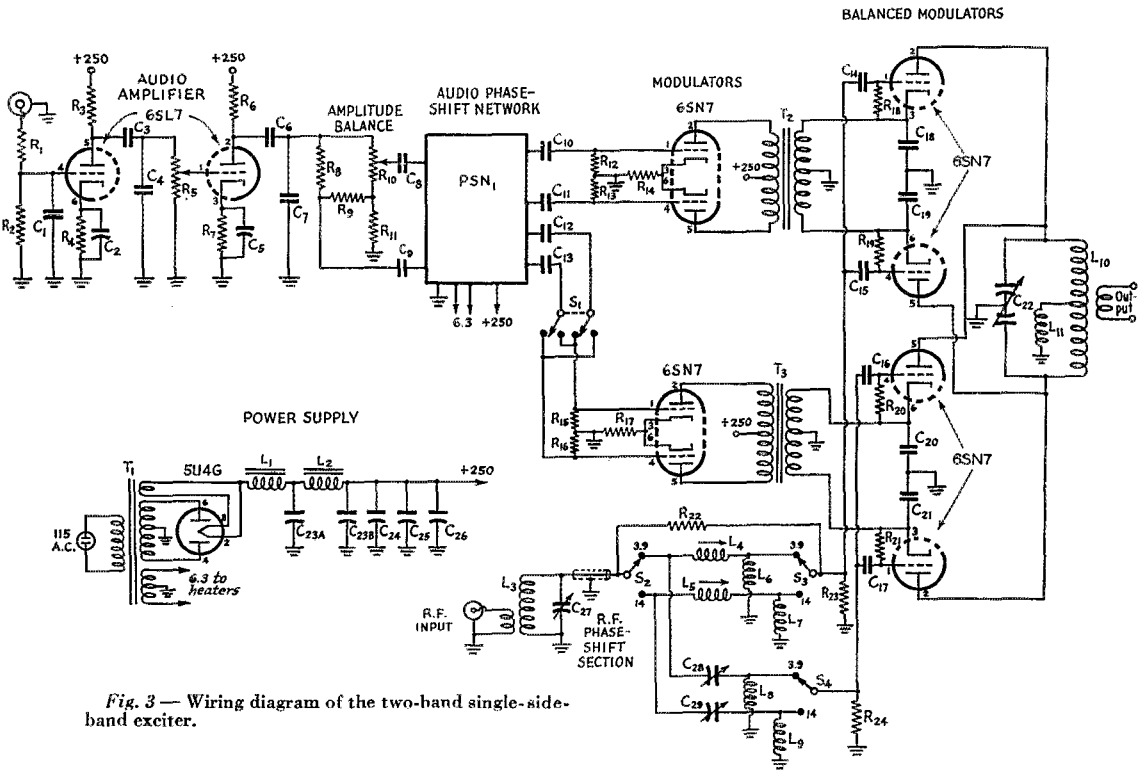


Fig. 3 — Wiring diagram of the two-band single-sideband exciter.

C_1, C_3, C_6, C_{18}, C_{19}, C_{20}, C_{21} — 680-$\mu\mu$fd. mica.
C_2, C_5 — 10-μfd. 25-volt electrolytic.
C_4, C_7 — 2200-$\mu\mu$fd. mica.
C_8, C_9, C_{10}, C_{11}, C_{12}, C_{13} — 0.1-μfd. 400-volt paper.
C_{14}, C_{15}, C_{16}, C_{17} — 100-$\mu\mu$fd. mica.
C_{22} — 100-$\mu\mu$fd.-per-section dual (Millen 24100).
C_{23} — Dual 40-μfd. 450-volt electrolytic.
C_{24}, C_{25}, C_{26} — 80-μfd. (dual 40) 450-volt electrolytic.
C_{27} — 50-$\mu\mu$fd. midget variable (Millen 20050).
C_{28} — 75-$\mu\mu$fd. midget trimmer (Millen 26075).
C_{29} — 50-$\mu\mu$fd. midget trimmer (Millen 26050).
R_1, R_8, R_9 — 47,000 ohms.
R_2, R_{12}, R_{13}, R_{15}, R_{16} — 1.0 megohm.
R_3, R_6 — 0.22 megohm.
R_4, R_7 — 3300 ohms.
R_5 — 0.5-megohm volume control.
R_{10} — 0.1-megohm volume control.
R_{11} — 0.39 megohm.
R_{14}, R_{17} — 680 ohms.
R_{18}, R_{19}, R_{20}, R_{21} — 12,000 ohms.
R_{22} — 1000 ohms, 1 watt.
R_{23}, R_{24} — 660 ohms, 2 watts (two 330 ohms, 1 watt, in series).
All resistors ½-watt unless specified otherwise.
L_1, L_2 — 8 henrys, 120 ma.
L_3 — 3.9 Mc.: 43 t. No. 26 enam., link 12 t. No. 26 enam. spaced ¼-inch from other coil.
— 14 Mc.: 9 t. No. 26 d.s.c. spaced to occupy ⅜ inch, link 7 t. No. 26 d.s.c. spaced ⅛ inch from other coil. L_3 is wound on 1-inch diameter 4-prong plug-in form (Millen 45004).
L_4 — 44 t. No. 26 d.s.c. close-wound on 1-inch diameter form, slug-tuned. (See text.)
L_5 — 21 t. No. 26 d.s.c. close-wound on 1-inch diameter form, slug-tuned. (See text.)
L_6, L_8, L_{11} — 50-μh. r.f. choke (National R-33.)
L_7, L_9 — 37 t. No. 30 enam. close-wound on ¼-inch diameter 1-megohm resistor.
L_{10} — 3.9 Mc.: 46 t. No. 24, spaced wire diameter. Air-wound 1⅝-inch diameter. Shunted with 33-$\mu\mu$fd. mica (National AR16-80S).
— 14 Mc.: 12 t. No. 18, spaced to occupy 1⅛ inches. Air-wound 1¼-inch diameter (National AR16-20S).
PSN_1 — 90-degree audio phase-shift network (Millen 75011).
S_1 — D.p.d.t. rotary wafer switch, shorting type (Mallory 1215L).
S_2, S_3, S_4 — S.p.d.t. toggle.
T_1 — 350-0-350 at 120 ma., 6.3- and 5-volt filament.
T_2, T_3 — 1:1 audio transformer, push-pull (Stancor A-4711).

C_{19}, C_{20}, C_{21}, L_6, L_7, L_8, L_9, R_{23} and R_{24} are all made to soldering lugs held down by the screws that mount C_{22}. One of the filter chokes in the power supply is mounted above the chassis and one below, but that was only because we used a pair that were kicking around and that was the best way to handle them. The input coil, L_3, plugs in at the back of the chassis instead of from the top, because this seemed like the best way to keep it away from the output coil and still make it accessible. Its associated condenser, C_{27}, tunes from the top of the chassis, but it has only to be set once when tuning up, in the middle of the band. Panel control of C_{22} is more important,

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, tightening 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_6, L_7, L_8 and L_9 shouldn't be too critical, because they are shunted by R_{23} and R_{24} and consequently the circuits are low-Q ones. Anyone who has a grid-dip meter can check the resonant frequencies by lifting R_{23} and R_{24} 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_8 are standard r.f. chokes, and L_7 and L_9 are wound on resistors for want of a better coil form. Any ¼-inch diameter resistor above 50,000 ohms should be satisfactory.

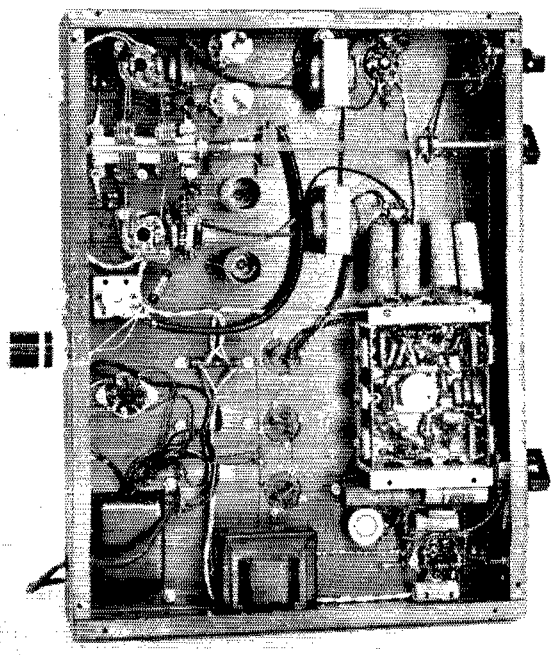
Adjustment

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_3C_{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 at a separation of about ⅛ 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_{28} 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 102)

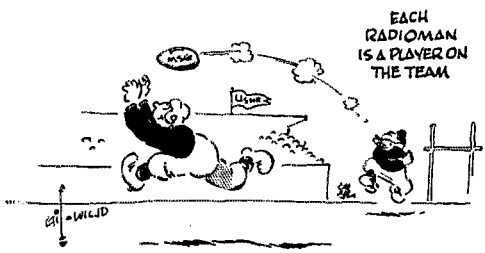


The audio phase-shift network is furnished already mounted on an aluminum chassis. It mounts on the large chassis with four screws and clearance holes for the tube sockets and potentiometer shaft. The r.f. phase-shift components can be seen between the balanced-modulator tube sockets and the audio transformers.

United States Naval Reserve

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?

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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.

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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 (KØNRF). There are over 100 competing units.

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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 (W6VGJ), RMN3.

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

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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.

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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 coördination of plans for emergency communications circuits.

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Cmdr. Bannie L. Stewart, USNR, well known in ham circles as W4CE, 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.

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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.

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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-

(Continued on page 106)

How's DX?

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 the half-and-half variety, i.e., one end strictly 'phone and the other strictly c.w. To say that such cards are not cricket for the 'phone DXCC would be superfluous in the extreme.

But, granted that the two-way principle is being solidly adhered to, there is still the question in many minds concerning the excessive use of c.w. in the production of voice QSOs. The fellows who use absolutely no code in securing their voice contacts present an impressive gripe when they point out that others of the fraternity may merely turn on the modulation momentarily during c.w. QSOs while the other station does the same, QSYing if necessary. Whether or not they are able to exchange much intelligence, if they can get a few words back and forth they can claim two-way 'phone communication.

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 voice and c.w. when working c.w. Offhand, 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 . . .

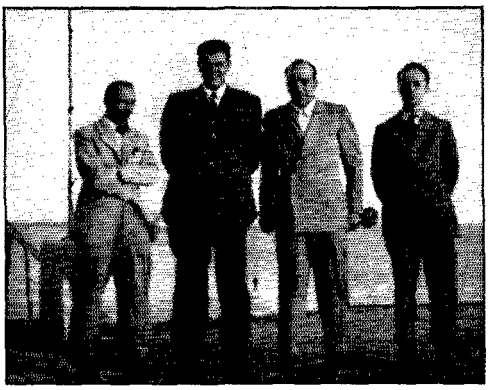
What:

W3BXE caused quite a to-do on the lower frequencies by trotting up to St. Pierre and putting FQ8AB/FP8AA on *forty* for a few evenings — details on page 35 of this issue . . . . Another new Caymans representative, **VP5BE**, showed up on 7295 kc. for W9RBI. The high end seems to be getting quite popular with DX in this hemisphere as W2AOR contacted VP5BD, KV4AA, KZ5WZ, YV5AL and PY7WS just below the high edge . . . . KL7RZ estimates four watts output from a VFO and works VKs, ZLs, **UAØFB** (7010), **JA3AA** (7030) and **KP6AE** (7030). A Windom antenna must be the secret . . . . W2CJX has been working HZ1KE on the low end and relays word to the effect that Ken has ambitions concerning 3.5 Mc. You may have worked him as MD5KW . . . . JA2BQ found UAØFP, LU5IA, HC7KD and KA7RZ using the 7-Mc. range and the latter was barreling through with four watts to a 6AQ5.

There rarely fails to be something unique in the flabbergasting department on *twenty*. The 'phone gang have been making much hay with **CR5UP** (14,150) on Sao Thome and Ws 2AGO, 3DKT and 9RBI were among the first to be in on the kill . . . . Continuing with voice notes, G6RH tagged **MP4BAD** (14,200) and **HS1SS** (14,350) while W3LTU clipped the aforementioned CR5 and **EA8CO** (14,315) . . . . **SP1KAB** provided a rare one for W2AGO on 14,320 kc. . . . . To prove that a returning old-timer can still show the upstarts a thing or two, W5JUF reached 105 on 'phone within five short months abetted by such as **AP2N** (14,175), **PK5RU** (14,290), **CR5AI** (Gad, another one! — 14,190), ZM6AF, LX1DC, VQ2JD, AR8BC, YK1AC and **MI3SI** (14,340) . . . . W2WZ's n.f.m. broke through to HS1SS, MF2AC, PK4DA and some JAs which is a good way to give BCI the ice treatment . . . . XE1AC enjoyed chats with CR5UP, **CR6AI** (14,137), **CR7AH** (14,192), **VP8AK** (14,235), **MP4BAC** (14,337), **LZ1ID** (14,134), **VK1VU** (14,199), **ZK2AA** (14,348), M1B (14,317), **ZS9F** (14,334), **FM8AA** (14,385), **VQ8AF** (14,195), **ZC1AL** (14,183), **VK1ADS** (14,380) and YJ1AA (14,392), all of eye-popping quality . . . . HC2JR now has cards on the way from **VK9GW** (14,350), **VR2BJ** (14,395), **VS6AZ** (14,300), **KB6AJ** (14,210), **F9QU/FM8** (14,347), **TA3BS** (14,378), **PK6NQ** (14,362), **EA9AI** (14,308), **HL1BJ** (14,312), **YK1AC** (14,317) and a nifty, **W5FYV/VR4** (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), **SVØAK** (14,010), **TA3FAS** (14,040), **ZD2RGY** (14,025 t8), ZD9AA, **ZE1JH** (14,060), **ZP8BL** (14,025), **EA6EG** (14,150 t8), **HL1BJ**

* DX Editor, *QST*. Please mail reports of DX activity to W9BRD's home QTH: 1517 Fargo Ave., Chicago 26, Ill.



These four gentlemen are largely responsible for keeping Sardinia represented on the ham bands: IS1s AHK, AFM, AYN and FIC.

(14,005 t8), **HZ1LD** (14,005 t9), HZ1KE, MD2GO, **MD7MR** (14,095 t7), VQ8AD (VFO t7), **PK2ZZ** (14,105), **YK1AB** (14,020) and one **VR5Z** (14,065) who gives Box 47, Nukualofa, Tonga, as his QTH . . . . We're glad to hear W6RBQ 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. Be wary of giving him a QRQ or you may get socked in the diaphragms with some 90 w.p.m.! DX must go for supersymmetrical sending — a half dozen new countries in a jiffy . . . . W4MR had to count to twenty when he found that EA8AO's QTH was Madrid. But Al made it up double by SP1IB, SP5AC, LX1QF, XZ2FK, VK9NR, ZK2AA and VR4AA QSOs . . . . **FI8AK** (14,100) is an interesting one at W8MFB along with **MD4GC** (14,115), **VR2BJ** (14,070), **MI3GH** (14,025), **YK1AB** (14,075), **VS1DC** (14,090), **VK1VU** (14,042) and some VQ4s . . . . W1ME caught up with AC4YN after eleven years of dial inspection on his behalf and W1IAP captured choice **VQ8AF** (14,073) . . . . W9MDG is about to chuck the indoor dipole for a new QTH and W9ALI broke in his brand-new shack on things like ZC6BU, LI2B and OQ5RA . . . . W2ZJ has been under the weather of late and would probably welcome word from some of his old cronies in the DX ranks. W2TXB paid Ed a vacation visit and then returned to Rochester for a helping of A3 juice: **AR8AB** (14,395), **YN6AP** (14,195), **ZP5BL** (14,180), **VP7NG** (14,175), **SVØWI** (14,320) and **EL6A** (14,380) . . . . With the pineapple business cutting into his DXing time (No, Jeeves, not the Chicago brand), KH6PM was limited to **W2WMV/C3** (14,055), **EL3A** (14,070), **HC1KP** (14,010), **KM6AK** (14,100), **KR6AZ** (14,130 t9c), **VQ2DH** (14,050), **VS6BI** (14,050), **VU2RX** (14,015), **YS1VJ** (14,000) and **ZD4AM** (14,125) . . . . **C8RR** (14,035), **CR4AD** (14,025 t6), ZD6DH and **VP8s AK** and **AP** (both 14,100, t9 and t7 respectively) were checked in at G6RH and VE3ADV mentions QSOs featuring C1JH, UAØKFD, UA9CC, CP2BA, KP6AE and GD3UB . . . . At long last a dependable in French Guiana! W2AGO is handling the QSL task for **FY8UD** (14,040-068 c.c.) and all cards for the chap should go to Jim at P. O. Box 13, Bloomfield, N. J. . . . . W2WZ ceased the deviation for c.w. specimens **CR9AG** (14,114), **DU7WP** (14,094), **FO8AC** (14,099), **KX6BA** (14,114), **VQ8AY** (14,090), **VS1DA** (14,110), **VS2CE** (14,078), **VS7BJ** (14,069) and **EK4AO** (14,005) while W7WEN surrounded **KP6AH** (14,120), DU1WP, DU9JO, **FK8AC** (14,005) and **KB6AJ** (14,061) with his 30-watter . . . . Still claiming to be a long way from DXCC, W6JWL snaffled **VS7AD** (14,038), **VS9AL** (14,068), **TA3GVU** (14,095), **ZP6AB** (14,014), **MD7GR** (14,092), **MI3FG** (14,095), **YO3RF** (14,044), **PK3ST** (14,010), **PK3JF** (14,030), **ZM6AL** (14,020), **UG6AB** (14,042), **ZE2KF** (14,084) and **UAØKSB** (14,033). Guess he can't raise Cuba, either . . . . W5HIP's rhombic on London is broad enough to raise **4X4CED** (14,000 t6), **MD4AM** (14,050), **TA3AA** (14,000 t8) and **IS1AFM** (14,020) while W8OCA grabbed KM6AO, VK1FE, VU2LK, VS7CC, DU6IV, CR7AF, VR2AS, KX6BI, I1BCB/Trieste, EA8BC, W6CRE/KC6 and W6ATB/KC6, the latter two in the Palaus.

Ten is back in the groove, let us tell you, in case the finance company has your receiver. According to W4QT, W4MKB's new 70-foot-high stacked 8-element do-jigger was good for five fast new ones in MI3AB, ZS9J, FO8AB, ZD2S and FF8FT . . . . W1RPC's 826s glowed for PK4DA, PK5HL and AR8AB while W5HBM busied himself with PJ5KO, OQ5BQ and ZS5GM/7 in Swaziland . . . . There's a stack of stuff at W2ZVS including ZS3O, EL6A, VQ2DH, VQ4RF, ZB1AJX, ZB1H, ZB1FK, FQ8SN, MT2FU, ET3AF, ZE2JK, IS1AEX, GC2RS, CR7AD and VQ5PBD . . . . HC2JR stayed around for **ZS8A** (28,215), **VP1SJC** (28,311) and **ZE2JQ** (28,270) while W3LTU adds **ZS9F** and **ZS9J**, both on 28,090 kc. . . . . Obviously, the preceding has been of the modulated variety but the c.w. hounds should be striking pay dirt before this appears in print.

Where:

We hear from W2ODZ and others that cards bound for YO-prefixed stations should go via Box 95, Bucharest . . . . The YK gang in Syria appear to be doing all business through Box 35, Damascus, and QSLs for 4X4s should

Third All-European DX Competition

1) European amateurs call "CQ AW." All amateurs outside Europe call "CQ EU." Object is for 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 GCT, Nov. 26th, to 2400 GCT, Nov. 27th. 'Phone contest period is from 0001 GCT, Dec. 3rd, to 2400 GCT, Dec. 4th.

3) Log form, contest serial numbers, and disqualifications 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 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 work maximum of three different stations in any country (W/VE licensing area) per band. No restrictions for countries outside Europe, and no restrictions on 'phone.

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 69, Praha I, Czechoslovakia.

Meet Capt. Ed C. Tietz, USAF, who operates DL4TL at Furstenfeldbruch, 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.

AC3SQ	S. Sajah, P. O. Gangtok, Sikkim State via Silliguri, N. W. Bengal, India
CM7NR	P. O. Box 148, Camaguey, Cuba
CR5UP	Leonel Pias, Sao Thome, Portuguese West Africa
CR7BZ	A. Da Silva, P. O. Box 276, Lourenco Marques, Mozambique
EA8DD	Box 346, Las Palmas, Canary Islands
EK1TY	% RCA, Box 57, Tangier Zone
FA9RZ	J. Bury, 16 rue du Fondouck, Oran, Algeria
FN8AC	D. S. Seal, Hatkhola, Dayerdhar, Chandernagore, India
FN8AD	(same as above)
FN8MS	P. K. Seal, Dayerdhar, Chandernagore, India
FQ8SN	(QSL via OQ5LL)
HE1EU	(QSL to HB9EU)
HE1IL	(QSL to HB9IL)
HP1DP	P. O. Box 1672, Balboa, Canal Zone
KH6NRA	U. S. Naval Reserve Facility, Hilo, T. H.
KM6AO	Navy 1504, % FPO, San Francisco, Calif.
LZ1ID	% Radio Sofia, Sofia, Bulgaria
M1B	M. Graziani, Piazza dello Stradone, Republic of San Marino, via Italy
MD7MR	(QSL via RSGB)
MF2AC	D. Watkins, British Army Broadcasting Stn., via Bellosquardo 8, Trieste, F.T.T.
MI3AB	A. Fontanelli, Via-Molise, 31, Asmara, Eritrea
MI3DF	P. O. Box 622, Asmara, Eritrea
MP4BAC	(QSL via RSGB)
OQ5AO	(QSL via OQ5RA)
PI1LS	(QSL via VERON)
PJ5FN	(QSL via W5FNA)
PJ5TR	(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	Mrs. Carmelita Gossard, Vernamfield, Sandy Gully, Jamaica, B.W.I.
VP5BC	D. Crooks, Up Park Camp, Jamaica, B.W.I.
VP5BE	H. M. Coe, Grand Cayman, Jamaica, B.W.I.
VP5PZ	(QSL via VP5AD)
VP5RC	Jamaica Amateur Radio Club, "Cardiff," Retreat Post Office, Jamaica, B.W.I.
VP9RR	1934 AACS Sqdn., APO 856, % PM, New York, N. Y.
VS1DC	Major Les Hill, Base Workshops, REME, Singapore, Malaya
VS6BI	Box 541, Hong Kong, Asia
VU2RX	(QSL via ARCI)
W6ATB/KC6	(QSL via W6TI)
YN4CB	Calegio San Jose, Bluefield, Nicaragua
YV5DJ	Box 893, Caracas, Venezuela
ZB1AJX	G. Stanton, 18 Bugeja Bldgs. Prince of Wales Rd., Sliema, Malta
ex-ZC6DD	(QSL to VE3AGC)
ZD2LMF	L. Metcalf, Nigeria Signal Sqdn., Lagos Nigeria
ZD2P	Posts and Telegraphs, Port Harcourt, Nigeria
ZS9F	Box 4, Victoria Falls, Southern Rhodesia

• Did you participate in the VK/ZL DX Contest? If so, send your logs to the WIA, Box 2611W, G.P.O., Melbourne, Australia, to reach that address by January 16, 1950. See page 51 of October *QST* for further instructions.

For the preceding accumulation our most elaborate salaams go to W1s IAP, JCX, JGY, RWS, TX; W2s CJX, ODZ, TXB; W3s ARK, DKT; W4s CEN, MR; W5HBM; W6NTR; W8s MFB OCA, TLL; W9s CFT, DGA, RBI, TQL; KH6PM; VP5RS; XE1AC; The Northern California DX Club.

Tidbits:

Word via W2VTR from HL1BJ in the land of strange headgear: HL1s 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 . . . . . OQ5DW 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-240D . . . . . 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 6L6-6L6 exhaler on 14,085 kc. during a good part of his 7-day stay at Chileka Airfield near Blantyre. A folded dipole and a modified BC-348 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 KS4AC plus W5QCQ/KS4 will be left responsible for island ham affairs. W5MHO 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 tallied 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 heretofore 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 ZD9AA 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,* WØARL

[*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.[2,3]

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

Even though the intended function of C_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

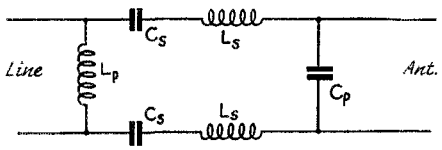


Fig. 6 — Two-band network suitable when the line impedance is between the two values of driving-point impedance, the larger of which is at the higher operating frequency.

ratio to be between Z_0 and the resistance component of the equivalent series circuit of C_P in parallel with Z_1, instead of being between Z_0 and Z_1. 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 L_P in parallel with Z_0 equals the resistance component of the equivalent series circuit of C_P in parallel with Z_1; and

2) At f_2, the reactance of C_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

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

and on f_2 we have

$$\frac{Z_0}{1+\left(\frac{Z_0}{KX_{LP}}\right)^2} = \frac{Z_2}{1+\left(\frac{Z_2}{\frac{X_{CP}}{K}}\right)^2}.$$

Simultaneous solution of these two expressions gives the reactance of L_P and C_P at the f_1 frequency as

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

and

$$X_{CP} = K\sqrt{Z_1Z_2\frac{K^2Z_2-\frac{Z_1}{K^2}}{K^2Z_1\left(\frac{Z_2}{Z_0}-1\right)+Z_2\left(1-\frac{Z_1}{Z_0}\right)}} \text{ ohms}, \quad (19)$$

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 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

* Box 6023, Kansas City 4, Mo.

2) At f_2, the total net reactance, X_{B2}, 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

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

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_S and each C_S at the f_1 frequency is

$$X_{LS} = \frac{KX_{B2} - X_{B1}}{2(K^2 - 1)} \text{ ohms} \qquad (20)$$

and

$$X_{CS} = \frac{K(X_{B2} - KX_{B1})}{2(K^2 - 1)} \text{ ohms} \qquad (21)$$

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_1 to somewhat greater than Z_2, the limits depending upon the relationship between Z_1 and Z_2. The lowest possible value of

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

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

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

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_{P1}, is inductive and of such magnitude that the resistance component of the equivalent series circuit of X_{P1} 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_{P1} 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

$$X_{P1} = Z_0\sqrt{\frac{Z_1}{Z_0 - Z_1}} \text{ ohms;}$$

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_S — Series inductor.
X_{LS} — Reactance of L_S at f_1.
C_S — Series capacitor.
X_{CS} — Reactance of C_S at f_1.
X_{P1} — 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 C_P at the f_1 frequency is

$$X_{LP} = \frac{X_{P1}(K^2 - 1)}{K\left(K - \frac{X_{P1}}{X_{P2}}\right)} \text{ ohms} \qquad (22)$$

and

$$X_{CP} = \frac{X_{P2}(K^2 - 1)}{\frac{X_{P2}}{X_{P1}} - K} \text{ ohms}, \qquad (23)$$

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

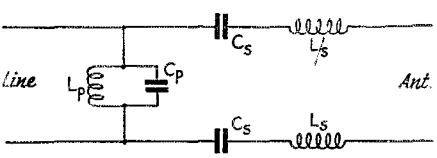


Fig. 7 — Two-band network suitable when the line impedance is greater than the driving-point impedances.

component of the equivalent series circuit of X_{P1} in parallel with Z_0; and

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

$$X_{LS} = \frac{KX_{B2} - X_{B1}}{2(K^2 - 1)} \text{ ohms} \qquad (24)$$

and

$$X_{CS} = \frac{K(X_{B2} - KX_{B1})}{2(K^2 - 1)} \text{ ohms}, \qquad (25)$$

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

$$\sqrt{(2W)\text{ (d.p.i.)}}.$$

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 occurs at f_1, and equals

$$\frac{X_{CS}\sqrt{2WZ_0}}{Z_0 \cos\phi},$$

where $\tan\phi = \frac{Z_0}{X_{LP}}$.

Network of Fig. 7:

The voltage across C_P is the same at f_1 as at f_2 and equals

$$\sqrt{2WZ_0}.$$

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

$$X_{CS}\sqrt{\frac{2W}{K^2Z_2}}.$$

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, $K > \frac{Z_1}{Z_2}$. 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 first, 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

$$\frac{Z_0}{s.w.r.} \text{ ohms}$$

when the d.p.i. $< Z_0$, and equals

$$(Z_0)\ (s.w.r.) \text{ ohms}$$

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 $Z_0 >$ d.p.i., and to be too great when $Z_0 <$ 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.[5] 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 ½ λ shortening, to compensate for end effects at f_1, becomes 10% of ½ λ 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)

Military Amateur Radio System

What MARS Offers the Amateur

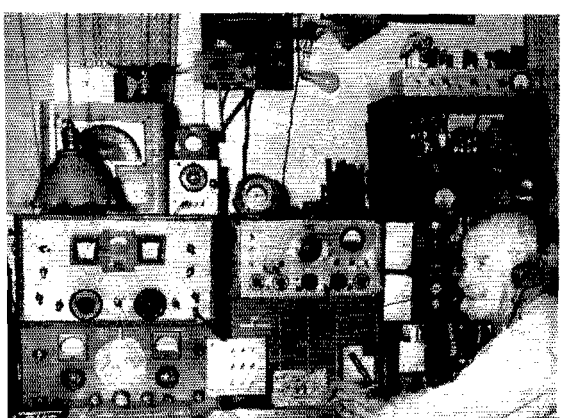
THIS space, made available regularly to the Military Amateur Radio System through the coöperation of the ARRL, is usually devoted to activities within the MARS. Readers of *QST* who have followed these reports have literally swamped MARS Headquarters in Washington with requests for more information about 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 coördinate 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 practised 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 coördinate 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 teletypewriter 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.

On the Air with SINGLE SIDEBAND

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**, Heidelburg, 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 2VV 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.

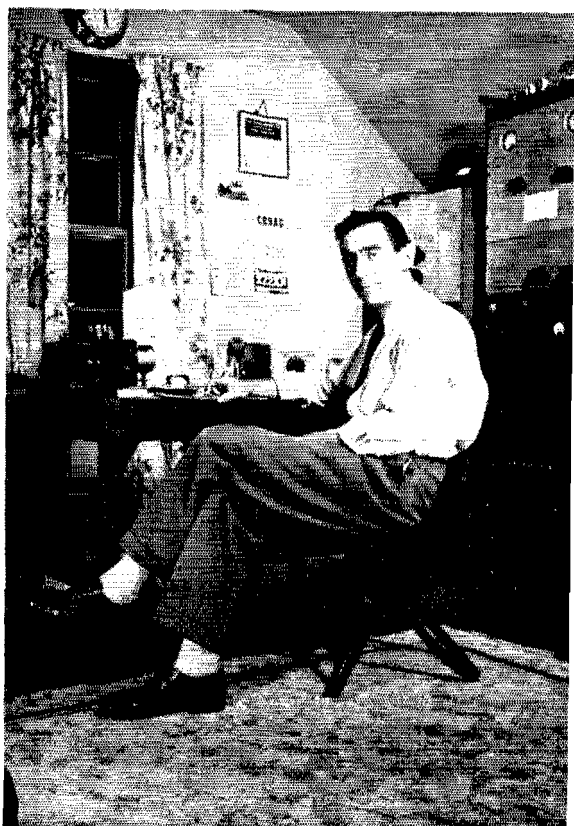
Sidney Rexford, **W2TBZ/2**, at Forth Monmouth, N. J., has a version of the **W6DHG** rig using 6V6s instead of 6L6s. So far he has only been running 6 or 7 watts peak on 75 with this outfit directly into the antenna, but he gets out fine around the Atlantic seaboard. The whole rig plus power supplies 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 TZ20s running about 120 watts peak. Frank schedules **W3MBY** week-end afternoons on 14,220 kc., where they are often joined by **WØMNN** 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 QRM. . . . 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.*



♦

It isn't easy to score a "first" these days, but John Erhart, W2TGO, managed the trick when he worked DL4PA for the first amateur two-way single-sideband trans-Atlantic contact. The rig is a crystal-filter job starting at 80 kc. and ending up with a pair of HK-257Bs in Class AB_1 running about 400 watts peak. The antenna is a 14-Mc. W8JK.

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 Bieberman, W3KT, Box 34, Philadelphia, Pa.
W4, K4 — Johnny Dortch, W4DDF, 1611 East Cahal Ave., Nashville, Tenn.
W5, K5 — L. W. May, jr., W5AJG, 9428 Hobart St., Dallas 18, Texas
W6, K6 — Horace R. Greer, W6TI, 414 Fairmount St., Oakland, Calif.
W7, K7 — Bob Donovan, W7EYS, 1530 Fairview St., Bellingham, Wash.
W8, K8 — William B. Davis, W8JNF, 4228 W. 217th St., Cleveland 16, Ohio
W9, K9 — John F. Schneider, W9CFT, 311 W. Ross Ave., Wausau, Wis.
WØ, KØ — Alva A. Smith, WØDMA, 238 East Main St., Caledonia, Minn.
VE1 — L. J. Fader, VE1FQ, 125 Henry St., Halifax, N. S.
VE2 — Austin A. W. Smith, VE2UW, 6164 Jeanne Mance, Montreal 8, Que.
VE3 — W. Bert Knowles, VE3QB, Lanark, 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
KH6 — Andy H. Fuchikami, KH6BA, 2543 Namauu Dr., Honolulu, T. H.
KL7 — J. W. McKinley KL7CK, Box 1533, Juneau, Alaska

FEED-BACK

In Table I of W1VW'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.

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. McVay, W7KCU*

Silent Keys

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

W2DLR, Ernest H. Newman, Seaford, L. I., N. Y.
W2LLU, Claude V. Tryon, Feura Bush, N. Y.
W3AWM, Charles J. Walter, Washington, D. C.
W3HBK, Robert E. Topham, Washington, D. C.
W3KM, Robert E. Linthicum, Washington, D. C.
W3LYT, William M. Adkins, Shickshinny, Penna.
W3RAS, William T. Daw, Pittsburgh, Penna.
W3TZ, Norman Bernstein, Philadelphia, Penna.
Ex-W5JPB, Paul L. Talley, Dallas, Texas
W5LIV, KL7UH, M/Sgt. 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.
WØHFF, Harry T. Hanley, Minneapolis, Minn.
VE1KE, Dr. Robert L. Ellis, Jacquet River, N. B.
VE7RN, ex-VE5RN, Clarence E. Carver, Victoria, B. C.

The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* W1HDQ

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 WØEMS, Adair, Iowa! At 8:42 contact was made with W9GZQ, Losantville, 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!

WØWGZ, Grinnell, Iowa, 770 miles, was worked at 10:10, and WØEMS was contacted at midnight, for a new record of 860 miles. WØEMS 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. WØEMS 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 WØs BJL, DEN and ZJB, and 10 states were logged. WØEMS 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, WØWGZ 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. HC2OT 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 HC2OT 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 W6OB to get them in on the opening. This was the first time that HC2OT has heard the band open to both Mexico

* V.H.F. Editor, *QST*.

RECORDS

Two-Way Work

50 Mc.: CE1AH — J9AAO
10,500 Miles — October 17, 1947

144 Mc.: W4JFV — WØEMS
860 Miles — September 16, 1949

220 Mc.: W1CTW — VE1QY
275 Miles — June 29, 1949

420 Mc.: W6VIX/6 — W6ZRN/6
262 Miles — July 4, 1949

1215 Mc.: W1OFG/1 — W1MZC/1
37 Miles — July 30, 1949

2300 Mc.: W6IFE/6 — W6ET/6
150 Miles — October 5, 1947

3300 Mc.: W6IFE/6 — W6ET/6
150 Miles — October 5, 1947

5250 Mc.: W2LGF/2 — W7FQF/2
31 Miles — December 2, 1945

10,000 Mc.: W4HPJ/3 — W6IFE/3
7.65 Miles — July 11, 1947

21,000 Mc.: W1NVL/2 — W9SAD/2
800 Feet — May 18, 1946

and this country at the same time. W6PUZ 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. 19th.

Here and There on 6 and 2

For some time 6-meter enthusiasts have hoped to work KL7 by keeping skeds with KL7UH-W5LIV. Now, from KL7WK, comes the sad news that M/Sgt. Robert G. Dunphy was killed in the performance of his duty on Sept. 2nd. No other details have been received. Bob put Iwo 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.

Lansing, 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. VE3AET writes that there is something doing on 50 Mc. in the Toronto area almost every evening, with VE3s ANY, AXT, ARV, BQK, DDT, ATB, BYZ, AJJ, APV and AET supplying most of the activity. Moral — when you hear signs of aurora effect on lower frequencies, or see that glow in the northern sky, plug in the key, aim the beam north, and make some calls.

Silver Spring, Md. — There is regular 50-Mc. activity in the Washington area. The stations in that region, including W4LVA, W3s AHQ, MPD, OTC and KMV, 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.

Santa Barbara, Calif. — According to K6BF (ex-XE1KE) Argentine beginners 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.

Collierville, Tenn. — In between regular schedules with W5NYH and W5JTI, W4FBJ/4, Glasgow, Ky., and W4FWH, Nashville, all 150 to 200 miles distant, W4HHK caught some good 2-meter openings during September. On the 2nd Paul worked W9FKI, Rantoul, Ill., and W9SUV, Arcola, both on c.w., 350 to 400 miles. W9EHX, McLean, Ill., was worked on the 10th. The big night was the 14th. Listening to the northeast Paul heard W8BFQ, apparently in a local rag chew, running a steady S5. This was too much for Paul, so he put in a landline call to W8UKS. This didn't work either, so W8WJC was 'phoned and informed of reception of W8BFQ down in the southwest corner of Tennessee. After several tries they made contact on 2 at 10:28. W8BFQ and W8UKS were worked soon after. These contacts are 625 and 650 miles respectively.

Nashville, Tenn. — Though he is less than 200 miles east of W4HHK, W4FWH finds that conditions vary considerably between the two locations. An example: When W4HHK worked W8UKS and W8WJC, as reported above, W4FWH heard the W8s, but it was not until the night of the 16th that he was able to work them, and W9UCH in Fort Wayne, Ind. This same evening he heard a W3K? calling a W2. Walt reports 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 explode this night-time-is-DX-time belief. Of course, most of us can't be on the air during weekdays, 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 lead for those who want to extend their coverage on 220 and 420 also.

Terra Alta, W. Va. — The 2-meter band was open at W8EP 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. "Smoke" had just put up a beam on a near-by hill, requiring 300 feet of open-wire line, and it worked out very nicely. During the evening 22 stations were worked, 19 of which had not been contacted previously. WØEMS and WØBJL were his best DX.

Madera, Calif. — Having had excellent results with rhombic antennas on lower frequencies, W6EPQ 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-

(*Continued on page 114*)

2-Meter Standings

	Call	States	Areas	Miles
W1PIV		13	5	550
W1HDQ		13	5	480
W1BCN		12	4	500
W1CTW		12	4	500
W1REZ		11	4	—
W1JSM		10	3	—
W1GJO		10	3	—
W1JMU		9	3	—
W1OOP		9	3	—
W1QXE		9	3	—
W1MBS		8	2	275
W1AW		5	2	—
W2BAV		14	5	430
W2NLY		13	5	515
W2NGA		13	5	—
W2DFV		13	5	350
W2CET		12	5	405
W2WLS		12	4	—
W2DPB		12	5	500
W2QNZ		11	5	—
W2NPJ		11	5	500
W2PJA		10	4	—
W2PIX		9	4	—
W2FHJ		7	3	—
W2RPO		5	4	—
W2UTH		5	4	—
W2UXP		4	4	—
W3RUE		15	7	760
W3GKP		13	6	610
W3KBA		13	6	—
W3KUX		12	5	575
W3OWW		12	5	425
W3PGV		11	5	—
W3BLF		10	6	—
W3GV		9	5	660
W3HB		9	5	—
W3KWH		8	5	—
W3KWU		8	3	—
W3VVS		7	4	430
W4IKZ		13	5	500
W4CLY		12	5	500
W4FJ		12	5	450
W4FBJ		11	5	—
W4MKJ		10	5	475
W4HHK		9	5	650
W4OLK		9	4	500
W4ODG		9	4	500
W4JHC		8	4	500
W4AJA		8	4	—
W4NRB		8	4	—
W4FQI		6	—	—
W4KKG		5	—	—
W4LNG		4	2	—
W5JTI		9	5	660
W5ML		2	1	425
W5AJG		2	1	400
W5FSC		2	1	250
W5JLY		1	1	1000*
W8UKS		18	7	720
W8WJC		18	7	700
W8BFQ		15	6	600
W8CYE		12	6	—
W8WSE		12	6	620
W8WRN		12	5	—
W8BAX		9	—	—
W8CPA		9	—	—
W8RDZ		7	4	340
W8DIV		6	4	—
W9JMS		12	5	600
W9PK		10	5	—
W9OBW		8	4	—
W9NKF		7	4	450
W9UIA		4	3	205
WØNFM		14	7	660
WØEMS		13	5	860
WØWGZ		10	4	760
WØIFB		9	6	—
WØHAQ		8	4	—
WØLZE		7	4	320
WØZJB		6	3	—
WØGOK		6	—	—
WØLZE		7	4	320
WØDEN		6	3	520
WØHXY		5	2	—
WØJHS		4	2	—
VE1QY		9	3	650
VE3AIB		8	5	520
VE3BPB		6	4	—

*Crossband.

Note to 2-meter operators: If your listing is incorrect or incomplete, please send in the correct information. Also, how about mileage listings from W6 and W7, and more information on leaders in W9?

Correspondence From Members-

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

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 contacts, 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 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 they are working in layers about six deep. Might just as well shut down and take a nap until they knock themselves out.

— *Allan R. Muncey, W2ORF*

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 week ends. 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, W2YGX*

NOT REALLY!

Larchmont, N. Y.

Editor, *QST:*

Quoting from an article entitled "Stop Thief" in the February issue of *Pageant* 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. Bretzfelder, W2JPX*

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 on countries-worked total is even better. Out of 196 worked postwar I have cards from 168, or 85%. My returns 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 enclose 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 it 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 times 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 terrific. 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 the new one, 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 Ussher, 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 formulae, 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 b.c. band, down to 20 kc.? Also, I realize that the use of permeability-tuned

(*Continued on page 120*)

Hints and Kinks For the Experimenter

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.

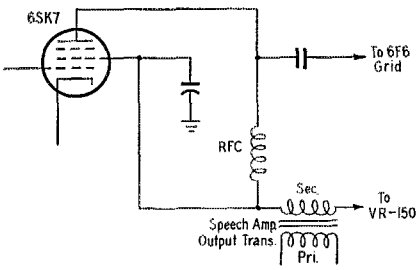


Fig. 1 — **Simple method of obtaining an n.f.m. signal for 75-meter 'phone-band operation. The plate and screen of a high-C VFO are amplitude-modulated as shown. The diagram is adapted from that of the VFO described in *QST* for September, 1946.**

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 c.w. signals can be observed. The connection to the 12SR7 does not interfere with normal functioning of the Q5-er. — *A. T. Purseglove, 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 7/8-inch form. Space the winding to occupy 5/8 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, W2ORG*

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 ½-inch dural was obtained. On it I scribed squares the size of my punch and drilled a 1/16-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 1/16-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, ¼-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

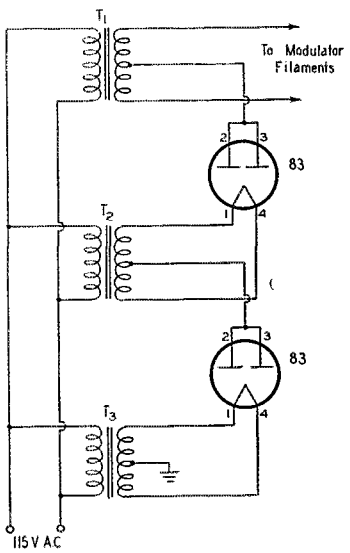


Fig. 2 — Simple bias system for use with medium-power Class B modulators. Additional mercury-vapor rectifiers may be added to obtain higher bias voltage, if desired. T_1 is the usual filament transformer in the Class B stage, while T_2 and T_3 should be selected for the particular rectifier tubes used in the system.

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, W2SKT*

(*Continued on page 122*)

Operating News

F. E. HANDY, W1BDI, Communications Mgr.
JOHN E. CANN, W1RWS, Asst. Comm. Mgr., C.W.
GEORGE HART, W1NJM, Natl. Emerg. Coördinator

J. A. MOSKEY, W1JMY, Deputy Comm. Mgr.
L. G. McCOY, WØICP/1, Asst. Comm. Mgr., 'Phone
LILLIAN M. SALTER, Administrative Aide

Staff Notes. Our heading pretty well tells its own story of several CD staff changes this month. The post of National Emergency Coördinator now is filled by George Hart, W1NJM, 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 coördinate all data for Net Directories, since such facilities constitute bona fide emergency routings as required. As NEC he replaces "Doc" Hayes, W1IIN, 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 ACM, 'Phone, and John Cann, W1RWS, is carrying forward the review and recommendations on operational c.w. matters. Since W1NJM 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., WØICP/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 coöperation 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 coöperation in this plan of operation obtain! (1) Listen on the calling frequency from the following list, in the band of your

choice. (2) If clear of emergency utilization, and if any current amateur calling-and-answering heard in progress has been completed, it's time to transmit and a directional CQ or a QSTed "traffic list" should promote results. (3) If you get a reply, tell the station you hook up with what traffic you have, and what frequency to go to in order to complete your QSO. (4) Be courteous and reasonable in all these operations. Do *not* tie up the frequency continuously; use it more as a "party line" and if your first calls stir nothing up shift from band to band to try another operating group, or at least wait several minutes, listening through the band, callbook in hand, to locate stations that may be able to handle your communications. After a reasonable intermission, it is of course proper to put forth your call again.

The use of the principle of *calling frequencies*, with QSY to other working frequencies, is well established in other services and is capable of paying dividends in operating success to amateurs too, if correctly used. We therefore urge that you give this as well as the National Traffic Plan a sincere tryout, that communication results may more and more meet your utmost expectations. Here are the National Emergency Frequencies suited to use as calling or traffic listing frequencies on either 'phone or c.w. at any times other than emergency. Note well that the channels *must* be clear of all but emergency use in *emergencies;* also, all users should make a practice of *moving off* the frequency for clearing traffic especially in busy hours. This is to keep the frequency *useful* for the calling purpose here designated. Here again are all the frequencies that we have identified as Calling and National Emergency Frequencies:

3550 kc.	3875 kc.
7100 kc.	14,225 kc.
14,050 kc.	

The use of these calling frequencies does *not* conflict with the National Traffic Plan (see Sept. *QST*, page 50) since that relates to correlated network operations, functioning mostly through scheduled-time evening operations, five days a week. That program sets a pattern ideally suited to speed traffic in the best channels — section to regional to area (time-zone) nets, and right down to section level again. Data are now being compiled for the new ARRL Net Directory so information can be printed soon giving the frequency and times of operation of all networks. This should facilitate operation under the Plan and via the most skilled traffic-handlers whose primary interest is in the nets. There will be assured the know-how, speed and accuracy of forwarding record traffic through this mechanism. However, additional specification of calling frequencies for use *at any hour* of the day or night, *except when emergency need requires limiting transmissions on a frequency to emergency calls only,* should be of assistance in furthering general efficiency in establishing communications to points currently desired with minimum delay.

The 16th "SS" . . . All Hams Invited. Here's the big annual ARRL activity held each fall. An instant success when first announced in 1930, the participation and success for all has come forward with each passing year. The SS affords the pleasure of making new and renewing old QSOs; many make WAS. Above all, it's a chance for a full tryout of your transmitter on the band or bands of your choice, in either one or both week ends of operation. Whether you use 'phone or c.w. or both, get in from the start (Nov. 19th–20th and again Nov. 26th–27th) and report your luck.

— *F. E. H.*

CODE PRACTICE PROGRAM

The following amateurs are transmitting code practice in the ARRL Code Practice Program:

W2NFU, Sidney Tritsch, 96–09 66th Ave., Forest Hills, N.Y., 28,610 kc., Tues. and Thurs., 0030–0100 EST.

W2ZRA, Herbert Paskin, 14 Markham Drive, Staten Island 10, N.Y., 29,600 kc., Tues. and Thurs., 2300–2315 EST.

W7LQN, S/Sgt. G. L. Wilkinson, Box 24, McChord AFB, Wash., 29,250 kc., daily, 1830–1930 PST.

WØEBE, L. G. Call, 613 E. Catalpa St., Springfield 4, Mo., 29,500 kc., Mon., Wed., Fri., 2000–2100 CST.

WØMXC, Charles Bove, 1611½ East Lake St., Minneapolis 7, Minn., 29,300 kc., Wed. and Fri., 2100 CST.

Additional volunteers are needed to send code practice by radio. Schedules may be arranged to suit your convenience. Suggestions for conducting code lessons are available from the Communications Department. If you are operating on 28 Mc. or higher and would like to help in the ARRL Code Practice Program, drop us a postal indicating your interest and we'll send details.

Those using the available practice are urged to correspond with the amateurs making the transmissions so that those who give this useful service may plan their lessons accordingly.

♦

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 Coördinator Roy V. Parrett, 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 268 were in favor of the change and 39 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 organization, 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 organizational 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 NTS takes a great deal of coördination among its members and its member groups, and this coördination, while looking fine on paper, takes time and effort in actual operation. With participation by such leaders as W2BYF (ex-W1IIN), WØHMM, WØIC, W7FIX, W1BVR, W2LRW, W4ANK, W4NNJ, W7CZY, W8NOH and VE2GM, all of whom have accepted managership posts to date, to say nothing of dozens of other outstanding traffic men who have agreed to assist wherever possible, and with pledges of aid 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.

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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 may take consolation in knowing 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 skillful 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 unfair 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 name 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 sent or received in "book" form (see *Operating an 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 with us up to noon, September 15th, our copy deadline. At that time, registrations were literally "pouring" in, so there were many registrations which just "got in under the wire" and several others which missed it only by a few hours. If your net is not listed, it means either that the registration reached us too late or that your net was not registered.

Shortly to be in process is a mimeographed version of the Net Directory. This mimeographed version will await such time as most of the active nets seem to have been registered, but our guess is that it should be available by the time you read this. Meanwhile, supplemental lists will be submitted for the pages of *QST*.

If you want your net to be included in the ARRL Directory, send us 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.

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for August traffic:

Call	*Orig.*	*Del.*	*Rel.*	*Extra Del. Credit*	*Total*
W7CKT	2	3	4522	3	4530
W6CE	24	63	3326	47	3460
W2TYU	30	64	2976	60	3130
W7CZY	65	146	2601	101	2913
W4PL	9	143	2631	126	2909
W9EBX	3	15	2832	15	2865
WØZJO	17	8	1860	260	2145
W5GZU	11	167	1504	165	1847
W7QGN	3	841	829	0	1673
W7LFA	48	35	1106	0	1189
K5NRJ	328	310	294	150	1082
W8RJC	3	165	701	165	1034
W6FDR	93	321	258	305	977
WØQXO	17	418	208	208	851
W4IQV	306	64	410	51	831
W6ADB	1	1	744	1	747
W7KWC	0	0	745	0	745
W1QMJ	12	51	516	48	627
W8NOH	87	116	334	87	624
W7BX	5	5	580	0	590
W7LFA *	44	8	536	0	588
W7AMZ	548	15	12	8	583
W7FRU	5	550	9	3	567
W6YLZ	24	135	272	129	560
W6IXH	29	188	134	184	535
W6DDE	50	222	32	214	518
W7ZU	47	114	256	93	510
W2JYR	112	72	324	0	508

* July Traffic.

The following made the BPL for deliveries:

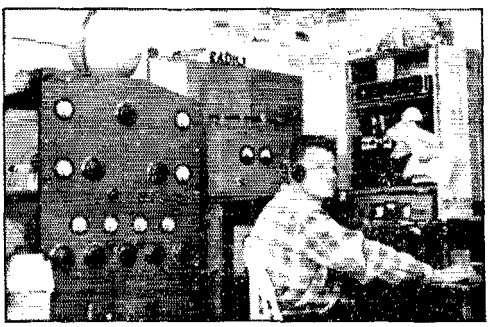
W3CUL	210	W2VNJ	137	W1NXX	107
W9DKV	199	WØGMZ	137	W7FIX	105
W2OXE/MM	176	W7HDN	132	W1IIN	104
		W7KCU	114		

A message total of 500 or more or 100 "deliveries plus extra delivery credits" will put *you* in line for a place in the BPL. The Brass Pounders 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.

Name of Net	*Freq.*	*Time*	*Days*
Alabama Emergency Net	3715	1900 CST	Daily
Alabama Emergency Net	3955	1830 CST	Mon.-Sat.
Amateur Emergency Corps (Mich.)	3915	2200 EST	Mon.
American Legion Net (Calif.)	1990 3975	1930 PST	Mon.-Fri.
Arizona Net	3515	2000 MST	Mon.-Fri.
Ark. Emergency Net	3885	0600 CST	Mon.
Arkansas Net	3695	1900 CST	Mon.-Fr
Beaver Net (Ont.)	3535	1900 EST	Daily
British Columbia Net	3655	2100 PST	Daily
Central Area Net (NTS)	3670	2030 CST	Mon.-Fri.
Connecticut Net	3640	1900 EST 2200 EST	Mon.-Fri.
Conn. Training Net	3640	1900 EST	Sat., Sun.
Cracker Net (Ga.)	3705	1900 EST	Mon.-Fri.
Eastern Area Net (NTS)	3705	2030 EST	Mon.-Fri.
Eastern Penna. Net	3785	1830 EST	Mon.-Sat.
Eastern Mass. Net	3745	1900 EST 2200 EST	Mon.-Fri.
Eastern Shuttle Net	7120	0930 EST 1800 EST	Daily
Eighth Regional Net (NTS)	3530	1945 EST 2115 EST	Mon.-Fri.
First Regional Net (NTS)	3645	1945 EST 2115 EST	Mon.-Fri.
Fla. Emergency 'Phone Net	3910	1815 EST	Tue.
Fla. 'Phone Traffic Net	3950	0700 EST	Mon.-Sat.
'Gator Net (Fla.)	7290	1930 EST	Mon.-Fri.
Georgia Slow-Speed Net	3582	2100 EST	Mon., Wed., Fri.
Illinois C.W. Net	3765	1845 CST	Mon.-Fri.
Ill. Emergency Net	3940	0900 CST 1900 CST	Sun. Tue., Thu.
Indiana Net	3656	1900 CST	Mon.-Sat.
Indiana 'Phone Net	3905	0900 CST 1830 CST	Sun. Tue., Thu.
Interstate Utility Net (Colo.)	3540	1915 MST 2200 MST	Mon.-Fri.
Kentucky Net	3600	1900 CST 0900 CST	Mon.-Fri. Sun.
Ky. Blue Grass Net	3890	2000 CST	Mon., Wed., Fri.
Knights of the Kilocycles	3910	0700 EST	Sun.
Md.-Del.-D.C. Net	3650	1930 EST	Mon.-Fri.
Michigan Emergency Net	3930	0900 EST	Sun.
Michigan Traffic Net	3663	1700 EST 1800 EST 1900 EST	Mon.-Fri.
Minnesota Section Net	3785	1900 CST	Mon.-Sat.
Missouri Emergency Net	3905	1930 CST 1000 CST	Wed., Fri. Sun.
Mountain Area Net (NTS)	3540	2030 MST	Mon.-Fri.
Nebraska C.W. Net	3745	1900 CST	Mon.-Fri.
N.Y.C.-L.I. Net	3710	2100 EST	Mon.-Fri.
New York State Net	3720	1900 EST	Mon.-Sat.
New York State Slow-Speed Net	3720	2100 EST	Mon.-Sat.
No. Jersey Mobile Net	29,400	1700 EST	Mon.-Fri.
No. New Jersey Net	3630	1900 EST	Mon.-Sat.
Oklahoma Traffic Net	3682	2000 CST	Mon.-Sat.
Oregon Emergency Net	3600 3865 7200	1900 PST 2000 PST 2100 PST	Daily Daily Daily
Ozark Net (Ark.)	3695	1900 CST	Mon.-Fri.
Palmetto Net (Fla.)	3675	1930 EST	Mon.-Fri.
Pineapple Net (T.H.)	3725	1600 HST	Mon., Wed., Fri.
Pine Tree Net (Me.)	3549	1900 EST 2200 EST	Mon.-Fri.
Potomac-Rappahannock Valley Net	3935 146,800	0400 EST	Sun.
Quebec Net	3570	1900 EST	Mon.-Sat.
Show-Me Net	7272	1600 CST	Sun.
So. California Net	3765	2000 PST	Mon.-Fri.
So. Carolina C.W. Net	3525	1900 EST 2130 EST	Mon.-Fri.
So. Dakota State Net	3720	1930 CST	Mon., Wed., Fri.
Southern Border Net (Calif.)	7285	2030 PST	
So. New Jersey Net	3700	1930 EST	Mon., Wed., Fri.
Swing-Shift Net	7280	1230 EST 1830 EST	Daily
Tall Corn Net (Iowa)	3560	1845 CST	Mon.-Fri.
Tennessee Net	3737	1900 CST 2200 CST	Mon.-Fri.
Tenn. 'Phone Net	3980	1900 CST 0800 CST	Tue., Thu. Sun.
Thirteenth Regional Net (NTS)	3675	1945 EST 2115 EST	Mon.-Fri.
Traffic Exchange Net	7150	1900 CST	Mon.-Fri.
Trunk Line A-P	3630	2130 EST	Mon.-Fri.
Trunk Line I	3690	2100 CST	Mon.-Fri.
Trunk Line L	3615	2200 EST	Mon.-Fri
Trunk Line S	3545	2100 EST	Mon.-Fri.
Virginia C.W. Net	3680	1900 EST	Mon.-Fri.
Washington C.W. Net	3685	1900 PST	Mon.-Fri.
Washington Section Net	3695	1900 PST 2200 PST	Mon.-Fri. Mon.-Fri.
Western Mass. Net	3760	1900 EST 2200 EST	Mon., Wed., Fr
Western Mass. Ten-Meter 'Phone Net	29,250	2100 EST	Thu.
West Virginia Net	3770	1900 EST	Mon.-Fri.



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 HQ120, 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.

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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.

Net	*Frequency (kc.)*	*Day*	*Time (EST)*	*NCS*
10 'phone	28,900 (will tune entire band)	Tues.	8–9 A.M.	W3NNS
10 'phone	28,900 (will tune entire band)	Tues.	1–3 P.M.	W3NNS
40 c.w.	7220	Wed.	11 P.M.	W3NHI
20 c.w.	14,100	Thurs.	6:30 P.M.	W3CUL
80 c.w.	3610	Thurs.	11 P.M.	W3AKB

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 week end 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*.

FLORIDA HURRICANE EMERGENCY

It was twelve hours before the hurricane of August 26th–28th hit the mainland of Florida. The three section nets in Florida were being mobilized for the expected emergency work that precedes and follows these devastating blows. There was work to be done, but first, the net members had to make sure that they were properly battened down and that emergency power units were ready to take over. Then began the long grind. Weather reports were assembled. 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 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.

A typical AEC set-up was established in Miami at the Red Cross offices. Separate transmitters were installed to handle traffic on 7100, 7290, 3675 and mobile on 3910 kc. W4JIP broadcast official weather reports from the Weather Bureau direct as a public service and for rebroadcast by b.c. stations. At Lake Placid W4BYR, with professional weather-forecasting equipment, rendered invaluable service until his anemometer went down during some blows that hit at velocities higher than 110 m.p.h. W4BYR reported weather via the net that was operating on 7290 kc. to Weather Bureaus in Miami and Tampa and to the U.S. Engineers at Clewiston. At Ft. Pierce, a critical spot, W2OES/4 did an excellent job of reporting conditions. Loss of antennas was severe due to the terrific winds, but because of perseverance and ingenuity the fellows managed to stay on the air.

At West Palm Beach W4MVJ erected a hurricane-proof antenna, installed his 400-watt transmitter plus a 25-watt emergency rig and made tests the day before the storm struck. He maintained continuous operations on 7290 kc. until skip conditions set in. W4POF set up his equipment at Red Cross Headquarters, doing an excellent job arranging outlets and handling traffic. On the fourth day, Monday, a Red Cross communications truck arrived at West Palm Beach. As it had no licensed amateur in its crew, W4MVJ operated the equipment under the call A4ARC, handling over 300 messages.

The unstinted help rendered by many, many stations doing guard duty to keep the channels clear was deeply appreciated. It was not necessary to ask the FCC for clear channels. The Red Cross has reported that only two lives were lost this year and casualties were very light.

The stations listed below are those known to have taken part by handling traffic or monitoring the frequencies used: W2OES/4, W2OSE/4, W2ZK/4; W2COK/4; W3BHK, ECP; W4s AAY, ACB, AFO, AVQ, AXY, AZK, AKV, ALK, AOK, AUS, AYV, BAQ, BIN, BIZ, BMR, BOL, BQO, BRB, BYR, CL, COI, COK, CPG, CQR, CVQ, CY, CYC, DES, DGW, DLX, DQA, DQW, DU, DXI, ES, FEQ, FS, FWZ, GJI, GMJ, GUJ, GZV, HPY, HUY, HWA, IEZ, IKI, ILG, ISR, IQV, IUJ, IVX, IYO, IYT, JEP, JKI, JIP, JNP, JOY, JQ, JWG, KET, KH, KHA, KHY, KQP, KTN, KXF, LCF, LEC, LEP, LET, LMG, LSQ, LTE, LVV, MBM, MFB, MFY, MJI, MKP, MNT, MTU, MXU, NAK, NFY, MUR, NN, NUR, NVU, OBQ, OBW, OCG, OK, OKD, OKH, OMN, ONF, OPG, OU, OVZ, PB, PEI, PFH, POF, PPR, OR, RP, SFH, SI, TH, TL, WS, ZC; W6MEP/4; W8AJT/4; W9VHK; K4FAL, K4FAN, K4NAR, K4USA; AF4MGA; VE2TA.

— John W. Hollister, jr., W4FWZ
SCM, Eastern Florida

ANOTHER AMATEUR RADIO SCOOP

Communications coverage for a 12-mile round-trip boat race was the assignment for members of the Sangamon Valley Radio Club of Springfield, Ill., on Sunday, August 28, 1949.

Fifty-four outboard motor boats competing in six different classes raced on Lake Springfield from Spaulding Dam to the U.S. 66 Highway Bridge. All boats were raced together making the spotting of leaders at an intermediate point as well as the turn-around point a real problem.

Three separate "Field Day" rigs on 3940 kc. were used for communication, one each at the starting-finishing line, Marine Point, about midway along the course, and the Bridge. Arrangements were made to patch the receiver at the Anchor Boat Club, the starting-finishing point, into the p.a. system so spectators, numbering close to 1000, could hear a direct report of race progress.

About six minutes after the race had started a call came through from the station on Marine Point that a boat had overturned in the lake about 300 yards from shore and that two persons, not race entrants, were struggling desperately in the water. Marine Point is about a half mile from the nearest telephone so the information was relayed via radio and telephoned from the boat club to city and county authorities. The captain of the Lake Police was at the amateur station at the Bridge and of course proceeded immediately to the scene of the accident.

A vivid description of the rescue operations was 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 step in and provide public service.

During the time rescue operations were taking place the race was still going on and direct reports of progress were also piped over the p.a. system.

Amateurs participating in this display of ham versatility were W9ISG, JSD, KCX, KQL, SSP, UQT, WPP and ZSN. Illinois State Police Operators W9PJJ and W9YHP, on duty at KSA-213, monitored 3940 kc. after the accident occurred and conveyed necessary information to authorities.

— Harris F. Lund, W9KQL

"PAWN TO KING FOUR"

Chess games via amateur radio are becoming increasingly popular, and some of the more avid enthusiasts want us to designate a "cigar store" where the gang can hang out when looking for a game. Pulling a couple of frequencies out of the hat, we come up with a "cigar store" — 3700 kc., and a "drug store" — 7250 kc. A few "CQ chess" calls should get you a good game almost any time of day or night, but watch out for the traffic nets — those guys don't approve of gambling!

BRIEFS

Latest W1 call to come to our attention is W1SFH. Age 13, this ardent amateur operator visited Headquarters in company with ex-SCM Thompson, formerly ARRL SCM of the Philippines for many years, now W1NAF and W4LAB. W1SFH and W1NAF will be operating mobile while they visit in New York, Michigan and Minnesota. In view of spending part of last winter in Florida and plans for returning to St. Pete next year, the designation "One Southern Fried Ham" is not inappropriate for this young amateur.

A.R.R.L. ACTIVITIES CALENDAR

Nov. 2nd: CP Qualifying Run — W6OWP
Nov. 16th: CP Qualifying Run — W1AW, WØTQD
Nov. 19th–20th, 26th–27th: Sweepstakes Contest
Dec. 4th: CP Qualifying Run — W6OWP
Dec 13th: CP Qualifying Run — W1AW, WØTQD
Jan. 7th: CP Qualifying Run — W6OWP
Jan. 19th: CP Qualifying Run — W1AW, WØTQD
Jan. 21st–22nd: V.H.F. Sweepstakes
Feb. 3rd: CP Qualifying Run — W6OWP
Feb. 10th–13th: DX Competition (c.w.)
Feb. 13th: CP Qualifying Run — W1AW, WØTQD
Feb. 17th–20th: DX Competition ('phone)
Mar. 5th: CP Qualifying Run — W6OWP
Mar. 10th–14th: DX Competition (c.w.)
Mar. 17th–20th: DX Competition ('phone)
Mar. 17th: CP Qualifying Run

W1AW OPERATING SCHEDULE

(All Times Given Are Eastern Standard Time)

Operating-Visiting Hours:
Monday through Friday: 1130–0600 (following day)
Saturday: 1900–0230 (Sunday)
Sunday: 1600–2200

General Operation: Refer to page 64, September *QST*, for a chart showing W1AW general operation. This schedule is still in effect and is not reproduced herewith for space considerations. Mimeographed complete master schedules of all W1AW 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, 28,060, 52,000, 146,000 kc.
'Phone — 1887, 3950, 14,280, 29,000, 52,000, 146,000 kc.

Times:
Sunday through Friday, 2000 by c.w., 2100 by 'phone.
Monday through Saturday, 2330 by 'phone, 2400 by c.w.

Code-Proficiency Program: Practice transmissions are made on the above-listed c.w. frequencies, starting at 2130, Monday through Friday. Speeds are 9, 12, 18, 25 and 35 w.p.m. on Monday, Wednesday and Friday, and 15, 20, 25, 30 and 35 w.p.m. on Tuesday and Thursday. Approximately ten minutes of practice is given at each speed. Next certificate qualifying run from W1AW and WØTQD is scheduled for November 16th; from W6OWP, November 2nd.

The station staff:
T. F. McMullen, W1QVF, "fm"
R. N. Eidel, W1RUP, "re"
R. E. Morrison, W1RXL, "lr"

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/WØTQD will be made on November 16th at 2130 EST. Identical texts will be sent simultaneously by automatic transmitters. Frequencies of transmission from W1AW will be 1887, 3555, 7215, 14,100, 28,060, 52,000 and 146,000 kc. WØTQD will transmit on 3534 kc. The next qualifying run *from W6OWP only* will be transmitted on November 2nd at 2100 PST on 3590 and 7248 kc. These W6OWP-only runs will have different text from the runs sent by W1AW and WØTQD. For additional qualifying run dates, see the ARRL Activities Calendar elsewhere in these pages.

Any person may apply; neither ARRL membership nor an amateur license is required. Send copies of *all* qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the five speeds transmitted, 15 through 35 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m., you may try later for endorsement stickers.

Code-practice transmissions are made from W1AW each evening, Monday through Friday, at 2130 EST. References to texts used on several of the transmissions are given below. These make it possible to check your copy.

Date	Subject of Practice Text from September *QST*
Nov. 1st:	*A Simplified Circuit for Audio* . . . , p. 13
Nov. 2nd:	Qualifying Run, 2100 PST, from W6OWP only
Nov. 4th:	*A Simplified Circuit for Audio* . . . , p. 16
Nov. 7th:	*The "Gamma" Match*, p. 20
Nov. 10th:	*450 Watts on V.H.F.*, p. 22
Nov. 15th:	*A 1950 VFO Exciter*, p. 29
Nov. 16th:	Qualifying Run, 2130 EST, W1AW/WØTQD
Nov. 18th:	*The Fourth Inter-American–Region 8 Radio Conferences*, p. 35
Nov. 21st:	*Vertical Beams on 14 Mc.*, p. 48
Nov. 23rd:	*New National Traffic Plan*, p. 50
Nov. 29th:	*The World Above 50 Mc.*, p. 53

DX CENTURY CLUB AWARDS

HONOR ROLL

W1FH....223	W6EBG....210	W3GAU....203
W6VFR....218	W3BES....209	W4BPD....201
G2PL....212	W2BXA....209	WØYXO....201
W8HGW...211		G6RH....201

RADIOTELEPHONE

W1FH....181	W1JCX....156	W2BXA....152
W6DI....163	W8HGW....155	G2PL....150
XE1AC....161	VQ4ERR....153	W1NWO....150
W4CYU....157		W2AFQ....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....138	W6CUL....107	G8KU....101
W1KWD...122	W1KQY....106	W7ETK....101
PY2CK....120	W8MFB....105	W2ABS....100
W7PGS....119	OK1NS....104	W1IOZ....100
W7AC....118	Z85U....104	W2CGJ....100
W2BJ....114	W1AFB....104	HA4EA....100
KH6CD....114	W2JJC....104	HB9DH....100
W9RQM....110	W6EHV....103	SM7IA....100
W4AIS....110	W9ABA....103	W3KJJ....100
I1XK....109	W6APH....103	GI4NU....100
VK6SA....108	W2CTO....102	SM5IZ....100
VE1EP....107	W2OST....102	W8MPW....100
	ZL2BH....102	

RADIOTELEPHONE

PY2CK....119	W2JJI....105	W2QKJ....103
W8ZMC...109	W6AED....105	W1KWD....101
CE1AH....108	I1ASM....104	W2NHZ....101
SM4KP....106		W9HP....100

ENDORSEMENTS

W6SAI....200	W2IMU....151	W1AH....130
W6TT....192	HB9J....150	WØEYR....129
W6MX....190	W8SDR....150	W5IGJ....127
W9ANT....183	W3KDP....144	W2CSO....126
W2HZY....183	W2RDK....144	W6VE....124
PAØUN....181	W1KFV....143	W6PQT....124
W6ZCY....181	W2JVU....142	W2WZ....120
W6AM....180	W8UDR....141	W4DHZ....120
W2CWE...173	W8KPL....141	CE3DZ....120
W3DRD...173	OZ7EU....141	W8GLK....120
W6RM....171	W2AGO....141	GM3AVA....114
HB9CX....162	W1DX....140	W9CYT....112
W6UCX...162	W2BRV....140	W6LVN....112
W6SRU....162	W6CUQ....140	EI4Q....112
W2TQC....160	G5YV....140	W2GTP....112
ON4JW....160	W8UAS....139	PAØCB....111
W6SYG....160	VO6EP....137	W2QKJ....111
W3OP....160	W5ADZ....135	W7GPP....110
W2UFT....157	G2MI....135	W6CTL....110
W3DKT...157	W1PKL....134	W7KTN....110
W8CVU....154	W9FKC....132	WØRIA....110
W5KUC....153	W1FTX....132	W6WJX....110
W3JKO....152	W8DMD....130	G8PL....110
W6TI....151	W4VE....130	W9TQL....110
	W2RWE....130	

RADIOTELEPHONE

W9RBI....140	G6AY....121	W3LTU....120

MEET THE SCMs

Eppa W. Darne, 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, W3CNJ 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, WAS, and Code Proficiency awards, and several Public Service Certificates. A past OBS, he now holds appointment as RM and ORS and is a trunk-line station. A member of the Washington Radio Club since 1923, he has held the posts of president secretary-treasurer and chief operator.

Eppa has done notable work in floods, hurricanes (especially the Maryland and Florida hurricanes), sleet storms and blizzards. In 1931 he copied news dispatches nightly for many months from the Hardt Trans-Asia 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) 210-211-204A, 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 FB7X. Antenna is a 132-foot wire, end-fed. Emergency equipment consists of two battery-operated receivers, 1000-watt gas-engine a.c. generator, 300-ampere-hour 32-volt Edison battery with 600-watt rotary converter (32 volts d.c. to 110 a.c., 60 cycles), portable 150-watt transmitter for 3.5 and 7 Mc., and a 10-watt battery-operated rig for 3.5 Mc. using auto-type 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, Eppa'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 c.w. In spite of the effort, expense, and sacrifice involved, he feels that he has been amply repaid 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 W3AKB, who was later to become Mrs. Darne.

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. 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 received reveals 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: *W. New York* — W2ZUZ, 468 points; W2PLU, 250 points, 46 contacts; W2KZ, 24 contacts. *W. Pa.* — W3MQW, 22 points 11 contacts. *Illinois* — W9GLY, 41 contacts. *No. N. J.* — W2IQQ, 2023 points; W2IDZ — 64 contacts; W2AMJ, 666 points; W2DZA, 105 points. *Conn.* — W1PBB, 57 contacts. *W. Mass.* — W1QXE, 90 contacts. *San Francisco* — W6VCG, 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, W2WC 22,912, W9BRD 20,928, W2YZG 19,328, W4JLW 18,144, W6HZT 15 744, W1AWX 13 440, W2WZQ 13,440, W8YGR 11,424, W9KZZ 10,584, VE3BTG 23,768, VE3NE 25,599, VE5QZ 23 130, VE5MQ 21,600, VE3AGX 21,042, VE5RW 18,832, VE7YL 17,952, VE3BBQ 17,566, VE4SO 17,380, VE3MI 16,672.

Section Leaders

E. Pa.	W3GYV	29,440	Oregon	W7ABH	720
Md.-Del.-D.C.	W3LVJ	10,240	Wash.	W7ETO	2952
So. N. J.	W2ORS	3744	S.C.V.	W6CIS	3024
W. N. Y.	W2WZQ	13,440	E. Bay	W6LMZ	1680
W. Pa.	W3GJY	8512	San Fran.	W6WBU	3384
Ill.	W9BRD	20,928	Sac. Val.	W6GVM	240
Wis.	W9KZZ	10,584	S.J.V.	W6BHI	6144
No. Dak.	WØLHS	1440	Va.	W4JLW	18,144
Minn.	WØLHT	4648	W. Va.	W8CKB	7560
Miss	W5WZ	1824	Colo.	WØIC	2976
Ky.	W4KVX	9912	E. Fla.	W4BRB	9472
Mich.	W8GQB	6608	Ga.	W4MCM	6272
Ohio	W8YGR	11,424	Los Ang.	W6HZT	15,744
N.Y.C. & L.I.	W2WC	22,912	San Diego	W6MI	5616
No. N. J.	W2YZG	19,328	No. Tex.	W5JD	6400
Iowa	WØLDH	7392	So. Tex.	W5JPC	5760
Kans.	WØDYX	3360	New Mex.	W5OVL	8962
Conn.	W1ODW	10,272	Mar.	VE1MW	12,710
Maine	W1GKJ	7448	Que.	VE2XR	9150
E. Mass.	W1AWX	13,440	Ont.	VE3BTG	25,768
W. Mass.	W1JYH	5120	Man.	VE4SO	17,380
N. H.	W1QYZ	3744	Sask.	VE5QZ	23,130
Idaho	W7GHT	1408	Alt.	VE6EO	16,218
Mont.	W7EWR	6720	B. C.	VE7YL	17,952

BRIEFS

OBS W6ITH, Moraga, California, is sending ARRL Official Bulletins daily for one hour by radioteletype on 26,962 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 WØDVU/Ø, 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 WØVDU/Ø coughed, used up its last drop of fuel — and stopped.

NATIONAL CALLING AND EMERGENCY FREQUENCIES

C.W.	*'PHONE*
7100 kc. (day)	3875 kc.
3550 kc. (night)	14,225 kc.
14,050 kc.	

During periods 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.*

Station Activities

• **All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.**

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — We are sorry to have to accept the resignation of a long-standing ORS, ADE, for reasons of health. He will continue to serve as OO, however. Silent Key: NAF on Aug. 23rd. OCU is rebuilding to use a pair of 250THs. His DX total is now 183 worked and 158 confirmed. CUL makes the BPL with a bang this month. BXE had a Field Day on 7 Mc. while at St. Pierre signing FQ8AB and FP8AA. The pile-up was something to behold. Jack used an indoor antenna and his little Field Day rig which was described by him in an issue of *QST* a couple of years back. Jane Bieberman, OVV, was using the little rig also and it was in the photograph on the front cover of *QST* a few months ago. So the gang can see what they heard from FP8. In fighting a four-alarm fire in central Philadelphia, firemen chopped a twenty-foot hole in FUF's roof and wrecked beyond repair his nifty 80-meter antenna. CHH, who operated on Iwo and KG6, is back in Philadelphia and expects to get back on the air here. DOE and LVF have new 40-foot self-supporting towers. PUP is a new ham in Philadelphia. CPV and FUF received their Class A tickets. CPV celebrated his by working CR5UP in Portuguese Guinea. He, CPV, runs only 100 watts to an 814. CTJ has his new 14-Mc. three-element beam up on a 40-foot mast which is dwarfed by the tower of WPTZ, a few hundred feet away. DL4LN passed through Philadelphia and visited some of the local lads. Traffic: W3CUL 363, ANK 39, OCU 21.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Eppa 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 nice hamfest-picnic at Triton Beach on Aug. 14th attended by hams from Baltimore and Washington. The gang enjoyed outdoor sports, many valuable prizes were given to the lucky ticket holders, and a nice P.A. system and a working 28-Mc. rig were set up for the affair. The Chesapeake Amateur Radio Club, at its August 16th meeting, featured a discussion on "Practical Transmitter Circuitry" by LXK. The Club held a picnic and transmitter hunt Sept. 11th. The Washington Radio Club's August meeting was a picnic-hamfest in Rock Creek 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 eats for everybody. After the eats the gang enjoyed an evening of entertainment and prize drawings with many valuable parts, 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 Net resumed operations Sept. 19th on 3650 kc., meeting Monday through Friday at 7:30 P.M. OLY, president of the YLRL, had a regional get-together at her QTH of ten YLs from District of Columbia, Maryland, Virginia, Pennsylvania, and New York in mid-August. A recorded program was made for later use on the "Voice of America." YLRL officers later convened at the home of OQF for a business meeting and future planning. PSG, the Baltimore Amateur Radio Communications Society's station, is operated every first and third Friday at 9:00 P.M. as Control Station for Mobile Emergency Corps drill. KDV, NUM, OWN, OBY, and MWY participated in recent Baltimore Yacht Club sailing races. MCG vacationed in Maine. EQK has been appointed Official Observer, and has worked 78 countries and 30 zones on 14-Mc. 'phone. IBX has been appointed Official Observer, and vacationed in Vermont; he also took along a ten-watt portable rig. 2SAG/3 is back in Baltimore and will be on soon. LVJ has left for an indefinite stay at National Company, Malden, Mass. DYA has a new mobile rig on 28 Mc. using all 6AQ5s. OTG has a Signal Shifter. IKX, recently wed, will be off on 14 Mc. while moving, but still will be mobile on 28 Mc. PRJ is on 144 Mc. with a 522 and rotary five-element beam. 28-Mc. airborne KYG and FLG took the July *QST* handie-talkie aloft, made six contacts in a 30-minute flight, and determined transmitting range about 10 miles at 2,000 feet. PHT is back on 28 and 1.7 Mc. after the mice ate coil leads in receiver and lightning hit his antenna. EYX's 32V-2 transmitter is back from the factory after being T.V.I.-proofed. CJS has moved to Arlington, Va. CDQ still schedules VP4TZ. She won a new transmitter at the Washington Radio Club Hamboree, and has been doing quite some DX, including I1ER, her friend of many years. PSP is a newly-licensed station in the Baltimore area. OZG worked 1SF in Connecticut, using 144 Mc. and a six-teen-element beam. LSX gets out well with her new 14-Mc. rig. Traffic: W3EQK 28, FWP 8, LVJ 3, BWT 2, CDQ 2, CJS 2.

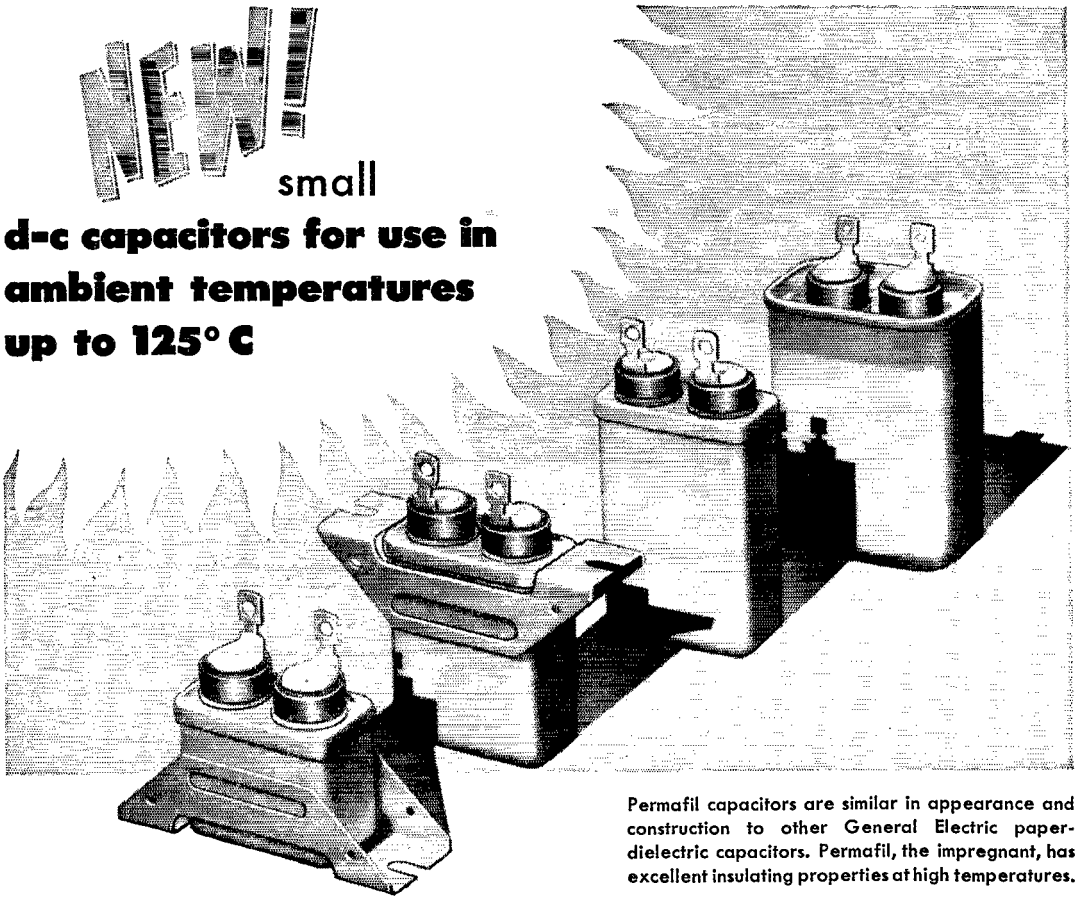
SOUTHERN NEW JERSEY — SCM, Dr. Luther M. Mkitarian, W2ASG — My sincere thanks for electing me as your SCM. I will do my best to serve you. PAU, EH, and DEJ are using a "flip-flop" 144-Mc. beam. BAY is active on 56 Mc. ASG has the 10/20 rotary beam working. The Southern New Jersey Net is active on 3700 kc. Mon., Wed., and Fri. at 7.30 P.M. RPH wants a few active operators on his net.

WESTERN NEW YORK — SCM Harding A. Clark, W2PGT — SEC: SJV RM: FCG Activity continues at the usual summer low level but with fall here again things will pick up in fine style. NES finds a difference of 18 db. between identical beams indoors and outdoors at the same height above the ground on 144 Mc. in favor of the outdoor antenna. UTH is using nine-element reflector ¼-wave spacing with pronounced improvement in front to back ratio and has discontinued schedules with VE3ANT because contacts have been TOO reliable. HQB has moved back to Long Island and has resigned as EC of Tompkins County. TGU is new EC for Tompkins County. RAWNY held its annual stag outing with KBT members as guests. SJV, operating portable, contacted and steered mobile stations YRL, 3JH, and 9AHV to the scene of festivities. YRF experimented with two-section 8JK antenna and made WAC. QHH continues schedules with VE8 Land and found time to hook UO5, FP8, and VR2 to bring his country total up to 176 with low power. AOR continued to work DX on 3.5 and 7 Mc. with new Mon-Key during the summer. SRI and VDQ are using new 813 finals. WWK installed mobile rig in his bucket of bolts. LLW has new YL operator. Sorry to report that WFU is moving to Long Island — our loss is their gain. UXP is using sixteen-element beam on 144 Mc. PBC and BHN are new stations on 144 Mc. in Perry and Bristol Center respectively. RTB shouts himself hoarse on 220 Mc. with no success up to the present time. KEL is new OBS appointee. New York State National Guard Armory is new meeting place for Syracuse Radio Amateur Club. Contact NCK for details as to when meetings will be held. YLV has moved to Indiana. The frost is on the "punkin." Let's get those reports comin'. Traffic: (Aug.) W2QHH 83, WFU 79, PGT 32, AOR 27. (July) W2RSL 80, QHH 74, WFU 37.

WESTERN PENNSYLVANIA — SCM, Ernest J. Hlinsky, W3KWL — The South Hills Brass Pounders & Modulators of Pittsburgh held its Annual Hamfest in August. The ATA 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. KG6CU wants the traffic boys to line up schedules with him when he returns to Guam. He operates on 7023, 14,090 and 28,800 kc. Congrats to the Horseshoe Radio Club of Altoona on its splendid radio work during the Centennial Celebration. MYN and LJQ used 144 Mc. to cover the parade and Soapbox Derby. LIV and MBB used walkie-talkies. POZ and KQD carried on radio communications. BWL, recently-appointed ORS, is knocking off the traffic. Had the pleasure of meeting MYN, LIV, LJQ, and OJX at the Pittsburgh Hamfest. The Old Kilo Watt Harmonic station still can be heard tearing the clouds apart on 144 Mc. New members of that slick outfit are JT and NWD. The elaborate antenna system used by UUG and MPO has the boys all a-buzzin' Up Erie way, TFX comes through with items on the Conneaut Lake gang. The recent RAE-CRC Hamfest was attended by 300, including PMY, NQA, BOZ, and LFV. The DX boys in Erie are NGB and NLU. Those attending the Pittsburgh Hamfest from Erie were Mr. and Mrs. NCJ, TXZ, KJT, WBM, KKT, and TFX. PSN is a new ham in Erie. LST sends in news from Oil City. LFX is working 14-Mc. 'phone. LST is proud of his new HQ-129X and super-duper 144-Mc. gear. NSL is attending State College. KXQ lost his folded dipole in the storm. The Mercer County Radio Assn. is planning another v.h.f. expedition to the mountains in West Virginia. GEG is newly-appointed RM. OIF can be heard on 28 Mc. with

(*Continued on page 70*)

NEW! small d-c capacitors for use in ambient temperatures up to 125° C



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.

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. 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.*

GENERAL ELECTRIC

407-162E

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 P.M. on 3750 kc. with Chief RM NUG in charge. Newly-appointed ORS are PAB and IYR. PKE is an addition to staff station YA, of Pennsylvania State College. NUO is with the college staff. LRD was the only YL operator ever at 3YA. AER reports 14-Mc. DX opening up. Traffic: W3AER 12, BWL 9.

CENTRAL DIVISION

ILLINOIS — SCM, Lloyd E. Hopkins, W9EVJ — Section nets: ILN on 3765 kc. and IEN on 3940 kc. UQT is our Phone Activities Manager again this year. KQL resigned as Chief Route Manager because of new working hours but will be around when time permits. EVJ is Acting Manager of ILN at present. The Cahokia Amateur Radio Club reports new officers are END pres.; FIN, vice-pres.; NMY, secy.; TCK, treas.; and ZYP, sgt. at arms. The Club recently purchased a BC-654 complete with dynamotor. GDI is new OO, so watch your notes. NN is firing up on 7 Mc. for the winter season. JMG returned to the air using an 814 on 3.5- and 7-Mc. c.w. EEK is working on 28-Mc. mobile job and doing a good job with traffic. APK at long last has a new rig on the air. EBX received appointment as Assistant Director. BON is experimenting on 144-, 220-, and 450-Mc. equipment. CMC operated portable during vacation and reports lots of contacts. FFR returned to 7 Mc. after a six-months layoff. PHE added a Collins 30K to his 75A. FIF has rotary on 28 Mc. along with BC-610 and SX-42. UAK moved to the country. JVI is in Germany. RVF is driving a bus on the early shift and building a house. HOD may be found on 14-Mc. 'phone and c.w. because of antenna limitations. HXE is QRL selling bottles of the 50-kw. class. The Hamfesters Radio Club sponsored a very successful picnic which brought together hams from all over the State. That's all for this month and your SCM would appreciate reports before the seventh of the month so that they may be sent in promptly. Let's go all out for the largest fall and winter season in our history. Traffic: (Aug.) W9EBX 2865, EEK 150, KQL 14, FFR 13, APK 10, JMG 6, CMC 2. (July) W9DTC 2.

INDIANA — Acting SCM, Wilber E. Monigan, W9RE — BRO is studying E.E. at Tri-State College. MDC is trying mobile on 28 Mc. PIQ works for the B.&O. Railroad. ABT is married. HZB has close-spaced 28-Mc. beam. DUD received mementos, call letter plates, etc., from WØDUD, ex-9DUD. BKJ has a new receiver and now can hear the Indiana 'Phone Net. LTR and PUE are mobile on 75 meters and would like information on a good mobile antenna. CVO, BSZ, TBE, and VMQ are sending code practice on approximately 7187 kc. Tuesday and Thursday at 2030 to 2100 CST. ZGC now is on 3.85 Mc. PDS built a low-pass filter for T.V.I., and is MARS NCS for the Hot Rod Net. Indiana members are DKR, DCM, FJL, GHK, RE, SWN, DMK, WAA, CQU, DNC, TEK, and FLE. KTX is on 14 Mc. CMU has Class A license. ELP is at Purdue operating portable. ABP lost his long-wire antennas and is trying mobile on 3.85 Mc. BKJ received a plaque as the outstanding amateur of Indiana. DGA has worked 110 countries and has two vertical 8JK antennas. The Fort Wayne Radio Club resumed yearly schedule in September at which time officers were elected. The Northeast Indiana Radio Club also has resumed meetings. The Michiana Amateur Radio Club now meets the second Tuesday and last Wednesday of the month. Send your reports and comments to W9RE, 1504 E. Ewing Ave., South Bend 14, Indiana. Traffic: W9DKV 365, EQN 37, FMJ 18, RE 14, BKJ 7, KTX 5, ZGC 5, DGA 4.

WISCONSIN — SCM, Reno W. Goetsch, W9RQM — We welcome back to the CD fold, UIT, with OBS transmissions on 3855 kc. daily at 0115 CST, to catch the early birds. According to latest reports, DJV has a new jr. operator. New 144-Mc. antenna at JBF's is a four-element stacked above the old four-element beam, while a new converter is under construction. Pushing out the signal at DND are three transmitters; an ART-13, a 250-watt 813 rig, and a kw. p.p. 813 rig. EOQ received Class A ticket and soon will be on 14- and 3.85-Mc. 'phone. QGQ reports a successful picnic at M.&M., with KL7DF as the greatest DX in attendance. HHS (what a call for a bug!) has been knocking them off on 14- and 7-Mc. c.w. with his HT-17. New calls at Milwaukee are HWV and HXV, both students at Milwaukee School of Engineering, according to IWT. QSLs from OE8AN, UB5KAB, and FA8IH bring the confirmed total of WEN up to 72. ESJ made another sojourn into northern Wisconsin. Taking time out from traffic, CBE works a little 4-Mc. 'phone. YCV operated portable from LaCrosse during vacation. IQW gave the exam to two new prospects. 50-Mc. rigs are being planned by DSP and DND. PM was heard by 2NLY on 144 Mc. HDZ has new Signal Shifter and 20-w.p.m. sticker for Code Proficiency certificate. ZTO installed a new mobile rig in the car. FZC put up a new combination beam; three-element on 14 Mc. and six-element on 28 Mc. SZL is getting ready for a new season of TL operation. FYP works 28-Mc. 'phone, both mobile and at home. This is your column, fellows. Just drop me a card on the first of each month with the latest news from your QTH. Traffic: W9ESJ 307, CBE 25, YCV 23, IQW 20, DND 18, SFL 18, CWZ 17, MUM 15, LVR 13, RQM 10 UIT 10, HDZ 4, PM 4, WJH 2.

DAKOTA DIVISION

SOUTH DAKOTA — SCM, J. S. Foasberg, WØNGM — DOP has been transferred from Sioux Falls to the St. Paul office of N. W. Bell. RWE has a new home with a room set aside as the shack. PHR is back from summer session at the University and is hard at work rebuilding. RRN has a new Signal Shifter. PRZ is heard on 14-Mc. 'phone now that he is Class A. DKJ is back in Aberdeen after his summer cruise at Great Lakes and brought back a 610 for the unit. The Black Hills gang turned out to help during the recent forest fires, providing communications that were badly needed at the time. The Forestry unit in control left for Colorado Springs when it looked as if the fire was out and after they had gone the fire broke out again and the Rapid City gang had to take over as operators. OXC has a new state car and is planning on putting in a 160-meter mobile unit.

MINNESOTA — SCM, John B. Morgan, WØRA — Asst. SCM, Jean E. Walter, KYE. SEC: BOL. RM: RJF. Send AEC applications to BOL as soon as possible. EPJ was visited by 4LAB and 1SFH. YPN complains his bees have v.h.f. antennas but a.c. notes. Section nets are requested to use greater accuracy in spotting net frequencies; 250 cycles each way as a minimum would help NCSs and speed up QNI. TSN visited the Arrowhead Club in Duluth and discussed points of interest in League functions and how things stack up for the future. BGY, ROE, ZOB, and CWB went to the Skroo Bawl Net meeting in Wisconsin. KØWAA and KØUSN attended the Sauk Rapids picnic with a 500-watt mobile each. SUZ has become 6GWL in Los Angeles. FHH has moved to Chicago to work in the t.v. division of Motorola. The Minneapolis Radio Club held its annual picnic in Minnehaha Park with 45 locals present with their families. There was 14- and 28-Mc. DX and a ball game for the OMs, games for the kiddies, and liquid pop for the Moms. The Rochester Club has an impressive emergency layout, tying in with Red Cross and police and fire departments. HFJ, HUO, and FID are sporting new 28-Mc. rotaries. COS has a new 654 mobile on 3.5 and 3.85 Mc. FID and 4KV chalked up a QRP QSO on 14 Mc. with .03 and .5 watts, respectively, both 559. IXR is back on the 'phone net with his modernized 32-V1, and is keeping traffic buzzing. The Mesabi Range Wireless Club is holding emergency drills on 160 meters, with 4 stations now active there. SMT accidentally was locked inside a gasoline tank farm one evening while searching for a hidden transmitter. Using his mobile to request release he was astonished to find that the policeman sent to investigate also was a ham. Minnesota stations are urged to check into either or both the c.w. and 'phone nets as often as possible. The c.w. net meets at 7:00 and 10:00 P.M. on 3795 kc., and the 'phone net at 12:05 (noon) and 6:00 P.M. on 3960 kc., daily except Sunday. The 'phone net also meets at 9:00 A.M. Sundays on 3960 kc. C.w. 'phone men are present on both nets for interchange of traffic. Traffic: WØHFF 234, RA 128, BGY 45, IXR 36, UCV 29, EPJ 26, ANU 19.

DELTA DIVISION

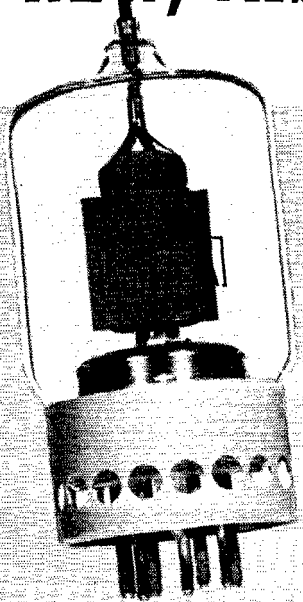
ARKANSAS — SCM, Marshall Riggs, W5JIC — EGX is a new EC for Pulaski County. FPD is new Net Control for Arkansas Emergency Net on 3885 kc. at 6:00 A.M. Mondays. The Ozark Net reopened with good attendance and meets on 3695 kc. at 7.00 P.M. Mon., Thurs., and Fri. DVI has a converted BC-375 at 300 watts, plus receivers, generators, and trailer for any possible emergency. PYM is new call in Pine Bluff, running 15 watts on all bands. OXU has new ORS appointment and a BC-458 at 75 watts on 7 Mc. now. LUX has dropped the n.f.m. for a.m. after a year of it. Maybe I can hear Fred now. Let's see more news, boys, either in message form or mail, as the QSO type of information soon gets lost.

MISSISSIPPI — SCM, J. C. Wallis, W5DLA — A very large shrimp supper was enjoyed by a very large attendance of members at the Aug. 26th meeting of the Gulf Coast Amateur Radio Club. The Keesler Air Force Base Club is sponsoring a series of bingo parties. The Club recently installed a couple of BC-610s. One will be used on the MARS circuit and the other on the "ham" bands. WZ, Columbus, has been reappointed RM and ORS. He is a member of the Rebel Net and TLAP. Recent visitors on the Gulf Coast were GXO, MUG, DOL, KYC, and FSS. The latter was driving a new car, but he was in such a hurry I couldn't tell what kind it was. Others with new cars are GIA and DT. NYV, HRW, and DLA have T.V.I. complaints down to a minimum. JHS reports rig troubles kept his traffic down JSH is proud papa of a new YL. On Sept. 1st DLA was appointed chairman of communications for Gulfport and Harrison County at a meeting of the disaster committees of the American Red Cross. Traffic: W5QEP 13, JHS 10, DLA 6, ANP 5.

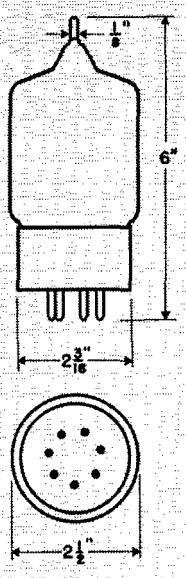
TENNESSEE, SCM, Ward Buhrman, W4QT — The Oak Ridge Club was host to Communications Manager Handy at the Aug. 16th meeting. A number of hams from other areas were in attendance. We were impressed with the

(Continued on page 72)

A NEW, VASTLY IMPROVED 4E27



- MORE RUGGED PLATE-LEAD
- PYROVAC PLATE
- OVERSIZE PLATE
- NON-EMITTING GRIDS
- MECHANICALLY RUGGED
- MOULDED-GLASS HEADER
- LOW-LOSS LEADS
- EASILY COOLED STEM



EIMAC PENTODE TYPE 4E27A/5-75A

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 protype* 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.

* Lead connector is supplied to make this new tube directly interchangeable with 4E27.

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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 system calculated to arouse any of the fellows who might otherwise inadvertently sleep right on through a good holiday DX week end. OJZ is in charge of this enterprise. KKR makes a bigger noise now with improved skywire. KMH is new OBS. LCB moved to Centerville and is now EC there. He is replaced in Nashville by FWH. ABQ is new EC at Bristol. NNJ has been on the sick list. FDF has snazzy mobile rig complete with modulator. We have suspected him of using this modulator in connection with his 600-watt affair. Club secretaries: Please ask your members to submit activity reports and renew appointments. AAW and MKB have new stacked arrays on 28 Mc. MKB has added some new customers, bringing the total worked up to the necessary 100. He assures us the postman is treated with a rare degree of respect and courtesy nowadays. PSI is new 7-Mc. call in Nashville. Traffic: W4PL 2909, BAQ 18, QT 16, EBQ 13.

GREAT LAKES DIVISION

KENTUCKY — SCM, W. C. Alcock, W4CDA — All stations are requested by the SCM to encourage local Red Cross chapters to file test messages and give our nets more traffic. Messages can be to other chapters or to National Headquarters. This is one of the best emergency ideas we can think of. Let's do it. JQV is finishing a de luxe kw. rig. OEY is attending M.I.T. so he won't be too active. YPR reports back on KYN-Net on 3600 kc., and says QRM is heavy toward the end of the KYF-Net season on 7200 kc. JCN visited MWX. See BAZ if you need a tank of airplane gas on credit. Two men in a two-engine plane got gas, but the F.B.I. got them as two of the ten-most-wanted criminals in the U. S. FKM is recovering from an accident, but his rig is ailing with burned-out transformers and his antenna blew down. CDA worked RBQ, formerly of Covington, now in Miami. NWQ says PSE is a new ham in Louisville. YPR, JRA, NZH, and MWX were recognized for the fine work on KYF-Net this summer. Others reporting in that Net were BAZ, MEY, MRF, NIX, NWQ, OXT, and JQV, with No. 1 traffic-handler 4PL, Chattanooga, joining in. JGU contacted Red Cross chapter at Central City on emergency plans. EDV says KYP-Net (3955 kc.) took a nap for August as did the "89 Club." We *MUST* have more traffic on our nets. Let's originate plenty of messages, but make them good traffic. For net work, write BAZ and get details on QN signals and net procedure. See you on the nets this fall and winter. Traffic: W4NWQ 8.

MICHIGAN — SCM, Robert B. Cooper, W8AQA — Asst. SCM c.w., Joseph R. Beljan, 8SCW. Asst. SCM U.P., Arthur P. Kohn, 8TTY. SEC: GJH. PAM: YNG. RMs: GSJ, UKV. New appointments: OES — ZCH. EC — DLZ. OO Class III, IV — NOH. RJC, as high traffic man for the month, sets a postwar record for traffic totals and the feat, accomplished under trying summer conditions beset with inconsistent schedules, deserves a very hearty "well done." EPN made quite a contribution in raising the over-all evaluation of amateur radio in its contribution to society in general by the publication of the fine work of REU in locating a supply of aureomycin to combat virus pneumonia when the daughter of VK2JP was desperately ill and the only hope for her life was in this new drug not yet available in Australia. CSI also has established very favorable public relations in Marquette by his contacts, as witnessed by newspaper accounts. MQU reports active work on the part of the Flint Emergency Corps on the Labor Day traffic congestions by the mobile rigs, operated by the members of the Corps and the local Red Cross. NOH is busy organizing the new 8RN regional net on 3530 kc. under the proposed traffic plan. YMO reports a new operator, EOS, in the Mt. Pleasant area. Congratulations to YMG and CLY on the new jr. operators. 2LMB/8 reports traffic for the last time for this summer season in Michigan. TDO, OAF, and LU spent their vacations in the Upper Peninsula with portable rigs. DLZ extends an invitation to all to join the Parasitic Net activities on 28 Mc. BXU has been keeping schedules with the Badger Net as an outlet for Michigan traffic. MGQ, ACW, QAM, and WXO were heard in the Michigan Flea Power Field Day Contest. YLA is a regular member in the Buzzards Roost and reports the loss of a rotary beam by CQG in high winds and EOI as a new operator in the Negaunee area. SCW has no intention of permanently forsaking his bug in favor of 28-Mc. mobile operation. AYV has qualified for WAS and is getting good results with an 812A. TRN is making many 14-Mc. DX contacts. DED is using a new 300-watt rig. UES is in his new QTH. YER is working on 14-Mc. rig with p.p. 807s. NKK has his new antenna in the new QTH. SFA/9 is looking for contacts with the old gang. FX is now an authority on 1306 reconversions. Traffic: W8RJC 1034, NOH 624, YMO 151, CRH 98, YNG 57, LU 54, 2LMB/8 50, TDO 46, AQA 44, DLZ 28, UGD 25, LR 18, UKV 18, ZWM 18, BXU 10, WXO 10, ZBT 9, ZHB 9, YLA 8, SCW 7, AYV 6, YER 3, TRN 2.

OHIO — SCM, Dr. Harold E. Stricker, W8WZ — Asst. SCMs, Charles Lohner, 8RN, and C. D. Hall, 8PUN. SEC: UPB. PAM: PUN. RM: PMJ. WZ attended the combined meeting of the Springfield and Dayton Clubs and the meeting of the CORC where Hal Bird, the Great Lakes Division Director was the principal speaker. He explained the League policies very thoroughly. Also attended the CARA and GCARA Hamfests, both of which were gala affairs. There were about 500 people present at the CARA Hamfest and about 500 stags at the GCARA Hamfest. The CARA Hamfest was marred by rain but nevertheless everyone had a good time. The GCARA Hamfest being a stag affair, the entertainment was varied. The committees in charge of both Hamfests should be congratulated on their work, especially the eats committee of the GCARA. DPE and WZ gave short talks at the GCARA affair. New appointees are BBK as OBS and BHE as OO. The Buckeye Net on 3730 kc. was officially opened on October 3rd at 6:30 P.M. with many stations checking in. The Slow Speed Net operates on the same frequency an hour earlier. From the *Carascope:* WYH, the EC, has lined up the following stations for emergency work in the different bands: WAB, 3.5 Mc.; QQ, 3.85 Mc.; IVC, 7 Mc.; ABO, 28 Mc.; and CPA, 144 Mc. Get in contact with these men. From the *Q-5:* JRG has new 10- and 20-meter beam. New hams in Springfield are EOD, EPA, and EOV. From the *AMC-ARC OVER:* ABL is in charge of training committee for would-be Class B operators. The following sent in good OO reports: EQ, JRG, JFC, BIF, UDR, and EDX. WRN kicks in that 144 and 50 Mc. were quiet but CPA added West Virginia for 9 states on 144 Mc. WRN is up to 12 and BAX has nine states. RJD built himself a v.h.f. grid-dip oscillator that works nicely from 26 to 250 Mc. HRN has new three-element 14-Mc. beam. YFJ is building 200-watt final for 28 Mc. TSA got a 2250-volt jolt through his mike and still is around. *BE CAREFUL.* BZX has new NC-183. QUM and QAD both have new antenna towers. EIB has new Collins transmitter, and EYH won a 310B3 at the GCARA Hamfest. UW received license as radio officer in merchant marine. DAE is working the ESN and SSN Nets. BFB worked all districts except WI from mobile rig in Florida. LBH has three-element 50-Mc. beam stacked above his 14-Mc. beam. BLI has new ST-202A. Don't forget to check the change in figuring traffic totals. Don't forget to send in your certificates for endorsement when they are due. Don t forget to send in your station activity report every month. Please send on the first or the second of the month. Fall is getting underway; QRN is abating but not too much; activity is on the upswing and let's look forward to a very active fall and winter season. Thanks a lot for your coöperation so far. Traffic: W8FFK 118, DAE 111, UPB 111, YFJ 38, WAB 26, BEW 14, RN 13, ZAU 9, DZO 6, EJX 6, PUN 5, HOX 4, IVC 4, DXO 2, TAQ 2.

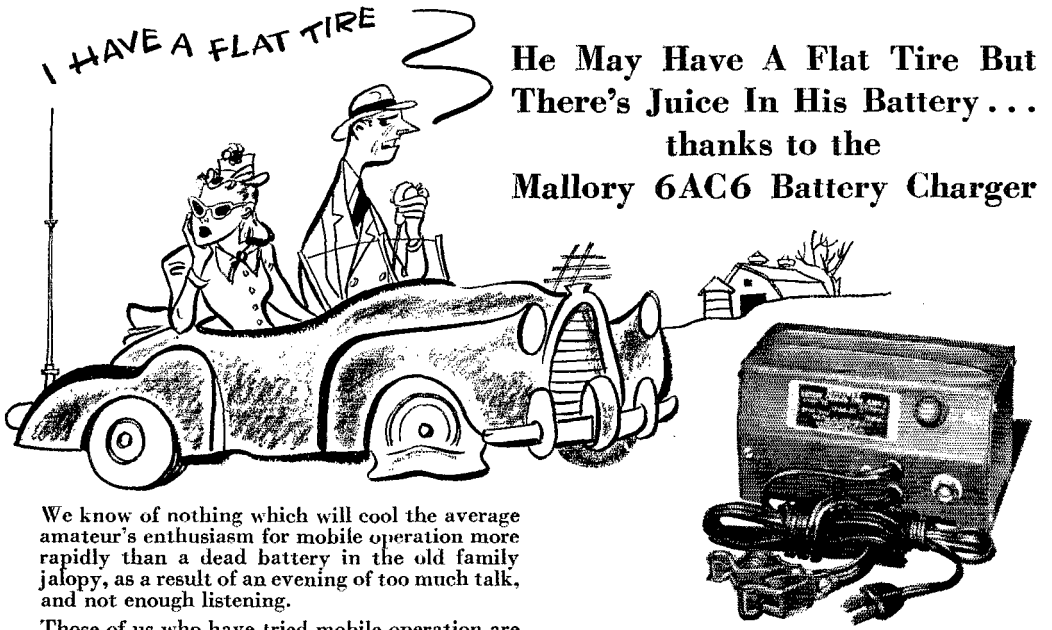
HUDSON DIVISION

EASTERN NEW YORK — SCM, Fred Skinner, W2EQD — SEC: G. W. Sleeper, W2CLL. The NYS Net is operating as part of new national traffic plan with two sessions, 1900 and 2200 EST. The slow-speed NYS Net operates at 2030 EST with PHO as Net Manager. Both nets use 3720 kc. New appointments: PHO as RM, QGH as EC for Larchmont, and WIK as OO. LRW is manager of new Second Regional Net. CLL is assistant manager of new Eastern Area Net. AWQ has just started at Clarkson Tech. NHM was at Cape Cod. ZEQ operates USNR K2NAJ. ZIS is home from the sea and doing FB on 28-Mc. 'phone. HMM is QRL with the jr. operator. VH is learning to play his new Hammond organ. GYV is building 700-watt rig for 50 and 144 Mc. GFH has new hilltop QTH in Scotia. JZK tied the feeders of his 80-meter doublet to ground before going on vacation and found the connection welded. There was no other damage, fortunately. RYT is a member of the Radio Amateur Scientific Observers, an organization investigating v.h.f. propagation. ACY is up to six states worked on 144 Mc. The SARA Field Day emergency stations had 239 contacts. PFU has a "hot" new converter for 28 Mc. 9ESM is now 2ESM and is operating on 14 Mc. at West Point. Traffic: W2CLL 257, LRW 67, PHO 44, EQD 33, TYC 3.

NEW YORK CITY AND LONG ISLAND — SCM, George V. Cooke, jr. — W2OBU — SEC: A. E. Hayes, BYF. RM: Pop Newman, TYU. Here is my first report and hope the mail keeps coming. AEC reports have been at a low because of summer vacations. Activity has been resumed with the appointment of BYF as SEC. OHE is EC for Brooklyn and reports full activity with increased members. Nassau rolls along with excellent results. Suffolk functioned without an EC but has turned in a good showing. SYW now is EC for Queens. Let's have some good drills, Ray. ALH and VHS are happy now with ORS and OPS appointments. VNJ is a full-fledged RM for SSN. Keep up the good work, Vic, and latch on to those BPL cards. UCU is working hard on keyer and puncher and desires word from teletype boys. BO made a 7300-mile trip through the West but got in stride immediately by working 12 hours aiding in the Florida Hurricane emergency. KV4AF/2 now is in Oakland, Calif.; NLI's loss, but Ted's gain. CSO comes up with DXCC 523, 128 countries confirmed, and now is OO and ORS. Let's hear you on NLI

(*Continued on page 74*)

MALLORY HAM BULLETIN



He May Have A Flat Tire But There's Juice In His Battery . . . thanks to the Mallory 6AC6 Battery Charger

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.

Reg. U. S. Pat. Off.

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MALLORY

soon. RTZ, CP, promises full activity in NLI from home QTH this season. New OO certificates have been issued to WHB, JYR, and EC. RWQ packs a wallop now with 4-125As. Turn your receivers down, boys. AIS erected a new steel tower 50 feet high for 14 and 28 Mc. BQP is a new call in the section. He was K6POZ, and requests word from former AACS members in NYC-LI. His address is 194 Aspen St., Floral Park. MHE has new VF-152, is OO Class 3, and is looking for 420-Mc. enthusiasts. TUK, QBS, and ZNM are QRL with school but manage to find some time to handle traffic. GG is very active on 3.5- and 3.85-Mc. mobile. LPJ comes up with new 813 final; for SS contest work, he says. Hi. YIR got his ORS appointment, and is QRL with studies, but gets in some net attendance. JYR says he has nothing to report but he went out and made BPL. Don't be so bashful, Walt. OUT is seeking new or slow speed members for the TLS and liaison with slow speed nets. Look for him on 3545 kc. at 2100 EST Mondays through Fridays. TYU's traffic score this month broke all his previous records and he promises to break more before long. Pop has NLI Net set up for National Traffic Plan and activity really stirring. The Huntington Radio Club now is affiliated and is building up a plan of interesting activities for the coming season. QFH got a 144-Mc. rig and will be hopping between there and 3.5-Mc. c.w. PF is building up good traffic scores on MARS and hope he clears some of it through local nets. LGK passes the word along that the Tu-Boro Club is growing and now is open for new members. Meetings are held the 2nd and 4th Fridays at 87-13 87th St. Woodhaven. The last shindig was a real get-together for the local gang. The Bronx Council of the Greater New York Councils is having an exposition on Nov. 10-11-12 at the Kingsbridge Armory. A booth will be operated by W2BRA. Amateurs are asked to look for the signal and special QSLs. Traffic: (Aug.) W2TYU 3130, JYR 508, VNJ 442, BO 274, OBU 48, RTZ/2 16, YIR 14, PF 12, RQJ 12, ZNM 9, TUK 4, YDG 4, EC 3, LPJ 3, OUT 3. (July) W2LGK 3.

NORTHERN NEW JERSEY — SCM, Thomas J. Lydon, W2ANW — The N.N.J. c.w. net meets Monday through Sat. at 7 P.M. on 3630 kc. J. N. Net meets Monday through Friday at 9 P.M. on the same frequency. The N. J. 75-meter 'phone net meets Sunday at 9 A.M. on 3900 kc. AWY, formerly 8WXA, is reporting regularly in traffic nets. NCY received 35-w.p.m. sticker for C.P. UWK has a new Collins 75A and is putting up a 65-footer to hold new four-element beam to snare those DX contacts on 28 Mc. MTV now has t.v. instead of T.V.I. QF has new exciter and five-element beam. SUZ and CCC are with WJZ. BUX spent his vacation at Lake George and kept two schedules daily with home. MGE finally has all the bugs out of kw. YOB has new receiver and converter. OUS is on 160 meters with 20 watts. KMK is on the 50-Mc. band. DIB has rebuilt his ARC-5. Traffic: W2OXE/MM 444, KUS 208, CWK 79, EWZ 78, NKD 65, KMK 7, NIY 5, CJX 4, LOP 1.

MIDWEST DIVISION

IOWA — SCM, William G. Davis, WØPP — The Iowa 75 Net held its annual picnic at Ames Aug. 21st. ATA reports a new net meeting daily on 3620 kc. at 7:15 P.M. The Council Bluffs gang is after the 144-Mc. record of BUP, of Elliott. SEE spent his vacation in Canada. After returning home he got a new Olds 88. DIX is a new ham at Council Bluffs. CJD has Collins 32V-2 and a new station wagon. GEP is back at Centerville. BQJ is a new ham at Clear Lake. BHO and AXH attended the North Iowa Hamfest at Mason City Aug. 7th. WLL now has his Dad working for his ham ticket. Looks like a contest for receiving c.w. between the Clinton Club and the Dubuque Club is in the offing. WML is industrial electronic super at Maytag. Members of the Campus Radio Club at Ames presented VDE, their engineering professor, with a fine pen and pencil set at the Iowa 75 picnic. RAC met with a serious accident in South Dakota on his way home from vacation trip. ENG, formerly of Emporia, Kans., is a new ham in Des Moines. AEH is working on crystal-controlled VFO. VRA maintained a schedule with NXW from International Falls, Minn., while on three-weeks vacation. The Mike and Key Club of Boone met at NEQ's Sept. 2nd. PP vacationed in the Rockies. On return he visited SEE and CJD at Council Bluffs and the Mike and Key Club at Boone. PUR has built a new home with built-in ham radio. ZQF visited YKN while on vacation. Vacation time is about over, fellows, so let's get those activity reports in and keep Iowa on top of the heap. Traffic: WØNYX 38, VRA 33, YDN 14.

KANSAS — SCM, Earl N. Johnston, WØICV — WGM, our new RM, says QKS and QKS ss c.w. nets will operate same schedules as last year — QKS on Mon., Wed., and Fri. at 1845 on 3610 kc. and QKS ss Tues. and Thurs. at 1845 on 3610 kc. NCV said business wouldn't let him do justice to the job of RM this year and he asked to be relieved. WGM did a fine job organizing and running the QKS ss last year as well as being active on QKS so we are assured of a good RM. More stations are on the active list of the Kansas 75 'Phone Net than ever before. The schedules are the same as last year — Sun. 0800, Tues. 1230, Thurs. 2000, and Fri. 1230, on 3920 kc. BNU and NXJ have their 32-V2s back and LYF still needs his antenna put up. DRB reports for the Olathe gang. The Navy GCA Radio Club has the call WWC and is active on 160 to 10 meters. The Club has two ART13s, a pair of 813s modulated with 805s, a 14- and 28-Mc. rhombic, and a pair of 144-Mc. walkie-talkies for emergency work. QQ, of Mission, has TBS-50 on 3.85-Mc. 'phone in the car. FLZ and ICV have gone 3.85-Mc. mobile also. WYE, one of BSP's students, will be on 28 Mc. soon. CRN, of Emporia, has new 28-Mc. three-element beam. HYC, formerly of Eldorado, has moved to K.C. LIX, of Independence, who entered the hospital Sept. 5th for an operation, should be out now working on his BC-348. IPI, of Olmitz, reports 50-Mc. activity July 18-26. The KVRC gang held a picnic at Lake Shawnee Sept. 2nd with a record turnout. SOE, the Red Cross station in Wichita, is very active on 3.85 Mc. Traffic: WØKXL 111, NIY 95, LIX 9, BNU 3, ICV 3.

MISSOURI — SCM, Ben H. Wendt, WØICD — ICP has been selected as the Assistant Communications Manager, 'Phone at ARRL Headquarters. Mac's fine work in the Missouri section will be long remembered. Appointments and renewals: GBJ as ORS, GZR as OBS, YKR as EC, GZR as OPS, and WRD as EC. DEA's QTH still is Joplin instead of St. Louis, as reported in Sept. *QST*. All interested stations are requested to report in on the Missouri Traffic Net Mon. through Fri., 7:00 P.M. CST, 3755 kc. The Missouri Emergency Net, 3905 kc., broke all records in handling an urgent message between Kansas City and Hartford. Missouri amateurs recently have had many opportunities to enjoy themselves at various picnics in addition to the great Midwest Convention at Omaha. The DAN'L BOONE Radio Club was organized at Columbia with AOP, pres.; FRG, vice-pres.; and QXO, secy. Mr. Handy, from Headquarters, honored the Springfield Club with a visit. ICP and DEA also were hosts to Mr. Handy. A number of 3.85-Mc. mobile rigs are springing up in the section. GCL invites all CAA stations to report in on the CAA Net 3960 kc., 8:00 A.M. CST each Sat. OMG is the proud recipient of an award as Sweepstakes winner on 'phone. 6BXY, formerly ØYHZ, sends greetings to all Missouri hams. OUD found valuable information in March '48 *QST* on revamping the vacuum-tube keyer to give improved break-in. NNH is helping several SWLs to become hams. LSA is a new ham at Poplar Bluff and is pulling teeth on 7, 14, and 28 Mc. QXO has replaced the burned-out plate transformer on his big rig. HWL has QSYed to Los Angeles and now is 6GUN. QMF helped his neighbor install a t.v. receiver and hopes to maintain good friendship. Back at Mo. U. we have PME and CKS. RMX has QSYed to New Madrid. CGZ has built a new receiver. Traffic: WØQXO 851, PME 300, YSS 147, WAP 64, CKS 35, QMF 9, ICD 8, ICP 5, DEA 3, GBJ 3, PTG 2.

NEBRASKA — SCM, William T. Gemmer, WØRQK — Must have been the summer heat and rebuilding activity, as the reports hit an all-time low. Congratulations to GMZ. Sewall made Brass Pounders League the hard way with 69 deliveries in one month and during the summer lull at that. FMW received second W.U. award for last winter's work and also membership in the Old Timers Club. FMW built low-pass filter for Single Signal c.w. The QRM Club now is affiliated with the ARRL. From SENRC's new secretary-treasurer, AYM, comes news that WKP has been elected president and LPU vice-president. The Nemaha Valley Net will swing into operation Sunday morning at 8:30 A.M. with NWC at the controls and LPV as alternate on 3983 kc. Thanks, Margaret, and congratulations on the new job. FHA has new Kato light plant for this season's operating. HBS believes DX should be good on 160 meters; he says KCOW (1400 kc., 250 watts) is getting reception reports from ZL Land. The QRM Club's picnic was a big success with 150 in attendance eating free watermelon, drinking pop, and playing bingo. HLX dropped in on the Hamfesters picnic in Chicago while touring the East. On August 22nd VEC worked BIP, DVV, and QXR and heard RNC, ZJB, and ZHB on 144 Mc. Traffic: WØGMZ 270, LJO 22.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Walter L. Glover, W1VB — The Connecticut gang participated in emergency "Operation Lookout" conducted by the State Police during the week of Sept. 11th, which included messages direct to Commissioner Hickey in Dallas, Tex. The whole affair was quite successful. IIN has left Headquarters and the section to become editor of *CQ*, and now is 2BYF. IKE is building a new house in Avon. BVB maintained schedules with RGB/1 and BEQ/1 on 7 Mc. during the summer. QIS received his 35-w.p.m. certificate. The Norwalk Emergency Corps is using the call SGZ. QAK is in the hospital for a short stretch. The CARA boys handled traffic from the 963rd Field Artillery Battalion, while they were on active duty, to the officers' and men's families, and received a commendation from the battalion commander. LKF is on vacation. DAV has increased power with a T40 in the final. Perce Noble, BVR, has been appointed manager of the first regional net, which replaces NEN. It will meet at 7.45 P.M. EST on 3645 kc. CN will meet at 7 P.M. EST on 3640 kc. and probably again later in the evening to conform with the new

(Continued on page 76)

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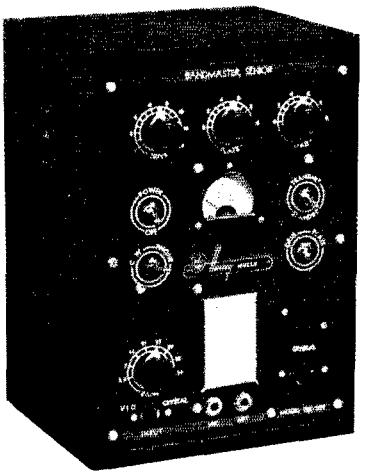

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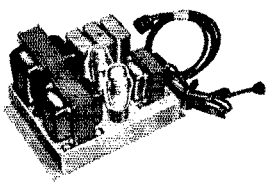

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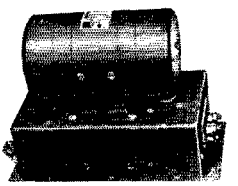

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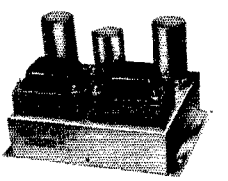

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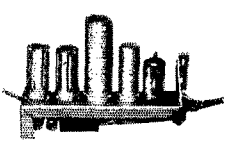

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traffic plan, when details have been worked out. HYF promises a bulletin, probably before you read this, with the necessary details. Traffic: W1IIN 167, RWS 123, AW 113, BIH 83, BVB 64, QIS 21, ORP 18, QAK 17, RXL 14, HYF 12, KV 12, CTI 5, IKE 4.

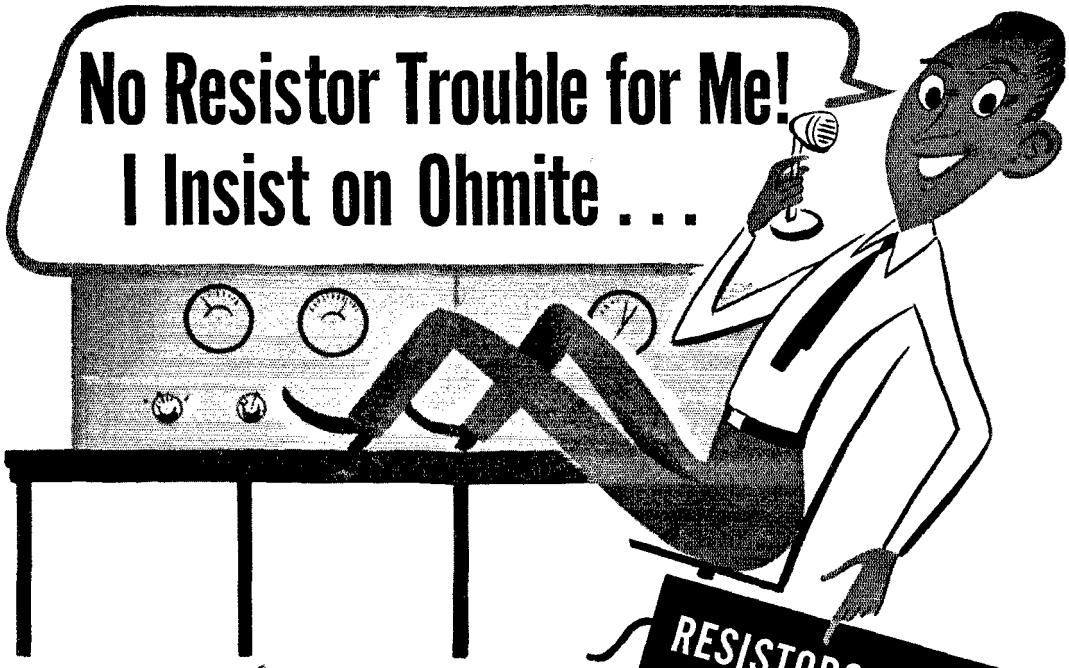
MAINE — SCM, Manley W. Haskell, W1VV — New ORS appointee is BWR, Norman A. Partridge, Augusta. Norm used to be in Maine, then he moved. Now he is back and all hands hope to QSO soon. NXX, our RM, reports that LKP, NGV, and himself handled lots of traffic between the Schooner *Bowdoin* and Maine people with QMJ, as TON. Spill, of NGV, reports that a new ham in Augusta is SIN. NGV's 250-watter is about ready to hit the ether waves. LKP had the following amateurs call on him the past summer: AUM, CB, OIJ, KID, PTL, 2ANM, and 8BMY. 8AQ was there for two weeks, with PZ there for all summer. LKP will have an 813 if plans work out. The PAWA entertained the Oxford County Radio Association on Sept. 7th when the up-State boys were in Portland. A return visit will be made Oct. 6th when the PAWA gang will go to Oxford. IGW has been appointed EC for the Lewiston-Auburn 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. QUI has accepted the EC appointment for the Portland area and is working closely with the SEC. There is a large possibility that the Portland Chapter, Red Cross, will have its own radio equipment, same to be operated by a trustee of the local club. Traffic: W1NXX 160, NGV 78, LKP 42, VV 12, QUA 2.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — QMJ has taken over the job as Route Manager for the 3.5-Mc. band and the Net on 3745 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 hams coming 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 have had their appointments endorsed: LJT, HP, EK, and QQL as ECs; LJT and PLQ as OES; ALP as OBS; MME as OPS; EMG and HWE as ORS. 9RSM is living in Cochituate and has applied for ORS appointment. RBZ is a new ham in Chatham. FTH, in Lexington, is on 3.5 Mc. WI is on the Eastern Mass. Net frequency at midnight. Anyone else home at this time? EK has a new QTH. QQL has a rig on 144 Mc. at Red Cross Headquarters. RAR is an old-timer from back in 1906 and now has Class A license. HX will have mobile rig on 3.85 and 14 Mc. 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 Topsfield Fair. QJB is keeping schedules and playing chess. Newcomers are 3ONB, BEZ, and QIS. EMG has portable rig on 3.5 and 7 Mc. BGW has TBS-50 in his car. The T-9 Radio Club met at KON's QTH. Skip Dodge just joined. OBN is on 7 Mc. and will have a 4E27 final. PLQ has a Q-5er and 150-watt job for several bands. NBS will have a rig on 28 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. GOU has a certificate for working all Chile districts on 28 Mc. FJW, in East Boston, is on 144 Mc. KPB and RGG also are on. The T-9 Radio Club held its annual boat ride. SAI has a rig in his car. LNE is going on 7 Mc. KWD plans new beam and 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 QQW, pres.; RVA, vice-pres.; JUL, secy.; RHX, treas. AMK, in Roslindale, and SAR, in Randolph, are on 144 Mc. EK has Workshop beam on 144 Mc. OMU has 522 on 28 Mc. RM is working on ARC-5s. PBM has Harvey-Wells TBS all-band transmitter. Traffic: (Aug.) W1QMJ 627, LM 87, QJB 44, TY 39, EMG 32, DMS 26, WU 16, MDU 11, RS 8, BDU 6, RBK 5, PU 4. (July) W1QJB 52, RS 26.

WESTERN MASSACHUSETTS — SCM, Prentiss M. Bailey, W1AZW — 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 in 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. Perce has a new 100-watt final for stand-by. GZ leads the section in traffic this month. BDV is all set for an active season after a fine summer lay-off. JE spent some time in the hospital for a slight operation. Hal will resume OBS transmissions on 7275 kc. Mon., Wed., and Fri. at 10 A.M. A new 500-watt final will be used for these transmissions. EOB has new final 600 watts and has added 21 new countries to his DX list. KFV and JYH are watching Vic with an eagle eye these days. RZG wants ORS appointment. IBZ has new 500-watt final a.m. modulated for all bands. Seems like the summer months have been busy ones for most of the gang. MUN is starting on a 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. RHU is ready for WMN this season. Russ and Nes, of GZ, have been about the only real active traffic men throughout the summer. Everyone had a swell time at the Hampden County Radio Club picnic. AVK and PDF are back on 3.85-Mc. 'phone. GP and ARA have teamed up and have started WTXL in West Springfield. SIT is a new ham

(Continued on page 78)

No Resistor Trouble for Me! I Insist on Ohmite . . .



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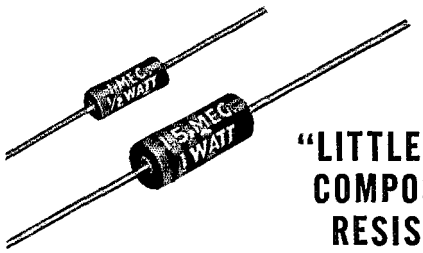

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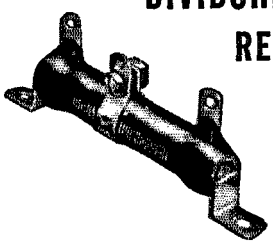

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in Springfield. OBQ has changed his position. He now uses his sales technique at Hatry and Young. LKO had a tough time with illness during the summer. AZW rebuilt his rig in aluminum to combat T.V.I. Let's get into the active season with a bang. West. Mass. Net meets on 3760 kc. Mon., Wed., and Fri., 7 P.M. and 10 P.M. *Try to make the nets* and handle some traffic! Traffic: W1GZ 56, BVR 21, RHU 20, JE 9, RZG 6, EOB 2.

NEW HAMPSHIRE — Acting SCM, Clifton R. Wilkinson, W1CRW — 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. 1PVF/1 reports in the Net using BC-474 receiver and three 6L6s in transmitter. ORN is back at U. of Kans. SIC, a new ham in Whitefield, will be on the air soon. SAL will have more power soon. Joe does a swell job as it is. EWF hopes to have new 14-Mc. beam finished before it gets too cold. That boy is really after the DXCC. POK does a nice job as OO. Also daughter Nr.3 is trying to take over. QGU is back in N. Y. C. until next summer. 1RFP/1 is back at Hanover. CRW is mobile 'phone and c.w., all bands. QJY reported in the traffic outlet. Hope this happens more often. QJX reports in the Net often. We have no Nashua outlet. How about it, gang? BT is on 3.85-Mc. 'phone. This is all for now, gang, as there are no more reports. Would like to have reports of anything that you will send me. Traffic: (Aug.) W1CRW 281, SAL 19, QJY 12, QJX 10, KYG 3, EWF 2, PVF/1 2. (July) W1SAL 20, EWF 4.

RHODE ISLAND — SCM, Roy B. Fuller, W1CJH — AQ has a net going Sundays at 0930 on 3525 kc. You are invited to drop in on them and get acquainted. Particular invitations are issued to such old-timers as AMD, AOP, BOP, BOY, BZI, and CMY. NAARO's new club station is now active on 29,080 kc., the Club's net frequency. CPV and BGA now sport the same QTH without QRM. BGA 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. EJ is operating a movie projector but is active Sundays on the AQ Net. JER procured radiotelephone 1st-class license in two hours and a half. Something of a record, eh? MJL's new final is a mechanical beauty, p.p. 813s. QOG is experimenting with beams and promises something hot for the coming DX season. BFB is planning separate finals for the contests. NCX will give c.w. a whirl after four years on 28-Mc. 'phone. QBX is engineering at WPJB. LWA promises activity in the SS. OHR is active on 14 and 28 Mc.

VERMONT — SCM, Burtis W. Dean, W1NLO — W1JEN/K1NAG has been appointed EC for Chittenden County and CGW for Franklin County. AVP and BJP have had their OO appointments renewed for another year. FPS has joined the AEC. MLJ is building up rig for 29-Mc. 'phone. KJG is OPS. ELJ has his ORS appointment. PSD has Meissner Signal Shifter. (No more chirpy note.) NLO recently visited KRV, MLJ, MMU, and AAJ. VTN is operating Mon. through Fri. at 7 P.M. EST with KRV as RM on 3740 kc. More outlets still are needed in the large cities to give a good coverage of the State. Vermont has lost another Old Timer from its ranks. Harry Page, W1ATF, passed away this summer at his home in Hinesburg. Harry in the early days was SCM and OO and was active on 160 and 80 meters. In late years Harry had taken up astronomy as a hobby. 30 Harry. Traffic: W1KRV 19.

NORTHWESTERN DIVISION

ALASKA — SCM, Charles M. Gray, KL7IG — 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 KL7s are coming back on the air. GV is leaving for a trip outside and he is including a portable rig with his gear. He will be on c.w. with an HT-18 to an 807. 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. Tintinger, W7EGN — SEC: CT. RM: COH. PAM: CPY. Helena CAP members BIS, IKV, JKR, and EAI spent four days with little sleep in rugged mountain country on the disastrous Mann Gulch fire that claimed the lives of thirteen fire fighters. The Forest Service did not require the offered CAP gear. However, the experience of the CAP amateurs was vital in helping to establish a radio network linking all camps with base headquarters and maintaining a constant flow of important fire traffic. GFT left Great Falls to be chief engineer of the b.c. station at Lewistown. While vacationing in South Dakota, CAL scheduled his brother-in-law, HBM, at home with portable gear. GCS, at Sun River, has been reporting into the regular 144-Mc. net schedule in Great Falls using a mobile 522 job from various outlying locations. NOZ is a new call in Polson. NRJ and NPV are new calls in Missoula. KIY has moved from Poplar to South Dakota on a Superintendent of Schools job. CT has completed a new exciter using a Clapp oscillator. KOG is now ready for emergencies with a 474 surplus for 3.5 and 3.85 Mc. and home-brew

(*Continued on page 80*)

Hand Size

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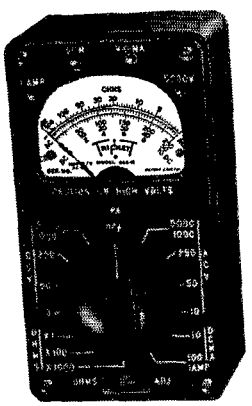

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RANGES:

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A.C. VOLTS: 0-10-50-250-1000-5000, at 1000 Ohms/Volt.

D.C. MILLIAMPERES: 0-10-100, at 250 Millivolts.

D.C. AMPERES: 0-1 at 250 Millivolts.

OHMS: 0-3000-300,000 (20-2000 at center scale)

MEGOHMS: 0-3 (20,000 Ohms center scale)

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In Canada: Triplett Instruments of Canada, Georgetown, Ontario

28-Mc. mobile in the car. If you have emergency gear, or any ideas on EC work, drop our SEC a line. Traffic: W7CT 31, EGN 2.

OREGON — SCM, J. E. Roden, 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 perk right. Coos Bay: EJF is new EC and soon will have a kw. going. Also a new club is being formed here. Eugene: FKS, our RM, is developing a new Oregon Slow Speed Net on 3585 kc. not to exceed 15 w.p.m. straight key, catering mostly to new hams and 'phone operators who want to brush up on the code. Medford: HLF, our SEC, reports that the Medford Club 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 Hamfest at Emigrant Park, with Baker Club members ably assisting. Pendleton: LXR is new OBS. The Pendleton Club kept two-mile Round-Up parade moving by use of mobile equipment. Portland: ESJ attended the Vanalta Division Convention and came back with some FB prizes. HDN has a second call, NSD, for emergency work from his shop. EKL lost the roof from his house by fire. KEG is active on MARS, OEN, and all Trunks when he has traffic. FU is back on after a siege in the hospital. HVX has a pair of 70-ft. poles. LT now is mobile on 3.85 Mc. ACZ was maritime mobile at Astoria Salmon Derby. Philometh: APF is showing the boys that he can use a mike as well as a key. Tillamook: IDP works 3.85-Mc. mobile with FB results. Traffic: W7QGN 1673, APF 199, HDN 184, KEG 181, HLF 155, FKS 81, JRU 80, DIS 58, GNJ 53, LT 40, HVD 26, KL 26, FY 24, MQ 24, BDN 10, HJI 10.

WASHINGTON — SCM, Clifford Cavanaugh, W7ACF — SEC: KAA. RM: CZY. PAM: CKT. EGR, Kittitas County EC, sends over the following news: JAS has moved to Ellensburg to attend college. HRU got his license back and is hard at work trying to get beam working on 28 Mc. FFR has been transferred to Baker, Ore. EG is getting back on the air with HT-18 exciter. EGR himself spends his spare time on WARTS Net. HM, formerly 6HU, has moved to 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 other purposes than radio for the past six months. LFA handled plenty of fair traffic this month. ETO has a new HT-18 exciter and it sounds swell. FWR is back on 28 Mc. again. FWD reports his new tower and beam are up and working fine. The following stations made the BPL: LFA, CZY, ZU, FRU, BX, FIX, AMZ, KCU, CKT, and KWC. Ten stations in one section is something of a record. KNV is getting ready to go back to college. LIL is doing a fine job handling all the WSNet traffic for Tacoma. JZR is building a den for his gear; he is making it noise-proof and YF-proof. GEU, at Walla Walla, is being transferred to Medford, Ore. KAA, the SEC, is getting out a fine booklet on his AEC communication plans. CZY, the RM, says that a lot of this fall fair traffic is being incorrectly handled by several of the boys. Let's read the booklet, *Operating an Amateur Radio Station*, fellows, and get away from this stuffing the ballot box business. It makes it tough on all of us. NMR is new WCWNet member. ZU is the happy man. He made the BPL again. FRU set up one-man radio show for Bothell Chamber of Commerce in connection with what they call Appreciation Day. He handled a nice stack of traffic. EAU finished his new VFO. FIX is helping the RM put the National Traffic Plan into operation. GHI is building new mobile rig. AMZ is resting up after pounding brass for days at Southwest Washington Fair. CKT says that 4PL and 6CE are after his scalp in the traffic business. KCU is hunting for schedules with W6 Land. CWN still is on 14 Mc. Traffic: (Aug.) W7CKT 4530, CZY 2913, LFA 1189, KWC 745, BX 590, AMZ 583, FRU 567, ZU 510, FIX 324, KCU 283, LVB 230, HWK 164, BZR 160, ETO 90, KAA 90, FWD 79, LIL 77, ERH 47, EAU 41, JZR 32, KNV 23, EGR 22, APS 15, DGN 12, HM 4, CWN 3, FWR 2. (July) W7LFA 588, FRU 424, CWN 1.

PACIFIC DIVISION

HAWAII — SCM, Dr. Robert Y. Katsuki, KH6HJ — SEC: KH6AS. BW, our RM, reports the Pineapple Net is tying with national net activities and has become the Hawaiian Regional Traffic Net. Active members are PL, Port Allen, Kauai; BW, Honolulu, Oahu; and PX, Lahaina, Maui. QR, Honolulu, and RZ, Paia, Maui, joined the Net on 3725 kc. but QR has now gone to the Mainland to school. BW is no longer with CAA but is riding herd on 40-kw. transmitters at the Army station, WTJ. PL and UL regularly clear traffic from the West Coast. BA, QH, and LG have their DXCCs now. Congratulations! How about mailing me an activity report, fellows? Mahalo. Traffic: KH6PL 24, BW 13.

NEVADA — SCM, N. Arthur Sowle, W7CX — Asst. SCM, Carroll Short, jr., 7BVZ. SEC: JU. ECs: HJ, JVW, JLV, KSR, TJY, KOA, KWZ, ZT. VO is on 7 Mc. with old stand-by Collins. JOS works on 3.85 Mc. when time permits. 5HDY/7 is a newcomer in Las Vegas on 7 Mc. JU, SXD, and KJQ are on 7 Mc. SXD and TFF have installed 28-Mc. mobile. BVZ now holds an Old Timers certificate. QYK has

(*Continued on page 88*)


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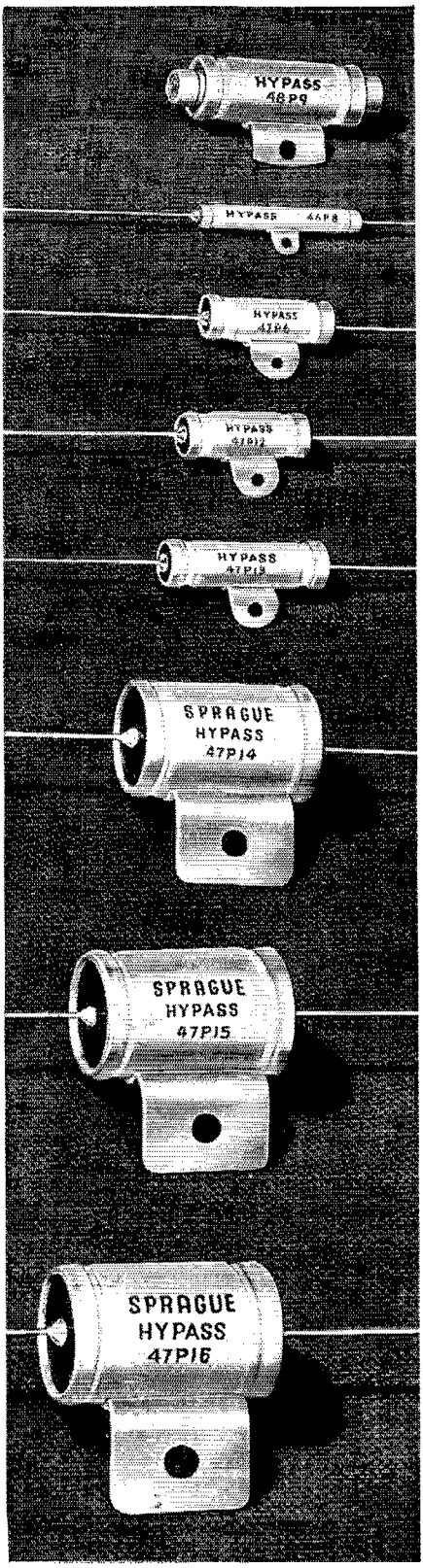
resigned as Elko County EC and KOA has taken over the job. The Boulder City EC boys are crystal-controlling some TBY sets on 28 and 50 Mc. for net operation. ZT is active on 7 and 14 Mc. as well as working on Civil Air Patrol station. TJY is active on Mission Trail Net. PST has been pounding a lot of brass. PWE is active in spite of a recent injury. JLV reports activity on 28 and 50 Mc. MRN has installed 28-Mc. mobile. MXJ has a new 40-ft. pole. BTJ has a 45-ft. vertical with flexible whip top. KHU has twin 3 on 20 with new poles. Traffic: W7TJY 72, JU 16.

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Asst. SCM, Geoffrey Almy, 6TBK. RM: CIS, OO: HC. EC: TFZ. IXH and ISX have been acting as NCS for the Pioneer Net because of the illness of REB, regular NCS. Frank reports that the prewar members of the AARS who are not eligible to join the MARS are organizing a club which is headed by DVD, of Oroville, as director for the first year. The first meeting was held on Sept. 12th. WNI is experimenting with audio filters to follow his super Q-5er. Earl had trouble in the last CD Contest from heating pad QRM. We know what you mean, Earl. BPT and family enjoyed a vacation trip to Salt Lake City the latter part of August. KIN worked AC4RF for some good DX on 14 Mc. Al now has 101 countries and 38 zones. WGO is going to triodes in his final amplifier. CFK is back on 14-Mc. c.w. at last. VIQ is spending the daylight hours on 28 Mc. AYL is on the air at his new location in the Santa Cruz Mountains running a kw. and reports that receiving conditions are very good there. Traffic: (Aug.) W6BPT 123, ISX 103, NW 36, WNI 10, RFF 4. (July) W6LZL 8.

EAST BAY — SCM, Horace R. Greer, W6TI — Asst. SCM, Charles P. Henry, 6EJA. SEC: OBJ. ECs: AKB, EHS, NNS, IT, IDY, QDE, WGM. Asst. EC u.h.f.: OJU. RMs: FDR, ZM. On Aug. 25th John P. Jones, WKL, passed away. His many amateur friends will miss his smile and true ham spirit. BIL received #611 DXCC certificate issued Aug. 3rd. George also has cards for Chile WACE. CDA still is very QRL. DUB took in Mt. Shasta hamfest. CTL is doing a good job as an OO. YDI still is plugging along. FDR has been appointed director of the Pioneer Net. BF gets time for a little traffic each month. VDR still sticks to 7 Mc. CGG is trying 'phone and c.w. but can't make up his mind which he likes the best. BUY is very active on 14-Mc. c.w. August has been a very busy month away from radio for many of the gang. Vacations, etc., have slowed up ham activity to almost zero. OBJ is getting back to normal and is awaiting the set from Collins so that he can get back on the air. DON'T FORGET THE PACIFIC DIVISION CONVENTION IN RENO OCT. 29–30. This should be a bang-up get-together. If you work any DX and expect QSL cards suggest that you try sending TI a self-addressed stamped envelope with your call letters on it. There are plenty of cards here so there could be some for you. DYP can be found on the air at almost any hour of the day. IKQ is getting back in the swing of ham radio after a European trip and just finished up helping UPV with his new beam for 28 Mc. KZF is selling wire recorders. Do you need one? GEA must be on project 7a by now. 7SS, ex-6SS, was a visitor of the Oakland Radio Club at Sept. 1st meeting. Many of the gang were seen across the bay in San Francisco at the 5th Annual Pacific Electronics Show Aug. 30th-Sept. 1st. The show had products from over 200 National and Western Radio and Electronics manufacturers. The show was held along with the West Coast Convention of the I.R.E. PB is building new 14-Mc. beam. MEK can't wait to move to his new QTH. It might not be for some time as he has just bought the lot. We understand his antenna farm will be built first and his house next to fit the situation. Please send me any dope you may have by the 7th of each month. You can call GLencourt 1-2792 if you care to. Remember this is your space for any information you may have. Traffic: W6FDR 977, IXH 535, BF 25, VDR 18, YDI 15, TI 2.

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6NL — Phone JU 7-6457. SEC: DOT. CEC: BYS, SLX, KNZ. OO: WB. YC applied this month for his WAS and WAC certificates. Nice work and lots of DX, E.B. He also handled traffic for the schooner *Bowdoin* during the month. SLX reports the Humboldt Radio Club of Eureka is backing up the AEC program. Fine arrangements are being made for the club to purchase five 28-Mc. mobile rigs from the city to further AEC work. The Club's EC membership is growing steadily. BYS is taking a vacation from ham radio to take up art. Those desiring pointers on interior decorating may contact Bill. Yep, he is remodeling the home QTH. CHP moved to new location and is busy getting the rig set up again. JDP is having transmitter trouble but hopes to be on again soon. He is recovering nicely from a prolonged illness and feels the urge to say hello to the gang again. JDG is giving the rig the once-over for clicks. Word from KG6DI, Guam, gives the following mailing address for all QSLs and other ham correspondence: Box 100, Guam, Mariana Islands, c/o KG6DI. Although he has been very busy of late and very active in club affairs there he still is holding down his many traffic schedules including ARRL Trunk Line through 7CZY to Guam. Our former CEC, SRT, now is located in Pasadena and can be reached at 635 Herkimer Street, Pasadena 1, where he is practicing radiology. Doc is

(Continued on page 84)



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Catalog Number	Mfd.	Working Voltage	Size Diam. - Length	List Price
48P9	.1	250 a-c	11/16 x 1 13/16	$2.60
46P8	.005	600 d-c	1/4 x 1 5/8	2.15
47P6	.01	600 d-c	7/16 x 1 1/4	2.35
47P12	.005	1000 d-c	7/16 x 1 1/4	2.40
47P13	.01	1000 d-c	7/16 x 1 1/2	2.60
47P14	.005	2500 d-c	1 x 1 9/16	2.90
47P15	.01	2500 d-c	1 x 1 9/16	3.10
47P16	.002	5000 d-c	1 x 1 9/16	3.20

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limited to activities on 27- and 28-Mc. mobile for the present but is building a new c.w. rig for 3.5, 7, and 14 Mc. so you brasspounders keep a watch out for SRT as he is looking for contacts with the gang here. JWF has been working hard upholding schedules from CXO on M.T.N. and is doing a swell job of it in spite of summer QRN. Although QSL cards from CXO have been ordered for a long time, to date we have not received them, but those who are awaiting them may take heart as we have received word they are being shipped, and all QSLs will be answered. The R. C. station has been going a long nicely although we have a few finishing touches to put to the ten-twenty beam. A new program is being arranged so those of you who wish to help in the operating schedules will have something constructive to work at. Those of you interested in operating, please contact BYS for particulars, as at present our EC, DOT, has been inactive because of ill health. The August meeting of the San Francisco Radio Club was held Aug. 26th. The speaker of the evening was the well-known radio design engineer, John L. Reinartz, 3RB, who gave a very helpful talk on T.V.I., the cause thereof and some remedies. Demonstrations with various wavetraps proved of great help to many. The usual raffle with refreshments wound up a very enjoyable evening. How about more reports? Because of a change in my working hours I am unable to get around often, so please send 'em in before the end of the month.

SACRAMENTO VALLEY — SCM, Ronald G. Martin, W6ZF — Asst. SCMs: *Northern Area:* Ray Jensen, 6REB; *Central Area:* Willie Van de Camp, 6CKV; *Southern Area:* Robert Metke, 6SUP. SEC: KME. ECs: Met. Sacramento, BVK; Walnut Grove, AYZ; Dunsmuir, JDN. RMs: REB, PIV. OES: PIV. OBS: BTY, AF. It is with deep sorrow we announce the passing of Andy Mercer, ex-LLU. *Northern Area:* REB has had to relinquish NCS of Pioneer Traffic Net because of illness. GJF says the north country is a good QTH for 3.5 Mc. with some DX. Mt. Shasta Club's Hamfest was a huge success. K6NAY, Dunsmuir Naval Reserve station, has a big fall training program. *Central Area:* GERC held August meeting at QEE. GUX is a new ham in Chico on 3.5 Mc. AF is rebuilding his 7–14-Mc. rig. HBM is on 144 Mc. consistently. *Southern Area:* John Reinartz, K6BJ, gave T.V.I. lecture to SARC, with Roseville and Stockton Clubs attending. MYL and his XYL are on 14-Mc. nightly. VTL is on 3.85-Mc. 'phone. BHS is on 28- and 3.85-Mc. 'phone. PHQ is on 3.5-, 14-, and 7-Mc. c.w. and 28-Mc. 'phone. WZD and PFT are on 3.85-Mc. 'phone. Placer Radio Club held its Gala Picnic at Royer Park, Roseville. SUP is on 27 and 28 Mc. GYW, ex-6VV-CUN, is in Sacramento at KFBK. BTY is on 28-Mc. ZYV is new NCS for Sac. Valley Net, to tie in with ARRL Regional and Area Nets. GHN has new 28-Mc. beam. AK now has kw. amplifier. GDJ and QEO have new beams and steel towers. BCI is active in MARS. BVK put up beam for 14, 28, 144, and 420 Mc. KME is on 3.5-Mc. c.w. and 28–144-Mc. mobile. GQS has flea power on 3.5-Mc. c.w. AUO is experimenting with new type of 144-Mc. beams. WSI joined 28-Mc. Emergency Net. ZF installed new mast and 3.5-Mc. antenna for traffic operation. Traffic: W6MIW 64, PIV 44, ZF 36.

SAN JOAQUIN VALLEY — SCM, Ted R. Souza, W6FKL — Asst. SCM, James F. Wakefield, 6PSQ. SEC: JPS. ECs: VTZ, PHL, WBZ. ADB makes BPL for the first time. VTZ has been hard at work on a Clapp oscillator. KMI is working on emergency equipment. ZYR is becoming interested in 3.85-Mc. mobile. EJD and KUT just about have the Sheriff's Aero Squadron rig whipped into shape. IEM is a new OPS. Anybody want to keep him company? JPU and VIS are working GGM in Santa Cruz daily on 144 Mc. UBK is building a new ham shack. PDD is going 3.85-Mc. mobile. PSQ has a twenty-four-element silver-plated copper beam on 144 Mc. RFN and DBH are very active on c.w. but have T.V.I. problems. HIP and UWY are doing some experimenting on 235 Mc. EMX was on a Navy cruise to Mexico. CPT has a new quart-size rig. RWI and CPT are co-editors of the SARC *Flysheet*. FGY is a new ham in Fresno. GUZ has a new 60-foot pole in his yard. OHT is on 420 Mc. and is looking for a contact. EFS is on 144 Mc. KFJ is making his postwar debut into the fraternity. Welcome home, OM. The following hams are some of those most often heard on 144 Mc. in the Valley: EHN, GUZ, BUT, FYM, ERE, IFE, JPU, PSQ, UBK, JCB, EFS, IMZ, EPQ, API, EXH, and GQZ. There are others, too, so keep an ear out. Now that we're back in the swing after the summer slump, let's keep each other informed of what we're doing, fellows. Remember the reports by the first of the month. Traffic: W6ADB 747.

ROANOKE DIVISION

SOUTH CAROLINA — Acting SCM, T. H. Wood, W4ANK — The Columbia gang held a hamfest at Sesquicentennial Park Sept. 4th at which the S.C. Amateur Net (3.85-Mc. 'phone) was organized. ADE is Net Manager; DPN is Net Scribe. This Net meets Mon.–Fri. at 7:30 P.M. and Sun. at 8 A.M. and 3:30 P.M. Net frequency is 3940 kc. BPD, FM, and HXZ will be the NCS. The S.C. 'phone and c.w. nets will tie into the National Traffic Plan. The c.w. net meets Mon.–Fri. at 7 P.M. and 9.30 P.M. on 3525 kc. EGH is on 160 meters from Blair. EOZ is on 3.85- and 14-Mc. 'phone and on 3.5-Mc. c.w. occasionally. IYA is

(Continued on page 86)

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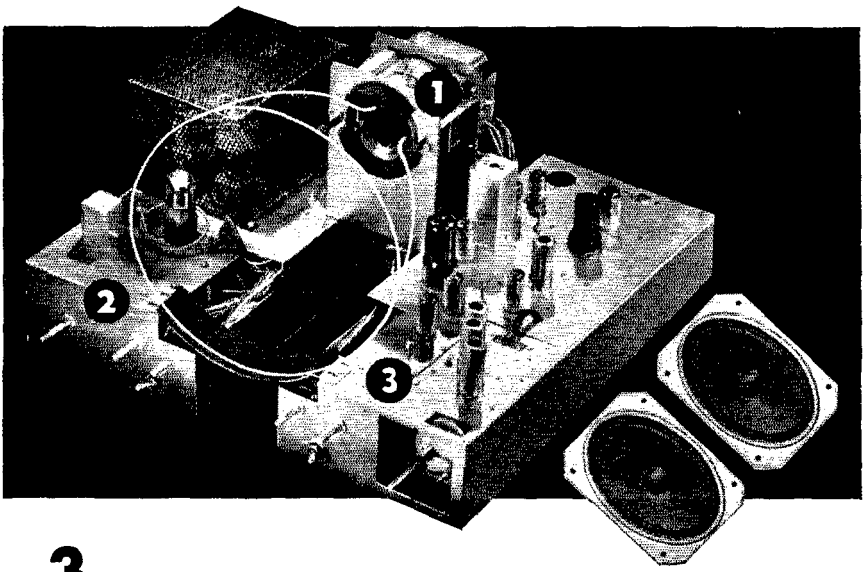

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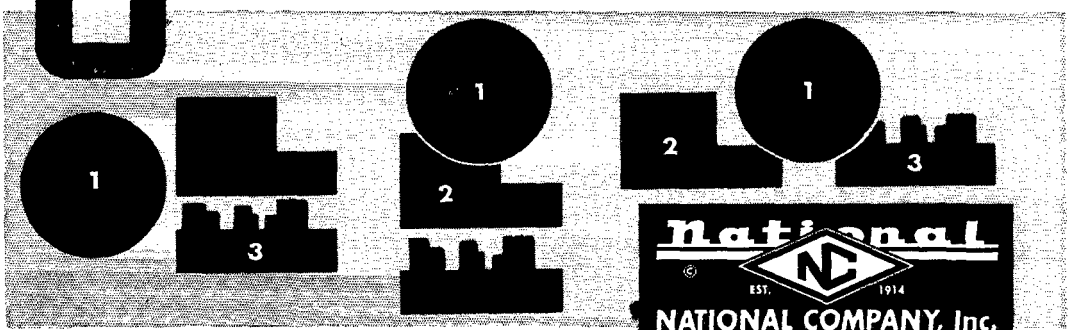

on 3.85-Mc. 'phone and 3.5-Mc. c.w. from Folly Beach. HEV, on 3.85 Mc., reports that the Columbia Club is taking U.S.O. traffic from Fort Jackson. VN has emergency rig in trailer. ADE runs 350 watts from Smoaks and reports brother Ed, OAP, on 7 and 14 Mc. from Columbia. IMW says the Clemson Club station is on 28 Mc. with 150 watts. Following are members of both the S.C. c.w. and 'phone nets: IYA, ANK, AUT, MRJ, and KEI. ILQ reports OZL as new in Greenville. FM is sporting a new beam. Drop a card to the SEC or SCM for a copy of the new S.C. Emergency Plan. BIZ broke into QSO to give PL a QSP on 7-Mc. c.w. en route to the Columbia Hamfest. Traffic: W4ANK 36, FM 12, JGM 7, EOZ 6.

VIRGINIA — SCM, Victor C. Clark, W4KFC — Asst. SCM, Elias Etheridge, W4KYD. VFN and VN, the section 'phone and c.w. nets respectively, meet nightly (expect Sat. and Sun.) with nice turnouts. VFN convenes at 7:30 P.M. on 3880 kc. and VN at 7:00 P.M. on 3680 kc. Net Control Stations on VN are: Mon. KFC, Tues. KYD, Wed. FF, Thurs. LAP, Fri. IA. Are you one of the 150 Virginia hams who reported on VN and VFN last season? Or one of the 80 who have qualified for a net membership certificate by attending at least 15 sessions? By all means plan to drop in on the gang this season! FF was VN's ol' reliable last season, attending 119 sessions. FV, IA, ITA, KFC, KYD, and LAP each showed up for more than 100 roll calls. IA, returning to active Navy duty, has found it necessary to relinquish his Roanoke Division directorship. Congrats to Ev for the fine performance turned in during the several months he served as Director. KVM, back on 3.85-Mc. 'phone, developed a new case of T.V.I. CVO, Portsmouth, is new OPS and OO, active on 14-Mc. 'phone. ØIC visited IA and KFC. NNN worked PY7WS for a new country on 3.5 Mc. CJS, ex-3CJS, transferred ORS appointment from Maryland and is active on 7 Mc. in Arlington using indoor antenna. EEP, 2QEM, now is located at Fort Meyer. MLH handled traffic in connection with Florida hurricane. KVM and LRI operated K3NRW during hurricane emergency period. ITA visited G2BSQ and saw British t.v. during recent visit to G Land. CC is on 3.85-Mc. 'phone with 30 watts. KQZ staged an FB steak dinner for SU, LXW, and KFC. SU has SCR-522 on 50 and 144 Mc. KYD assembled 12" t.v. set, and reworked VFO for fall activities. LMB now is in Alexandria. IOV reports T.V.I. down to a nubbin with 20-ft. separation between t.v. antenna and 10-meter rotary! PVRC members are greasing up their gear for all-out SS effort. The SCM will appreciate news of your activities. Traffic: W4KVM 87, CVO 20, YEJ 5, KFC 4, IA 2.

WEST VIRGINIA — SCM, Donald B. Morris, W8JM — VAN has been transferred to Virginia by his company. Murrill, formerly 8OK, now is on 28-Mc. 'phone from Tacoma signing 6OQ/7. BDD maintains consistent schedules on 14-Mc. 'phone with Asiatic stations. VKF, 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. c.w. 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 operation. BNL has been working 7 Mc. and taking West Virginia traffic for distributing on the 3.5-Mc. c.w. net. WSL has the DX fever along with doing a swell job on OBS work. PQQ continues to lead West Virginia in the number of DX stations worked. BWK and BTV keep Wheeling active on 3.5-Mc. c.w. CSF reports progress on EC 144-Mc. Net in the Charleston area. KWI worked 3.85-Mc. mobile on a trip to New England. KWI, YBQ, VAB, ESQ, and ATI have mobile 29-Mc. EC net going in Clarksburg. OIC is rebuilding to a kw. I am making a list of West Virginia stations. If you are active would appreciate hearing from you. Copies of the list will be given to Assistant Directors. Traffic: W8GBF 21, W8BNL 15, W8JM 4.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, M. W. Mitchell, WØIQZ — SEC: KHQ. RM: IC. 7WVZ, ex-9WVZ, is back in Colorado and still working for the D. & R. G. Railroad. He is new ORS, as is ZJO. ZJO rang the BPL bell again this month with a score of 2145! He handled all this on 7 Mc., too! The Colorado Slow Speed Net will operate on 3540 kc. at 6:30 P.M. Monday through Friday. The IUN Net will operate same frequency, 3540 kc., at 7:30 P.M. Monday through Friday. FPL is manager of IUN, and IC will be manager of Mountain Area Net, the frequency of which will be announced later. LZY is manager of CSSN and is NCS for TLS, western half. KHQ took a nice vacation visiting all the boys he worked on 3.85 Mc., which included a visit to yours truly. His itinerary took him to Wyoming, Kansas, all over Colorado, then back to work. He is trying hard to get a good emergency set-up going but response so far has been short of discouraging. MGY moved to Casper, Wyo., and has a new jr. operator. Yours truly visited SGG in Colorado Springs, and HDU, same QTH. Now is the time for all good hams to send in a report each month to his SEC and SCM. How about it, fellows. News comes mighty hard unless you send in that card. KHQ needs reports from you ECs so he can make out his report each month. I imagine he gets

(Continued on page 88)

W. Ben Wimberly
(W9IXD)

well-known amateur says: "For quick, accurate trouble shooting around my ham shack, the Simpson Model 240 Hammeter is indispensable. I've used Simpson equipment for many years."

RANGES: *Model* **240**

AC VOLTS: 0-15, 150, 750, 3000 (1000 ohms per volt)
DC VOLTS: 0-15, 75, 300, 750, 3000 (1000 ohms per volt)
DC MILLIAMPERES: 0-15, 150, 750
OHMS: *0-3000 (center scale 30)* 0-300,000 (center scale 3000)
ACCURACY: DC 3%—AC 5%
SIZE: 3"x5⅞"x2½".
WEIGHT: 1¼ lbs.
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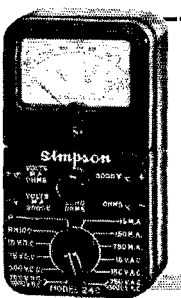
AMATEUR'S NET PRICE . . $24.60
Leatherette Case 5.00

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.

RANGES: *Model* **230**

AC VOLTS: 0-10, 250, 1000 (400 ohms per volt)
DC VOLTS: 0-10, 50, 250, 1000 (1000 ohms per volt)
DC MILLIAMPERES: 0-10, 50, 250
OHMS: 0-1000, 0-100,000
ACCURACY: DC 3%—AC 5%
SIZE: 3"x5⅞"x2½"
WEIGHT: 1¼ lbs.
SHIPPING WEIGHT: 3 lbs.
AMATEUR'S NET PRICE $23.40
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mighty tired of putting down zeros all the time. Traffic: WØZJO 2145, LZY 8, OWP 8.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Dr. Arthur W. Woods, W4GJW — JYB handled AENP control in a capable manner during the vacation of LEN, who is regular NCS. JYB has schedules with K4AF and W6DVC. The Taylor super-modulated rig is now in operation at JYB on all bands, 3.5-28 Mc., and power inputs varying from 100 to 1000 watts. MXU is back on 3.5 Mc. again with a new rig that required much bug exterminator. He regularly operates on 7230 kc. when he can get away from his 3.5-Mc. commitments and schedules. BA has had his PAM, OPS, and OBS certificates endorsed. DXB took an old 160-meter crystal and ground it down to the 80-meter band. When 3.85-Mc. 'phone began to appeal to him he ground it down still further into that band. Bad luck overtook him and he didn't get stopped until he overshot the net frequency and wound up on 3960 kc. If anybody in 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 coöperate. Otherwise this is the last column that will be written by this SCM.

EASTERN FLORIDA — SCM, John W. Hollister, W4FWZ — From the activity of the stations reported as damaged during the hurricane it appears that some of you got busy but quick, just in case another blow was around the corner! So many of the c.w. 7290-kc. net members did such a bang-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 3910 kc. was the means for some FB operating as regards information on highways, railroads, truck lines, and weather, especially the broadcasts from 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 PLZ 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, Al? Miami: MKP has radiotelephone 1st-class license now. BXL, with USCGA flotilla Nr. 10, is second operator at W4ES. ES reports "W4BRB(WPB) 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, Gene. Tampa: 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 5 minutes or so. The Dade Radio Club stations handled 168 messages for the Miami Weather Bureau. FWZ has been reëlected as SCM. Traffic: W4IQV 831, MVJ 292, ES 142, MNT 66, ZC 32, JWG 25, DES 13, LMG 13, BYR 4, OBW 4, FWZ 3.

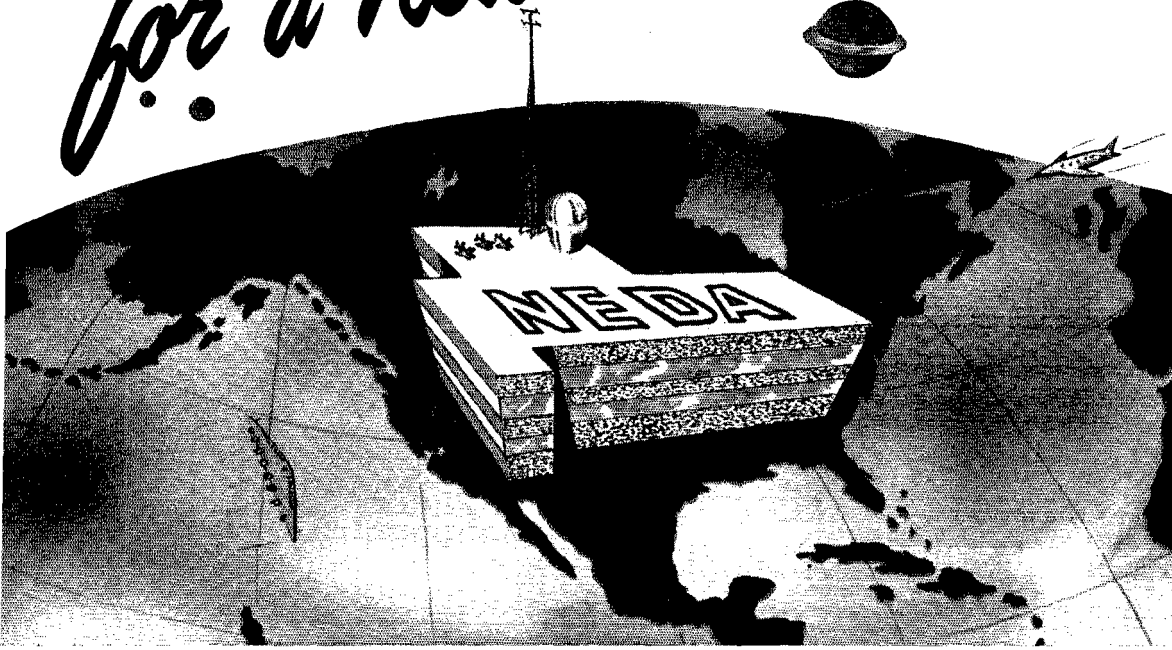
WESTERN FLORIDA — SCM, S. M. Douglas, jr., W4ACB. Fellows, the handling of traffic during the recent hurricane was most gratifying. The stations that participated in this section were NN, ACB, TL, OKD, QB, LDT, OCL, and GQM. In Perry, KQP was active on 3.85-Mc. 'phone. A swell job was done, especially when Net Control shifted to Tallahassee from Lake City and Jacksonville. Contact OKD for further information regarding reactivating the Suwannee Net. Let's get our emergency nets functioning 100 per cent. OHS is having car-radio trouble (new car). JV has been in Atlanta with the USMC. PAA is very active on 7-Mc. c.w. We need more activity there! OOC 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 prexy of Goslin Club at NAS Pensy, is getting new life in the club. MS is getting near his 50-Mc. WAS. ACB is getting the 50-Mc. rig ready. Traffic: W4NN 245, OKD 53, AXP 31, ACB 5.

GEORGIA — SCM, Clay Griffin, W4DXI — Albany: HKA has moved 12 miles south of Albany; IPV has a kw. on c.w.; POJ, PGK, and KOU are all new hams on 7 Mc.; HHE has 150 watts on 28-Mc. 'phone; DIA made DXCC with 115 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 IPV 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 DDQ visited HVD of Langdale, Ala.; ADA has a new 28-Mc. beam; DDQ exchanged his 32-V1 for a 32-V2; CVY built a 28-Mc. mobile rig; MBZ has a new AF-100 transmitter. POR is a new ham in Macon with 811s on 14-Mc. c.w. MCM is a new OO for Georgia. We are sorry to lose IRA, who is moving to Denver. JNL, JOY, and MMQ 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 138, KGI 38, MCM 22.

WEST INDIES — SCM, Everett Mayer, KP4KD — DJ, GP, FJ, and CP are new ECs, with JM as liaison be-

(Continued on page 90)

for a New World...



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tween Red Cross Disaster people and amateur stations. DJ, HZ, DC, CB, and JM have been QRL keeping ID active at Red Cross Headquarters. DJ has a new doublet for 14 Mc. working. CC received his c.w. DXCC and KP4ES received his 'phone DXCC. DV plans a station at his store QTH. DX has gone to the States to college. HZ got on 3.5-Mc. c.w. with 4-watt rig. Brother Vincent, in Ponce, has ex-Governor Pinero's old call, KT. HU still is pursuing DX and handles traffic along with DJ and DV. Helen, ex-HR, is W3PUG and Roger, ex-AM/BE, is W3EGI. JA moved to temporary QTH while old QTH was being rebuilt. The 75- and 80-meter gang was active in spite of bad weather in the vicinity. AS is selling out and moving back to California because of the illness of his XYL, Pearl. CB is on vacation and probably will move to CO/CM Land soon. JB left WEMB for CAA. Traffic: KP4DJ 12, HU 8, DV 3, KD 3.

CANAL ZONE — SCM, Everett R. Kimmel, KZ5AW — Acting SCM, Arnold Pincus, KZ5PA — AW and BT are vacationing in W Land. RV has returned to KZ5 after an FB transcontinental tour. GG, Activities Manager of the Crossroads Amateur Radio Club, worked out a program for a series of classes in code and theory for prospective KZ5s which started Sept. 13th. AB has added an oscilloscope and a wire recording machine. BK will use a pair of 813s in his new final. MB is departing for YV Land. WZ has new HRO and has revamped the rig. CG, FL, NM, RM, PC, and WJ are doing a nice job on the 28,900-kc. 'phone traffic net, with assistance from AC, AU, LS, and WD. RM's rebuilt modulator is working FB. WJ is temporary OBS. Thursday nights are code class nights for the Canal Zone Amateur Radio Assn. with instructors' chores being divided between CG, FL, and WJ. Traffic: KZ5NM 230, PA 166, WJ 61, WG 36, CG 12, EA 6, MB 6, WZ 6 RM 4, BL 3.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, Vincent J. Haggerty, W6IOX — August fairs and hobby shows galore helped CE build up a tremendous traffic score which well may be the all-time high for a single operator station in this section. DDE and IOX visited CE in mid-August and watched him at work. YLZ and DDE also made the BPL. The Paso Robles Radio Club had a portable set-up at San Luis Obispo County Fair with FYW, HFY, and HJL 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 Mc. who knew him when he was 9NOP. DGA moved from Barstow to San Bernardino. AM started a ten-element Sterba Curtain aimed at EA6EG. Before it was finished EA6EG was raised by 'phone on AM's London rhombic 14 degrees anyway. Upon completion of the curtain the misaimed rhombic proved still better than the aimed Sterba. NAZ got back on the air from a new QTH on a hill and says she is happy to learn a shielding mountain does not adversely affect her 14-Mc. signals. 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 IOX during August. MU is on his regular beat on 28 Mc. The SCM 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 present. He reports FEQ vacationed and fished at Silver Lake. My thanks to CMN for his valuable assistance as Assistant SCM. Bill 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 come in monthly by amateur radio to demonstrate the usefulness of the communications lines within the section. Traffic: W6CE 3460, YLZ 560, DDE 518, FYW 189, HJL 166, GWB 149, HFY 130, QAE 73, ZMZ 58, JQB 57, IOX 56, BHG 43, ZQV 28, CMN 19, TFC 14, DGA 11, AM 8, NAZ 5, CTJ 3.

ARIZONA — SC, Gladden MC. Elliott, W7MLL — 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 inspection of 14 mobiles and a meeting of 7 of the State's XYL operators. The Arizona gang regrets the passing of W7MUD, Rita Lemke. UPR has a new call, NTK, for operation in Douglas. The Mesa Club reports a membership of 15 and an emergency mobile net on 29,460 kc. LHM reports good DX with a 75-ft. tower and squirrel cage beam. KRW has a four-element wide-spaced beam. KJU is now 28-Mc. mobile. MEF is on 7-Mc. c.w. with long wire. MOJ has a new 125-watt rig. JIY was voted best-installed mobile rig at Hamfest-Picnic. MID reports the Saguaro Club is equipped with all-band mobiles. 1919 kc. has been designated as the official Arizona net frequency on 160, and 1992 kc. will be the 6L6 160-meter net frequency. The 7-Mc. gang will meet Sunday mornings at ten on 7220 kc. KRC has a Meck T-60 on 28 Mc. MDM is working c.w. exclusively. RJN has a new job that has taken him out of traffic work. NFL is 28-Mc. coördinator for Arizona to get intercity 28-Mc. activity lined up. Arizona hams enjoyed the visit of Director John Griggs very much.

SAN DIEGO — SCM, Dale S. Bose, W6BWO — Asst. SCMs, Shelley E. Trotter, 6BAM, and Gordon W. Brown, 6APG. SEC: DUP. RM: BGF. Traffic for this section took a decided jump this month because of the Orange County

(Continued on page 92)

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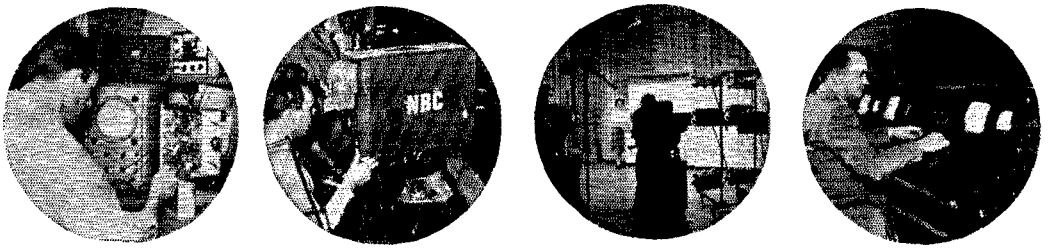

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Fair and the San Diego City Recreation Hobby Show. The Orange County Fair booth was sponsored by the Orange County Amateur Radio Club, spearheaded by CGF, QZQ, EOV, BAM, and DEY. Operators were FCT, DEY, EOV, BWO, and QZQ, each operator signing his own call, thus aiding his own traffic score. BAM took all the traffic from the Fair on 3.5 Mc. and relayed it on, mostly to CE 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 of the San Diego Young Ladies Radio League, 6FXD/6. VJQ furnished the 32V-1 and 75-A. YXE dug up the operators and routed the traffic. YXI 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 SBN with a Signal Shifter and 18 watts. DBZ is back from a Naval Reserve cruise to KH6 Land. He has a new modulator and a better antenna for 3.5 and 3.85 Mc. BYX spent three weeks in St. Louis visiting his folks and ham friends. BGF has new "coffee can" VFO without the coffee cans. It works FB, too. BZE has applied for DXCC. ITY is coming home from 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.

WEST GULF DIVISION

NORTHERN TEXAS — SCM, Joe G. Buch, W5CDU — FTK has completed rebuilding and now has an 813 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. IWQ is FTK's most active neighbor. IJQ runs 50 watts on 3.85-Mc. 'phone. HVP is back on 28-Mc. 'phone with 400 watts. 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 1949 Convention for a long time — he held the lucky number and carried home the 75A Collins. We enjoyed having our C.M., 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 QHZ, social activities committee. Thanks to HOF for the nice report. BFA, Borger, is the new NCS for Northwest 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 0730 CST. NTX Traffic Net will coöperate with the new traffic plan. The traffic net needs help from the 'phone nets in dispatching traffic in the Northern Texas section. MQF, Omaha, is working 3.85-Mc. 'phone. GZU breaks tradition and records by making BPL for the seventh consecutive month. Traffic: W5GZU 1847, ARK 116, PXY 57, CDU 42.

Waco Invitation: Clubs, their members and unattached hams! Nov. 20, Dec. 18 and Jan. 16, the third Sunday of each month, a signal from 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 W5KAU 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, W5AHT/AST — SEC: AGM. RM: MBV. PAM: ATJ. AGM, Oklahoma City, replaces HGC as SEC. Let's all give Claude a hand 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. HGC finds business interferes with ham radio. Our hats are off to the Dallas gang for a fine convention. BIE, DRE, GVS, GZK, HZD, JHA, MJU, OQM, and OQT were among the Okies seen there. The Lawton-Ft. Sill ARC Hamfest and Barbeque at Craterville Park was quite a success. Emma Hawkins, PWN, is a new ham in Lawton; the OM is FEC. FOM has a new center-fed antenna with 65 mast. NFG worked 28-Mc. mobile while on a short vacation at Galveston. FRB has an SCR-694 mobile. OOY and his flea power bucked summer QRN successfully. NMM had a hectic summer — night school, moving, etc.! K5NRJ handled emergency traffic from the hurricane area in Florida besides maintaining regular schedules and made the BPL again. OWV has a new jr. operator. PA fractured his foot and shortly thereafter an antenna mast fell on him. CKT is new EC. OWG is now Class A with new 14-Mc. beam and 4-250 final on c.w. only. RST is on 3.85- and 14-Mc. 'phone with 100-ft. water tower as antenna support! EGR is building 600-watt rig for 50 Mc. BLW is

(Continued on page 94)

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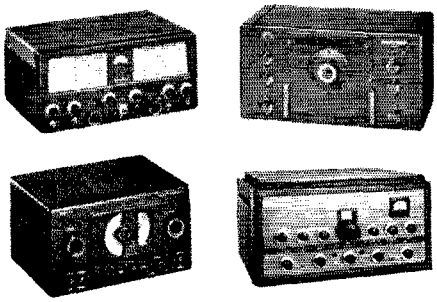

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rebuilding. KHF has new beam and Zepp. 9KPQ is new Ardmore ham. CVH works 3.85, 28, and 50 Mc. with high power. OQT has Class A license and is on 3.85-Mc. 'phone. NLZ, DFU, and LGW on 144 Mc. have consistent QSOs. Traffic: K5NRJ 1082, W5OWV 78.

SOUTHERN TEXAS — SCM, Ammon O. Young, W5BDI — PCO is new EC for El Paso. JIF and MDA are very active in keeping the El Paso Emergency Corps going. JKB is active on 50 and 144 Mc. NIY is back on STEN c.w. net. MN is handling traffic on 7 Mc. KSW has new tower for his 14-Mc. beam. OTU is new 5th district chairman for YLRL and requests reports from YLRL members in the 5th area. HBM has 650-watt rig on 3.85-, 14-, and 28-Mc. 'phone. KG6ES is now QIC. 8BBZ is now 5BBZ. FNH 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 dollar-short DX hams. ACL is having RX troubles. The Austin gang is having fringe area T.V.I. problems. FNA is nearing 170 countries confirmed. IYR is working 14-Mc. c.w. DX. MRV is losing sleep on 14-Mc. 'phone DX. NMA, LXY, JWM, and BDI are all very near getting their DXCC. NN has kw. on 7- and 14-Mc. c.w. Thanks to the FB 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. Traffic: W5MN 36, HBM 19.

NEW MEXICO — SCM, Lawrence R. Walsh, W5SMA — SEC: ZU. PAM: FAG. RM: NXE. AFU and OMR have ORS appointments. JXK and PSV now are ECs. KAO is in his new home at 2520 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 QJK. BHF has a "new" SX-16 receiver. BIH is giving New Mexico contacts to DX stations. NKG is on 3.5- and 7-Mc. c.w. and 28-Mc. 'phone. BYX would like to have 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 concerning this petition, please drop me or Bill a postcard. JXH is putting up a vertical antenna for 3.85 Mc. KEN and BYX are on 144 Mc. trying to work New Mexico stations. MYA is on 28 Mc. with 23 watts. MSG, OO, reports sending seven station notices for bad notes. OMR is on 14-Mc. 'phone with 500 watts to 813s and on 7 Mc. with 250 watts to a 4-125A. On Aug. 21st New Mexico held a state-wide emergency field test. Stations participating were JYW, MYQ, NXE, OMR, OII, OXC, UVA, CA, AHB, NJR, NLQ, NRK, NRL, QDD, SMA, BIW, JXH, HJF, LEH, JXO, and KBP. JYW won the emergency-power prize while NJR won the regular-power prize.

CANADA

MARITIME DIVISION

MARITIME — SCM, A. M. Crowell, VE1DQ — EC: FQ. OBS: RR. High traffic man this month is BK, with MK a close second. The Maritime District Convention was declared a huge success by all attending. There was not a single dull moment for the 250 hams in attendance. Reorganization of the different nets was discussed at the meetings and the 75-Meter Maritime 'Phone Net, with IE as control, had a most interesting meeting. Outstanding arrivals were two planeloads of thirty AFARS boys from VE2 and VE3 who, on their way back, made nice cross-band contacts with some of the local boys. W1DX, from Headquarters, and VE2BE, our C.G.M., were on hand and gave most interesting and informative talks. In addition "By" gave his technical talk on self-excited oscillators to a large gang of hams on Monday A.M. The door prize of a Hammond 10-meter beam was won by JH. Prizes included numerous 814s and other ham gear. To say "a good time was had by all" is putting it mildly. Many of the O.T.s enjoyed again meeting C-1AR, "Old Joe Fassett" our O.M., who was able to be with us. The HARC Convention Committees are recovering slowly from "a good job, very well done." Traffic: VE1BK 107, MK 58.

ONTARIO DIVISION

ONTARIO — SCM, Thomas Hunter, jr., VE3CP — Asst. SCM, M. J. McMonagle, 3AWJ. SEC: KM. RMs: ATR, AWE, BMG, BUR, DU, GI, TM, WK, and WX. PAMs: DD, DF, FQ, and RG. AZZ is now a member of the A-1 Operator Club. New appointments include WK as RM, DF as PAM, BCZ as ORS, and BIW as EC. VD is back on 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 CD appointees are reminded to study carefully the new set-up re nets; also the new method of reporting. Our hats are off to W1NJM, of the Headquarters staff, for a fine job in the new net set-up. BSG finally tutored the OM to his ticket. BUG is experimenting with low-power transmitters. DEB is on with Millen exciter. GN and GG hold regular schedules. APS is rebuilding

(*Continued on page 96*)

to higher power for both 'phone and c.w. CAR is back on operating all bands, 'phone and c.w. See *XTAL* for their schedule of Official Bulletins. VR is new in Hamilton on 28 Mc. QE is using n.f.m. IB, NI, and HK, three of our oldest hams, enjoyed the various hamfests held during the summer. It is suggested that any clubs or individuals operating rigs at hobby shows, etc., and passing traffic, use the existing nets. Your traffic will be cleared much faster. Nets in operation include the Ontario Beaver Net, Ontario Slow Speed Net, Ontario 'Phone Net, Ontario 40-Meter Net, Eastern Ontario Net, and AFARS, on both 'phone and c.w. Any of the above LOs will welcome information on the above nets and also applications for membership. AQB is on with new equipment after the fire. CI is back on 3.8 Mc. from Burlington. IR is on again after many years. RG is mobile on 3.8 Mc. Traffic: VE3BUR 103, WK 40, BQL 39, BCZ 37, VD 28, ATR 26, DU 17, NI 16, PH 12, CP 10, IL 6, RG 4, BUG 3.

QUEBEC DIVISION

QUEBEC — SCM, Gordon A. Lynn, VE2GL — Cap Sante, 30 miles west of Quebec City, on Aug. 28th was the scene of a bang-up picnic and hamfest with 99 VE2s registered from Hull, Seignory Club, Montreal, Three Rivers, Cap de la Madeleine, Shawinigan Falls, Port Alfred, Chicoutimi, Portneuf, Quebec City, Montmagny, Beloeil, Victoriaville, Drummondville, Pierreville, Grand Mere, and Berthierville. This represents a very comprehensive cross section of the Province, and many personal QSOs were made between hams well known to each other on the air. Fifteen different mobile rigs were in operation and the best work of the day seems to be a QSO with 2AT on 144 Mc. which lasted for over four hours. EC reports the Quebec 'Phone Net meets at 8:15 A.M. and 12:30 P.M. daily with OD, AHK, JAM, EV, AEM, AT, ZG, ABJ, AIM, KY, QJ, and JZ participating. TR lost his tower in a windstorm. QJ now has a VFO with a pair of 814s in final. SA is doing a rebuild on his S.S.S.C. The Canadian Red Cross has requested information regarding nets for emergency operating. Those sections not having an EC are requested to consider the selection of an amateur who would take on this responsibility and send his call, name, and address to the SCM or to the SEC, SA. All amateurs are invited to register in the Emergency Corps. Drop a card to SA for information. GM is getting things in shape for the PQN's fall activities and is looking for all the old members together with new members. Traffic: VE2EC 26.

VANALTA DIVISION

ALBERTA — SCM-SEC, Sydney T. Jones, VE6MJ — NB reports some good contacts from fixed portable location at Wainwright. OD is having a busy time with workmen in his back yard. ES is Medicine Hat's first YL operator. Congrats, Hilda. PB is now a full-fledged ham at the Hat. YD moved his QTH to Vulcan. JJ is rumored to be considering moving to warmer climes. VS has taken up residence at Edmonton and has been heard on 3.8-Mc. 'phone. NA proudly displays his award from the 1948 Sweetstakes. VA has his new rig on 14-Mc. c.w. TK got his antenna poles up and has been active on 3.8-Mc. 'phone. LG attended the Canadian National Exhibition in Toronto. WS and his XYL had a pleasant trip to the U. S. A. LQ has new prop pitch motor to rotate his Plumber's Delight beam. MJ is constructing added element on his beam. DN was a visitor to the Calgary area and was heard from OD's shack. XX takes over Net Control on Alberta Net when OD is unable to make it. Your SCM would appreciate your reports each month. KS reports the arrival of a new jr. operator. If you are interested in any of the ARRL appointments, contact your SCM for full particulars. Traffic: VE6NA 38, MJ 12, NB 5.

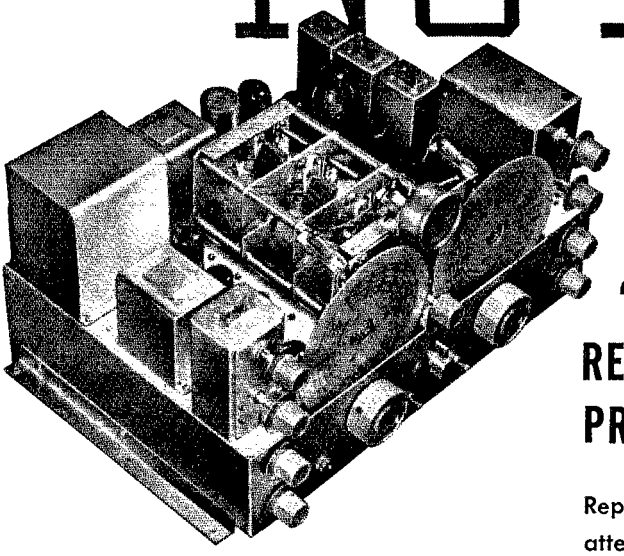
BRITISH COLUMBIA — SCM, Ernest Savage, VE7FB — With my first report may I say thanks to all for your vote. Now I ask for your support. TF, busy with summer activities, managed to get a bit done on new rig and traffic cleared. PARA members attended the International Hamfest and have prizes to show. AKG/7, Edmonton, as mobile, is making good contacts to the Coast. AKG was our good 28-Mc. contact in 1948. ID, your SEC, was operations officer for rehearsal of "Op. Eagle," Montreal, via air for the holidays. SW has worked 70 countries. US is busy on 5 O'clock Net and his SEAEC Net, 3755 kc. AC, convention chairman, is trying to rest but his work says "no." Those who missed the Convention sure missed Reg's good work and planning. WM is soon to have a new handle, "Beaming Bill." Traffic: VE7TF 116, US 35, AC 12, ID 2.

PRAIRIE DIVISION

SASKATCHEWAN — SCM, J. H. Goodridge, VE5DW — AW has returned to the air with his peanut-size rig and has plans for another. IC had a nice holiday mobile through VE6 Land. HR requests that all interested in the Section C.W. Net contact him immediately at 1044 King Street, Saskatoon, or on 3.5-Mc. c.w. Applicants are wanted for all appointments. Secretaries of all clubs in the section are requested to send an activity report at the end of each

(Continued on page 98)

NC-173

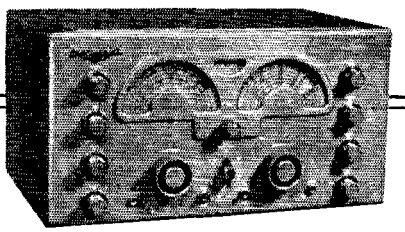


thousands of satisfied operators agree... "FINEST PERFORMING RECEIVER IN ITS PRICE CLASS!"

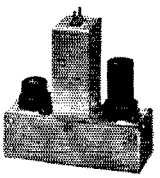
Reports from owners everywhere attest the superior performance and dependability of the NC-173. Week after week, month after month, the NC-173 delivers more real satisfaction because it's engineered to famous National standards, *built* — not assembled — using over-size National components. See it — try it — compare it — at your National dealer's.

$189.50

(less speaker) Also available in rack model at same price. Price slightly higher west of the Rockies.



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.



NFM-73 adaptor makes the NC-173 a real NFM receiver! Instant selection of AM or NFM from front panel. $17.95.

National

NC

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NATIONAL COMPANY, Inc.

MALDEN, MASSACHUSETTS

month covering station activities in their area to the SCM at the QTH given on page 6 of *QST*. Activity reports make this column — no reports, no column.

WWV Schedule

STANDARD-FREQUENCY transmissions are made continuously, day and night, as a public service by the National Bureau of Standards over its standard-frequency station, WWV, on the following frequencies:

Mc.	*Power (kw.)*	*Audio Freq. (cycles)*
2.5	0.7	1 and 440
5.0	8.0	1 and 440
10.0	9.0	1, 440 and 4000
15.0	9.0	1, 440 and 4000
20.0	8.5	1, 440 and 4000
25.0	0.1	1, 440 and 4000
30.0	0.1	1 and 440
35.0	0.1	1

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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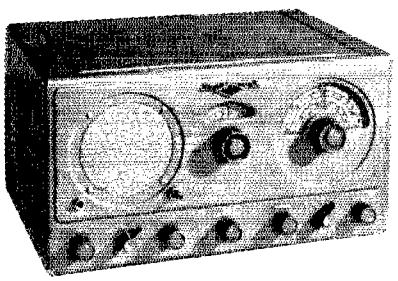
National NC

Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of all National amateur equipment for immediate delivery. Also complete stocks of all other amateur receivers, transmitters, and parts. I promise you that you cannot find lower prices any place else, nor more complete stocks. I give you quicker delivery, easier terms, and more generous trade-ins, and, in addition, a 10-day free trial and 90-day free service. I promise that you will be satisfied in every detail. Write, wire, phone, or visit either store today.

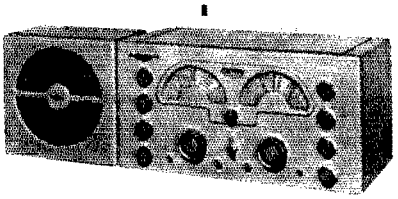
Bob Henry
W6ARA

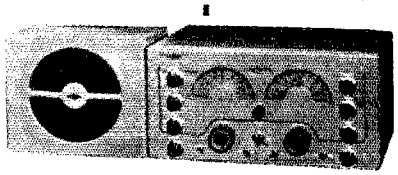


NATIONAL NC-173 • The NC-173 has a complement of 13 tubes (including rectifier and voltage regulator) in a superheterodyne circuit to provide such features as an RF amplifier stage, a separate AVC Amplifier and a double-diode noise limiter. A crystal filter is connected between the first detector and first IF stage. The frequency scope of the NC-173 includes the conventional 540 kc. to 31 mc. range plus the 48 to 56 mc. portion of the spectrum which covers the Amateur six meter band. Price: Receiver, $189.50; Speaker, $10.00.

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.

NATIONAL NC-57 • The NC-57 is a superheterodyne radio receiver, having a complement of seven tubes, plus a voltage regulator and rectifier, with a continuous frequency coverage of from 540 kilocycles to 55 megacycles. This receiver is designed to provide reception of A. M. voice or music and C. W. or M. C. W. code telegraph signals throughout its entire frequency range, which is greater than any other receiver in its class. Price: $89.50.





Butler, Missouri **HENRY RADIO STORES** 11240 Olympic Blvd. LOS ANGELES 25 CALIF.

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

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.[3]

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!"

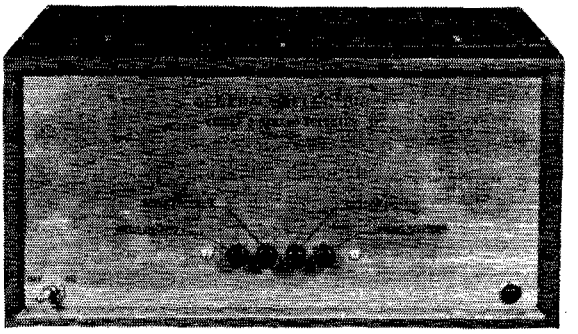
[3] O. G. Villard, jr., "Selective A-F Amplifier," *Electronics*, July, 1949, p. 77.

Break-In with One Antenna

(Continued from page 20)

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 Ry_2 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.

HARVEY does it AGAIN!



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SINGLE SIDEBAND SELECTOR
GENERAL ELECTRIC Type YRS-1

Single Sideband SELECTIVITY with no loss of audio response.

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.**
- **Can be connected to practically any communications receiver having an intermediate frequency of approximately 455 KC.**
- **Normal operation is in no way disturbed when single sideband selector is not in use.**

HARVEY SPECIAL PRICE 49.50

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All units in Brand New, Factory-Sealed Cartons
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103 West 43rd St., New York 18, N. Y.

"City Slicker" Array

(*Continued from page 38*)

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 WØBIP 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 worth-while improvement in his transmission and reception of 144-Mc. signals.

Happenings

(*Continued from page 34*)

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*)

nation 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 S_1, 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*)

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_3 and one vertical plate to the arm of S_4 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_2, S_3 and S_4 and changing L_3 and L_{10}. 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_6, L_7, L_8 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 AB_1, just to get the feel of things. And the 6AG7 can be used to drive some larger tubes in Class B[5] 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.

[5] Reque, "Linear R.F. Amplifiers," *QST*, May, 1949.

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Simpson 380 Wavemeter

Handy wavemeter-modulation indicator. Accurate bandspread wavemeter with 0-100 microammeter to indicate resonance. Ideal field strength meter. Reads modulation directly to 110%. Headphone jacks for monitoring. Complete with coils for 80, 40, 20 and 10 meters, 2 ft. plug-in antenna and individually calibrated charts.

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R. L. Drake TVI Filters

TV-52-40LP Low pass transmitter filter. For use in 52 ohm coaxial line. Cuts down harmonic radiation above 30 Mc., without loss of signal strength on 10 meters and lower frequency ham bands. Handles 1 KW.

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TV-300-50HP High pass TV receiver filter. For use in TV receiver 300 ohm line. Rejects diathermy, SW broadcast, QRN and other interference below 50 Mc., remarkably improving TV reception. List price $5.95. Sell 'em to your neighbors! Your cost

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Crown Antenna Rotator

A powerful and dependable rotator for TV, FM and Amateur beams. Will handle loads up to 175 lbs., up to 1¾" diameter masts. Compass readings show antenna direction. Weather-seal castings, lifetime lubrication and ball bearing equipped. Fully guaranteed for one year. This is a terrific value, only **39.66**

5 conductor ribbon cable, for connecting control box to rotator. Per ft. **4c**

SPRAGUE HYPASS CAPACITORS

REDUCE TELEVISION INTERFERENCE. Special three-terminal high frequency by-pass capacitors for TVI elimination! Suggested by ARRL for hams troubled with TVI.

46P8 .005 mfd.—600 volts..... **1.26**

48P8 .1 mfd.—600 volts..... **1.53**

Other sizes available

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.

Band	Antenna Length	Price	Add for Shipping
10 meters	18 ft.	4.53	30c
20 meters	35 ft.	5.64	36c
40 meters	70 ft.	7.94	41c
80 meters	135 ft.	12.20	46c

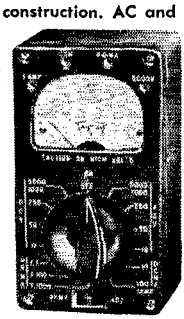
HALLICRAFTERS

S-72—Communications portable for standard broadcast and short wave. 4 bands, 540 Kc. to 31 Mc. AC, DC or batteries, with collapsible whip and loop antenna. 8 tubes plus rectifier. **79.95**

S-38A	39.95	SX-42	275.00
S-40A	79.95	SX-43	159.50
S-51	149.50	SX-62	269.50
S-52	79.95	HT-18	110.00
S-53	69.95	HT-19	359.50

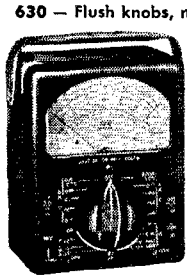
New TRIPLETT METERS

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. DC current ranges: 0-10/100/-1000 milliamperes at 250 millivolts sensitivity. Resistance: 0-3K/300K/3 Megohms. Complete with test leads, self-contained batteries and instruction book.



24.01

630 — Flush knobs, molded unit construction. 5½" square super-sensitive meter for accurate AC and DC measurements. AC and DC volts: 0-3/12/60/-300/1200/6000 volts. Six decibel scales. DC current: 0-60 microamperes; 0-1.2/12/120 milliamperes; 0-12 amperes. Resistance: 0-1K/10K/1 Meg/100 Megohms. With test leads and self-contained batteries.



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866 FILAMENT TRANSFORMER — Fully shielded, rated for continuous heavy duty. 2½ volts center-tapped secondary @ 10 amps. 10,000 volts insulation. 115 volts 50/60 cycles primary. *Shpg. 45c* **2.95**

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100 MA..... **49c** 200 MA..... **89c**

300 OHM TWIN-LEAD for T.V., etc. *Shpg. 14c.* Per 100 ft. **96c**

FEDERAL SHIELDED 300 OHM LINE, type K-111.
Shpg. 30c. Per 100 ft. **11.00**

VEE-D-X LIGHTNING ARRESTER. Low-loss, does not vary line impedance. Attaches directly without cutting 300 ohm line.
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No Tubes! No Power Supply! No Hum!

Miller #585—Covers 540-1700 kc. Band-pass circuit features germanium diode detector. Furnished with all coils, 2-gang tuning condenser, slide rule dial, punched chassis and instructions. *Shpg. 36c* **11.17**

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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).

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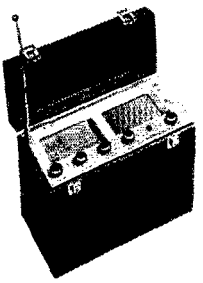

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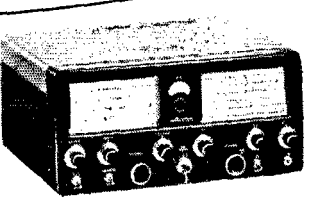
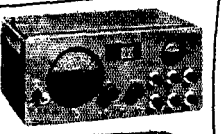
Wherever you go, this sleek new 3-way portable will bring in those hard-to-get ham, foreign and domestic stations sharp and clear as a bell. With a 540 kc to 31 mc range in 4 bands, S-72 is chock full of features appreciated by radio amateurs and shortwave listeners: 1 stage of tuned RF; separate bandspread tuning; automatic noise limiter; built in loop for broadcast stations; built in telescoping 27" whip antenna for short wave; panel phone jack; 8 tubes — 1T4, 1R5, 3 — 1U4, 3V4, 2 — 1U5, plus selenium rectifier. Includes power cord for operation on 105-125 volts DC or 60 cycle AC. Battery-pack operation if desired. Compact in size — 14x12¼x12¼x7¼" deep. Light — shipping weight only 16 lbs. Plywood cabinet is beautifully covered with brown leatherette and brass-plated trim. Complete, less batteries.
*Battery pack $8.85 extra, if desired.

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 these 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 538 kc to 35 mc and 46-56 mc; built-in limiter and balanced det. stages for hiss-free NBFM; double conversion gives image rejection of better than 300-1 at 28 mc. One RF, 2 conversion and 3 i.f. stages for sensitivity of 1 microvolt. Five bands — 538-1650 kc, 1600-4800 kc, 4.6-13.5 mc, 12.5-35 mc, 46-56 mc. Controls include: main and bandspread tuning, BFO pitch, 3-pos. selectivity, xtal phasing, tone AF gain, RF gain. Switches: ANL, BFO, send/receive. "S" meter adjustment on rear. Use doublet or single wire antenna. 10 tubes plus voltage regulator (VR-150) and rectifier. Gray steel and chrome cabinet 18½x9x12. For 105-125 VAC 50-60 cycles. Weight 33 lbs.



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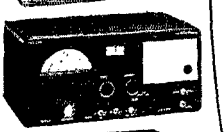

S-40A $79.95 Medium priced. 540 kc to 43 Mc Temp. compensated. One RF, 2 IF. 3 watt output. 4 Bands. 18½x9x9 in. deep. Ship. wt. 32 lbs. 115 V. AC. 8 tubes plus rectifier. Internal speaker.

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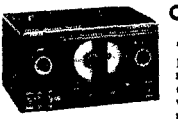

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How's DX?

(*Continued from page 47*)

of 180 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-grown 50-watter on 10 'phone. Chuck likes his code practice during 0330-0800 GCT and tries 28 Mc. whenever the band is open. That's fair enough . . . . . A few items on the hook in the Grrr-r-r Department: GD3UB asserts through W9TQL that GD3RX is ungood and W9TRD heard from the ARCI that FN8DC is definitely likewise. EA6EG, who QSLs with dispatch, tells W4MR that EA6AZ is not known there, and the VK gang have scotched rumors of possible recent legitimate activity in the Cocos Islands. We've received reports from W2HMJ and others regarding one UY5AK'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 *FEARL News*, JA2KG's last contact in Japan was his 162nd country, ST2DD. Lloyd vacates the top of the DX standing, leaving JA3AA head man with 160 in the log and 83 in the bag. Band allocations in Japan jibe pretty closely with our own with the exception that mobile work is not yet sanctioned below 28 Mc. . . . . HC2JR reports HC2GRC and HC2KB as involved in a friendly battle to see who first completes his 28-Mc. 'phone WAS. We Ws wish there were more of these private contests in progress! [Nuts, boss. Who ever heard of anyone needing Illinois for WAS? — *Jeeves.*] . . . . . VK3AMR confided to W8TLL that he will be operating portable-VK9 directly, 20 c.w. He didn't elaborate but it's most likely New Guinea or Papua . . . . . VP7NJ is getting out well from Green Turtle Cay, Abaco, in the Bahamas, using five watts from a vibrator supply on 14 Mc. He'll QSL as soon as he receives his cards on order from Nassau which may take some time . . . . . An old-timer who has been currently quite busy renewing old friendships on the air is CX2AJ. Enzo is now operating CX3CS on 20 c.w. and is putting a very hefty batch of r.f. into the States during the early evenings; 500 watts and beam antennae are used. Future operation on 40 and 10 is planned . . . . . Off on the WAS tangent again. ZD4AM wonders why more Ws situated in rare states do not designate same after their calls. Harold is about four states shy of the mark and is in there pitching regularly . . . . . W4AZK has been good enough to undertake the task of handling the QSL business of FM8AD. This is the umpteenth time or so that such an arrangement has been made tentative but it looks like the McCoy. FM8AD will send logs to Dave and possibly provide supplementary QSO information by schedules. Should the former be unable to finance the purchase of cards because of monetary red tape, W4AZK will arm himself with a rubber stamp and request all Martinique-bound QSLs be accompanied by a blank penny postcard. The blanks will be stamped and properly filled out according to log check. This looks like a system that might well be advantageously adopted by other rare DX stations who find themselves ensconced behind the confirmation eight-ball . . . . . HK5EM is shutting down for a trip Statesward and TI2VO speaks of a probable complete relicensing program in TG-land. This from W5HBM . . . . . DL4ZY returned to the U. S. and is now hard at work to obtain his W3 moniker. Any of the brethren still in need of a card may write Sgt. Stuart A. Robinson, Hqs. 2nd Arm. Cav. Bn., Fort Meade, Md. Stu is also ex-D4AZY . . . . . Those W6s are always down in the sixth layer digging up dope. The Northern California DX Club's *The DXer* has several items of import. ON4QF is expecting to operate PX1QF and CZ8QF on 14-Mc. c.w. before long — what a man! Jeeves is trying to talk him into a CM2QF stint, too. ZS6GV is expected to become ZS7B with 30 watts again soon. VS7AD attempted operation from the Maldives but a dead power pack threw a wet blanket over the feat and it was back to Ceylon for him, empty-logged . . . . . CT2AB is back on for the DX season and is scattering many snappy Azores contacts about on 20 c.w. W4MXU is regularly at the key.

—•••—

Jeeves has ceased to wonder about low long-time QSL-return averages after hearing five or six birds consecutively thank CO6AJ for being their first KJ6 QSOs one recent morning. An open-and-shut case of that new mass hysteria malady known as *pile-up-itis*.

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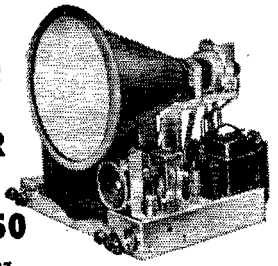

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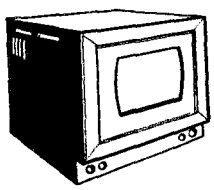

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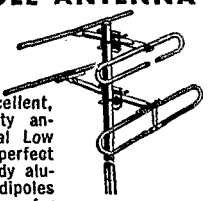

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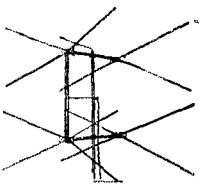

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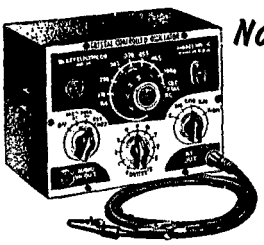

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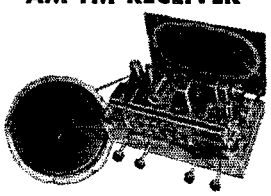

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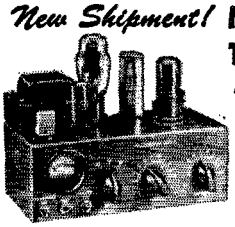

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Antenna-Matching Networks

(*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 for 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.[6] 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.[2,3] 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 112*)

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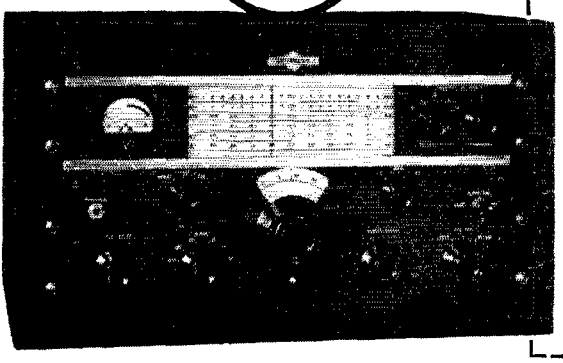

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form the formulas for the networks of Figs. 5 and 7 will present some difficulty if Z_0 is held exactly equal to Z_1 or Z_2. From a practical standpoint, this isn't necessary, and furthermore, we probably couldn't determine Z_1 or Z_2 to be *exactly* 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.[6, 7, 8]

[*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

[1] Marshall, "Matching the Antenna for Two-Band Operation," *QST*, Sept., 1945.
[2] Pichitino, "A New Principle in Two-Band Rotary-Beam Design," *QST*, Oct., 1948.
[3] Espy, "Resonant Circuits in Antenna Systems," *QST*, Sept., 1943.
[4] Andrew, "An R.F. Matching Network for General Use," *QST*, Oct., 1939; Gadwa, "An Impedance-Matching Transformer," *QST*, Feb., 1943.
[5] Stewart, "Measurement of Antenna Impedance," *QST*, Dec., 1943.
[6] The A.R.R.L. Antenna Book, 1949 edition, chapter 3, page 78.

(*Continued on page 114*)

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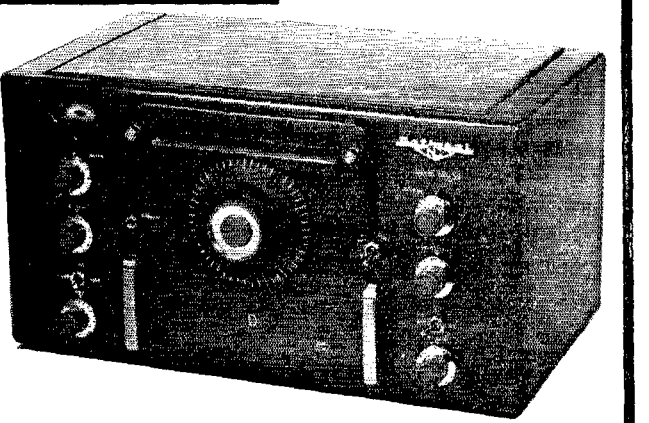

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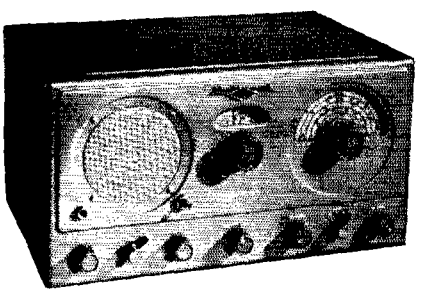

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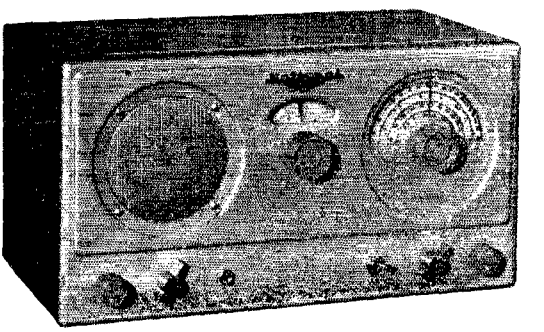

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[7] Potter, "Establishing Antenna Resonance," *QST*, May, 1948; Smith, "Adjusting the Matching Stub," *QST*, Mar., 1948; Scherer, "Applications of the Grid-Dip Oscillator," *CQ*, Jan., 1949.

[8] Jones and Sontheimer, "The Micromatch," *QST*, Apr., 1947; Jones and Sontheimer, "Additional Notes on the Micromatch," *QST*, July, 1947; Pattison, Morris and Smith, "A Standing-Wave Meter for Coaxial Lines," *QST*, July, 1947; Tiffany, "A Universal Transmission Bridge," *QST*, Dec., 1947; Garretson, "Transmission-Line Matching Simplified," *QST*, Oct., 1943; Paddon, "The Eyes Have It," *QST*, Oct., 1948.

50 Mc.

(*Continued from page 66*)

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.

Maspeth, N. Y. — Final results of the First 2-Meter Mileage Contest, sponsored by the Amateur V.H.F. Institute of New York, were announced Sept. 19th. Certificate awards for the highest score in each ARRL section from which reports were received went to W1s RMZ, QYV, QHS. W2s QED, ORL, BV, DHB, DFV, W3s MRQ/3, GKP, W6s ZOE, EKP, ZBJ, AJF, W8s WSE, EP, and VE3ANT. W2BV submitted the highest score, 4249 miles, and W6ZOE and W6IFE received certificates for the longest distance worked in a single contact.

Exeter, N. H. — As the 50-Mc. band is probably the best frequency on which to work the distances 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 P.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 W9JBF 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 W9FPE, Willard, Wis., and W9TKL, Waukegan, Ill., has been maintained solidly, and W9TKL is copied at Wausau at least half of the time.

Champlin, Minn. — 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. WØJHS 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 c.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 W2UTH is doing with good results.

Three-a-week schedules with VE3ANT, 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. W6GHE and W6PJV were on duty at the Chico starting point. W6KUI, Willows, and W6LYQ, Corning, served as stand-by 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 planes 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. This is

(*Continued on page 116*)

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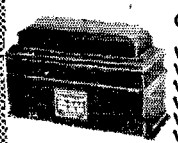

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W1CGY	44	W5FSC	41		
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W1HDQ	42	W5FRD	38	W9ZHL	47
W1KHL	41	W5DXB	35	W9PK	47
W1LSN	40	W5ZZF	34	W9ALU	46
W1HMS	38	W5GNQ	32	W9JMS	45
W1RO	36	W5NHD	32	W9QKM	45
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W4EQM	44	W7JRG	40	VE1QZ	31
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W4QN	43	W7JPA	40	VE3AET	27
W4LNG	42	W7FIV	40	VE4GQ	20
W4GIY	40	W7CAM	40	XE1GE	19
W4EID	40	W7KFM	40	HC2OT	16
W4EQR	40	W7FDJ	36	XE2C	14
W4DRZ	38	W7FFE	35	VE2GT	14
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W4FQI	34	W7ACD	32		
W4GMP	34	W7QAP	32		
W4WMI	33	W3CIR/7	30		
W4FNR	33				

Calls in bold face indicate holders of official 50-Mc. WAS awards, listed in the order of the award numbers.

the third year that the San Mateo County Amateur Radio Club has been in charge of communications for this event.

That Array on the Cover

Working 50, 144, 220 and 420 Mc. poses something of an antenna problem, even when one lives out in the country and has plenty of room. At W1HDQ we decided to consolidate our 220- and 420-Mc. antennas and the bedspring 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 ¾-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 1½-inch dural tubing.

(Continued on page 118)

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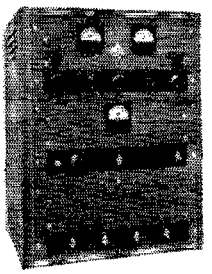

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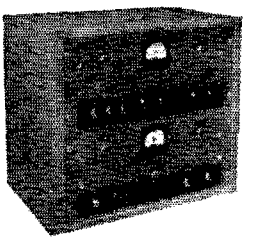

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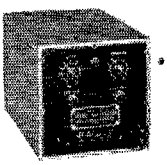

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slotted at the top and drilled at the point where the bottom of the screen frame passes through. The two middle driven elements on the 220-Mc. side are mounted on this pipe, and the other pairs are supported by the two vertical members on either side. Two 1-inch angle brackets are used for each support.

The corners of the supporting frame are made rigid through the use of angle inserts made by bending 4-inch lengths of ½-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 advice of W1VW 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, so an adjustable matching device was included. The two 8-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, each one wavelength (21½ 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 ⅜-inch tubes 6¼ inches long, mounted on a slotted polystyrene 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. W8NQD 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 6J6s.

From Baltimore, Md., W3KWU writes that W3JPX, W3GHQ, W3OUX, 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 W1INF shack at ARRL Hq., W1HDF, Elmwood, W1PNB, Bristol, and W1HDQ, Canton. Tests with W1CCH at Springfield have yet to work out successfully, but improvements all around are aimed at this objective.

SUN RADIO'S ANNUAL CLEARANCE!

CRYSTALS!

All crystals have Army MC harmonic ratings but Sun encloses directions for deriving the correct fundamental frequency in kilocycles.

JUST ARRIVED! NEW FREQUENCY CRYSTALS FOR HAM AND GENERAL USE
— FT-243 Holders, ½" pin spacing
(Fractions Omitted)

GENERAL USE

6006	6208	7873
6025	6773	7906
6040	6840	7925
6073	6873	7940
6075	6906	7950
6100	6940	7973
6106	6973	7975
6140	7740	8240
6150	7773	8273
6173	7806	8306
6206	7840	

49c each
10 for $4.50

HAM USE
2, 6, 10, 11, 20, 40 METERS

5305	5825	6273	6606	7306	7673
5675	5840	6340	6640	7340	7706
5677	5850	6373	6673	7373	8000
5700	5873	6106	6706	7406	8040
5706	5875	6425	6740	7440	8050
5725	5900	6440	6806	7473	8073
5740	5906	6450	7073	7506	8100
5750	5925	6473	7140	7540	8173
5760	5940	6475	7173	7573	8175
5773	5973	6506	7206	7606	8340
5775	5975	6540	7240	7640	
5806	6000	6573			

99c each 10 for $9.00

CRYSTALS WITH A MILLION USES

Fractions Omitted

kc	kc	kc	kc	kc	kc	kc	kc	kc	kc	kc	kc
412	422	433	442	462	481	492	503	507	511	516	522
413	423	434	443	468	483	493	504	508	512	518	523
414	424	435	444	472	484	494	506	509	515	519	
415	425	436	445	473	485	495					
416	426	437	446	474	487	496					
418	427	438	447	475	488	497					
419	429	440	448	477	490	498					
420	431	441	451	479	491	502					

49c each

Xtal. Freq. Stan.
3-prong holder
98.356Kc

Easily altered for 100kc Standard. Mounted in low loss 3 prong holder.

$3.89 each

For Crystal Controlled *Signal Generators*
Ft. 241-525Kc

526,388	533,333	537,500
527,777	536,111	538,888
529,166		
530,555		
531,944		

99c each

I.F. Frequency Standards

kc	kc	
450	461,111	**99c**
451,388	464,815	**each**
452,777	465,277	

200 KC CRYSTALS

Without Holders
$2\frac{1}{32}$" × $2\frac{3}{32}$". **Each** **69c**
3 for $2.00

Assorted Miscellaneous Crystals
Fractions Omitted

372kc	379kc	384kc	387kc
374	380	386	388
375	381		**39c**
376	383		**Each**
377			

priced at a fraction of the cost of their holders alone.

For Ham and General Use
Fractions Omitted

390kc	396kc	403kc	408kc
391	397	404	409
392	400	405	411
393	401		
394	402	**79c each**	
395			

CRYSTALS FOR SCR 522

5910kc	7480	
6370	7580	
6450	7810	
6610	7930	
7350		

$1.29 each

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FT-243 Holder
½" Spacing

ea.

3735 KC...69c
4190 KC...39c
5030 KC...39c
5485 KC...39c

Crystals from BC 610
¾" Spacing—2 Banana Plugs

2045	2305	3202	3550
2105	2320	3215	3570
2125	2360	3237	3580
2145	2390	3250	3945
2155	2415	3322	3955
2220	2435	3510	3995
2258	2442	3520	
2260	2532	**$1.29**	
2282	2545	**each**	
2300	2557		

• Payments must accompany order. Enclose 30c for postage and handling. *Minimum order — $2.00 plus postage.*
Crystals are shipped packed in cloth bags inasmuch as they are shock mounted. All shipments guaranteed.

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DUAL SPEED RECORD PLAYER, 78 and 33⅓ RPM, AC or DC in Portable leatherette carrying case with 8" speaker and 3-tube amplifier. Heavy 12" table, adjustable speed motor, slightly used but reconditioned and guaranteed **$12.50**

WESTON, 2-range DC Milliammeter, Model 1, 0-150, 1500 MA. Laboratory standard with leather case, value $125.00. Brand new. **$24.95**

OSCILLOSCOPE, 2" Waterman Pocketscope. Reg. $66.50 Only **$39.50**

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Low impedance dynamic for ham or professional use at 60% off list price, brand new American Microphone Co.

Model	Impedance	List	Reduced to
D7T	200 ohm	$27.00	**$10.80**
VR2T	200 ohm	42.15	**16.86**
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45 AND 33⅓ RPM ADAPTER for 78 RPM record changers and *manual players, converts any* 78 RPM record player to a 3-speed player. Quickly attached and removed, just slip on spindle. Only **$13.50**

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4 MF, 600-volt oil-filled cond. @ .....**$.66**

2 MF, 600-volt oil-filled cond. @ .....**.56**

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all new and guaranteed, some boxed, some bulk at tremendous savings — stock up now for Fall and Winter Business

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1H6GT	1.10	6C7	.59	12A6	.99	39/44	.88
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1T4	.43	6K7GT	.60	12SF5	.60	55	.69
2A6	.59	6K7GT	.60	12SH7GT	.72	80	.50
2A7	.88	6N6G	1.28	12SJ7GT	.60	89	.49
2B7	.59	6SF5	.60	12SK7GT	.49	485	.49
2S/4S	.49	6SH7	.72	12SQ7GT	.54	954	.50
5V4G	.88	6SJ7GT	.49	12SR7	.72	955	.55
6A6	.88	6V6GT	.72	14A7/12B7	.88	957	.55
6AE6G	.72	6V7G	.49	31	.88	1619	.55
6B4G	1.06	7A4	.72	32L7GT	.99	*VR53	.19
6B7	.59	7C5	.72	35W4	.45	*Use to replace 12K7 or 12J7	
6C5	.60	7H7	.40				

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Write us for prices on needs in speakers, amplifiers, FM-AM tuners, record changers, etc. We carry a full line of Jensen, Jim Lansing, Altec Lansing, Stephens, speakers; Meissner, Radio Craftsmen, Bogen, Collins, FM and AM Tuners; Bogen, Altec Lansing, Brook, Langevin, Newcomb, Bell, Scott Amplifiers, GE, Pickering, and Clarkstan Pickups at wholesale prices. We specialize in assembling units for custom installations. **SERVICEMEN** — We carry the complete line of EICO Test equipment Kits V.T.V.M. Kit **$23.95.** Oscilloscope Kit **$39.95.** Signal Generator Kit **$19.95.** Signal Tracer Kit **$18.95. HAMS** — SUN RADIO stocks almost all of the famous brands of ham transmitting and receiving equipment and parts . . . such as UTC, STANCOR, BUD, NATIONAL, HALLICRAFTERS, HAMMARLUND, RME, EIMAC, B&W, AMPHENOL, PETERSEN, CARDWELL, HARVEY WELLS, MILLER and many others.

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TERMS All items F.O.B., Washington, D. C. All orders $30.00 or less, cash with order. Above $30.00, 25 per cent with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.

Correspondence

(Continued from page 57)

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 ⅜ inch long by ¼-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.

— *Rex Cyril Byle*

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, condensers 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*

227 Poplar St., Wyandotte, Mich.

Editor, *QST:*

I have tried your idea of shielded cable and found it very satisfactory. I used a poor grade of coax. My transmitter is the open-rack type and before trying this idea operation of the rig was out of the question. Thanks for the help.

— *Claire S. Jones, W8IUD*

TRIBUTE

Champlain, N. Y.

Editor, *QST:*

We wish to extend our sincere thanks and gratitude to Mrs. Clara Reger, 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 "W8KPL DE W7RT GE 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 122)

VALUES

4241/2 Hudson Ave., Newark, Ohio

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 W8GSJ 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, W4GTH*

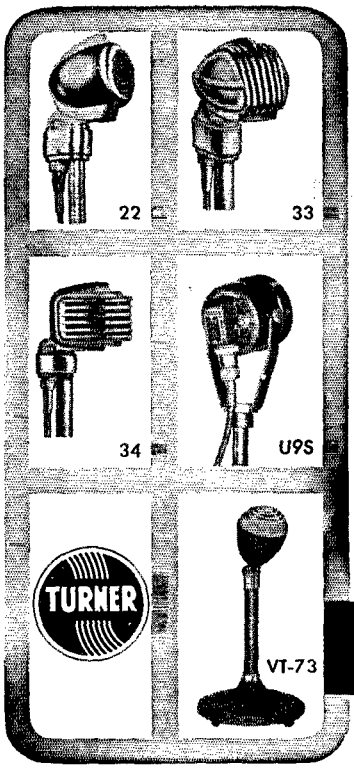
Hints & Kinks

(*Continued from page 69*)

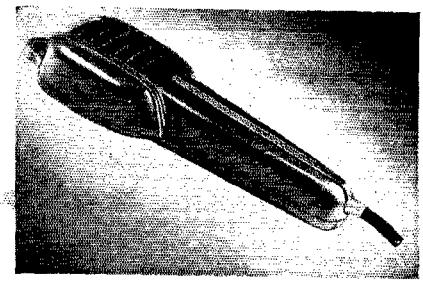
MODULATION MONITOR

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 pick-up 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*



SLIM, TRIM, AND TERRIFIC



THE TURNER MODEL 20X

Here's a mike you like to hold onto. It's light in weight and convenient to use. High quality crystal circuit delivers exceptionally high output. Ideal for amateur communications. Range 50 — 7000 c.p.s. Level 54 db below 1 volt/dyne/sq. cm. Give your rig a lift and enjoy the sleek performance and convenience of the Turner 20X. An outstanding microphone value at $12.85 list. See it at your dealer.

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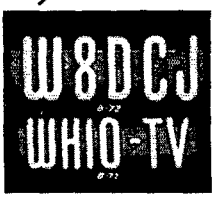
GIFTS *for the Amateur and for the Commercial Broadcaster*

Beautiful *Man Sized* Microphone Ash Tray

with call letters in satin-finished aluminum against a black crackle-enameled background on top of the polished microphone. The lustrous black Daka-Ware base is fire and acid resistant and will retain its sheen indefinitely. 7-inch diameter, 6-inches high. Accommodates up to five letters. The perfect gift for your fellow ham.

Type AT-80 ..... *$5.00* Postpaid

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 W8VZM-XYL. Price includes 5 letters only — for each additional letter, dash, etc. add 20¢.

Either style pin ... *$2.25* 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. Size: 5" x 2½". Accommodates up to six 1-inch, eight ¾", or ten ½" high letters.

Type AT-72.. *$3.70* Postpaid

Lapel Buttons

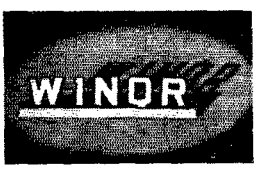
An attractive metal button with highly polished raised letters against a black background. Other colors 50¢ extra.

ACTUAL SIZE

$1.10 Postpaid

Type A-26P With Pin Backing *Type A-26L With Screw Backing*

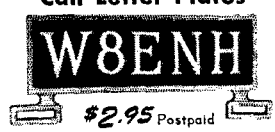
Silhouette Desk Plate



The cut-out satin-silver letters on the beautiful desk plate stand out in relief against the crackle-enameled back bar, with the edges of the letters also painted to accentuate the silhouette effect. Accomodates five 1¼" high bold block type letters.

Type D-21 *$3.95* Postpaid

Call Letter Plates



$2.95 Postpaid

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 2¼" x 8¼" with 1½" letters.

Type A-18 — For Your Car
Type A-19 — For Panel Mounting

NOTE — The letters on our A-18 Auto Plate can be inverted for mounting below the license plate on 1949 Fords and other cars. Plate measures 3-3/8" from center of mounting holes down to bottom when inverted. Specify type A-18-INV.

Send remittance with order. Allow three weeks for delivery. No orders accepted for Christmas delivery after December 1.

SREPCO, Inc. STANDARD RADIO & ELECTRONIC PRODUCTS
135 E. Second St. DAYTON 2, OHIO. Tel. Fulton 2174

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.
(3) The Ham-Ad rate is 30¢ per word, except as noted in paragraph (6) below.
(4) **Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.**
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 7¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7¢ rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 30¢ rate. Provisions of paragraphs (1), (2) and (5), apply to all advertising in this column regardless of which rate may apply.
(7) Because error is more easily avoided, it is requested signature and address be printed plainly.
(8) No advertiser may use more than 100 words in any one issue nor more than one ad in one issue.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products or services advertised.

Please note the 7¢ rate on hamads is available to ARRL members only.

QUARTZ — Direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond Drill Carbon Co., 719 World Bldg., New York City.

QSLs. 100, $1.25 up. Stamp for samples. Griffeth, W3FSW, 1042 Pine Heights Ave., Baltimore 29, Md.

AMATEUR radio licenses. Complete theory preparation for passing amateur radio examinations. Home study and resident courses. American Radio Institute, 101 West 63rd Street, New York City.

QSL'S. SWL's. Finest stock. Fairest prices. Faster service. Dossett, W9BHV QSL Factory, 857 Burlington, Frankfort, Ind.

QSLS! Kromkote cards at a fair price. Dauphinee, W1KMP, Box 219, Cambridge 39, Mass.

QSL Quality cards priced right. Samples. Ferris, W9UTL, 1768 Fruitdale, Indianapolis, Ind.

SUBSCRIPTIONS. Radio publications a specialty. Earl Mead. Huntley, Montana, W7LCM.

DON's QSL's. "The finest". Samples. 2106 South Sixteenth Avenue, Maywood, Illinois.

CRYSTALS: Precision low drift units. Type 100A in 80, 40, and 20 meter bands. Two units plug in one octal socket. Plus or minus 5 Kc. One dollar each. Exact frequency. $1.95 ea. Rex Bassett, Inc., Ft. Lauderdale, Fla.

DISTINCTIVE SWLS-QSLS. McEachron, 1408 Brentwood, Austin, Texas.

OUR business — buying and selling amateur radio transmitters. Transmitter Exchange, Wakefield, R. I.

FOR Sale: TEMCO 500GA transmitter and Collins 75A1 receiver like new. Will sell together or separate. Best cash offer will take. B. O. Reynolds, Lake Geneva, Wisconsin.

QSLS, SWLS. Those who want the best in QSLs. C. Fritz, 1213 Briargate, Joliet, Ill.

SURPLUS xtal kit. Two FT — 243 holders, two blanks each in 3.5 and 7 mc range, abrasives, etch fluid. $2.00 postpaid. The Vesto Company, Parkville, Mo.

WANTED: Marconi magnetic detector, multiple tuner, DeForest responder; early G-E and RCA receivers; other wireless gear prior to 1925. Franklin Wingard, Rock Island, Ill.

CRYSTALS: Etched precision low drift, FT243 or 5 pin type holders, 5 to 8.5 megacycles ± 5 kc. 95¢. Exact frequency $1.75. Money back guarantee. Lattin-Field Laboratories, 320 West Main, Owensboro, Ky.

QSL's. Reasonable, attractive, free samples. Thompson, W9JIP Print. 5301 N. New Jersey, Indianapolis, Indiana.

SELL: HQ-129-X with speaker. All like new condition $110.00. C. Horn, 325 E. 163rd Street, New York 56, N. Y.

MEISSNER 150-B with spare tubes and Vibroplex key. Guaranteed to be in good condition. All letters answered. WØZRG, 1204 Tyler, Lexington, Nebraska.

QSLS: Original designs priced to fit hams' pocketbooks. Stamps for samples. Leonard's Print Shop, 854 View, Hagerstown, Md.

ROYAL Air Force Receiver 1155, power-pact, loud-speaker. Glass, 9401-64 Road, Forest Hills, New York, 11 9-0905.

FOR Sale: Super Pro, new, with separate power supply, rack mounting, 2.5-5.0, 5.0-10.0, 10-20 mc., 100-200, 200-400 kc. $150.00. A 12 Jensen PM speaker, new, rack mounting, $20.00. 101X National receiver, used, 10-160 m., $75.00. Ten inch speaker for same, $10.00. Bernard Wexler, 1801 Wood Avenue, Linden, N. J.

BC 221-M, new transformers, chokes, filters, Ansco Speedex. Sell reasonable or trade for 16MM sound projector. Also need 8 and 16MM comics or cartoons. Blum, 2661 Dibblee, Columbus 4, Ohio.

QSL-SWL cards, personalized with photograph. The very best. Samples for addressed, stamped envelope. Bob Payne, WØOJC, Marshall, Missouri.

QRM eliminator described in CQ magazine, June 1949. Illustrated advertisement in CQ October, November. Audio filter system for use with any receiver, $32.50. Arrow Appliance Co., 525 Union St., Lynn, Mass.

FOR Sale: 600-watt phone, c.w. rig $350.00. Alabama sale preferred. Also, Webster model 78 wire recorder in excellent condition, only $60.00. W4IQN, 230 E. Thach, Auburn, Alabama.

SELL: Supreme AF 100 Transmitter. Like new. VFO all bands, 10, 11, 15, 20, 40, 75. AM, FM, CW, ICW, 100 watts output. Cost $550.00. Best offer over $300.00. F.o.b. takes it. E. H. Cunningham, W5CU, Zapata, Texas.

150 WATT all band phone transmitter. R.F. 807-812, Mod. 811s. Heavy duty common power supply. ECO to mike. In 36" metal cabinet. Write for pictures and more dope. $150.00. Don Abitz, 187 Nevada, Dubuque, Iowa.

FOR Sale: 225-watt c.w. transmitter, VFO, coils for 20, 40 meters, $50.00. 10 meter mobile station, transmitter, converter, complete $60.00. W6RLP. 1815 Union Street, San Francisco. Phone FILLmore 6-6437. Bay Area only.

NC-240-D. Like new with matching speaker. Sell to highest bidder or will take good wire recorder, small receivers, movie equipment in trade. Don Savin, WØZFK. 202 West 11th Street, McCook, Nebraska.

COMPLETE station: HQ-129-X, 100 w. 80-meter transmitter, VFO, PP 807 final, PP 6L6 modulator, attractive table top cabinet, mike, relays, etc., $250.00. Express collect. P. Boucheron, W2ZBR, 67 Hillturn Lane, Roslyn Heights, New York.

SELL: A-1 condition, ART-13. Best offer. BC-221-AH, $40.00; mod AC pwr unit, $55.00; BC-348-R with pwr pack, $70.00; TR-4, $15.00; TR-4B, $18.00; 2 Sperti Walkie Talkies, both $40.00; SCR-522 complete with control cables MG ant, etc., flight tested, $45.00; 500 ma. chokes, $10.00, #3" RCA 'scope, $50.00. Aerovox model 76 Cap-res checker, new, $40.00. BC610E factory converted for 10-meters $550. Send for list. W3BBV, P.O. Box 722, York, Penna.

NEW crystals for all commercial services at economical prices, also regrinding. Over fourteen years of satisfaction and fast service! Eidson Electronic Company, 'phone 3901, Temple, Texas.

CRYSTALS: Precision, low drift, mounted units, 3500 to 9000 kilocycles. ± 5 kilocycles $1.00. Exact frequency $1.50. Specify mounting. Quotations available for other frequencies. Breon Laboratories, Williamsport, Penna.

FOR Sale: QST 1935 to date, complete. Make offer. Herbert L. Gilman, 414 Triphammer Road, Ithaca, New York.

QSL's, high quality, fair prices. Samples? W7GPP R. D. Dawson, 1308 F Street, The Dalles, Oregon.

SELL: Amertran 6200 v.c.t., 700 ma. transformer. UTC 550 ma. swing and smoothe chokes cased. 5 volt, 25 amp. Acme filament transformer, 2KV insulation. Two 200-watt 25M adjustable bleeders. Two 872 sockets, clips and hash chokes. One G-E 4KV meter with shunts. One double pole, 30 amp. primary relay. Two G-E 4mfd., 3000 volt filters. All new equipment. Guaranteed. $80.00 crated F.o.b. Abingdon, George E. Bidwell, W9FIS, Abingdon, Illinois.

FOR Sale: HRO-7 and VHF 152-A like new, S-27 and Echophone. Numerous high power tubes, Millen exciter, Mark II tank set. Write for details. W2CPI, Box 68, Clayton, N. J.

SELLING out. RME-45, speaker, good condition, $90.00; SX28A, recently overhauled, $150.00; BC611 Handy talkie, $35.00; MAB Walkie talkie, $35.00; two TBY Walkie talkies with vibrapacks, batteries, spares, both for $30.00; Dumont 224A 'scope, $150.00. W2SHE, 111-55 77th Avenue, Forest Hills, N. Y.

FOR Sale: Complete 30-watt 10-meter FM 'phone station; type SCR-608, consisting of 1 BC-684 xmtr, 1 BC-683 rcvr; FT 237 mounting; 5 sect. antenna with mast base, complete set of 79 xtals covering every 100 kc. from 27.0 mcs. to 34.9 mc., also instruction manual. Transmitter is xtal controlled with ten push button channels. Receiver is manual tuning over entire coverage. Ready to go on the air with your 12v D.C. source. Can be easily converted to A.C. Price $59.00 F.o.b. J. H. Ashley, W4OSC, Ware Shoals, S. C.

SURPLUS tubes: 80% off list, F.o.b. Pittsburgh, Pa. Obtained from Army Signal Corps in original cartons, all guaranteed perfect. Following types available: 6F6, 6J5, 6K6GT, 77, 78, 6AC7, 6AG5, 6SH7, 6L6, 3S4, IN5, 1J6G, CHS721A, CTL954, 1299. Minimum quantity $5.00 net. Send all orders to Monarch Electric Company, 411 Wood Street, Pittsburgh 22, Pa.

FOR sale reasonable: a 300-watt rig. Millen final P.P. 812's, Millen exciter, 500-watt D.C. supply for final. Plenty of spare xtals. Good speech amplifier. 2A3's driving 811's P. P. Write to Fred E. Evans, W10IK, 6 Rowland Road, Newport, R. I.

BEST offer takes: New Elincor 400EA three element ten meter beam; Silver 701 transmitter like new; new WRL 300v, 100 ma. power supply. Waller, 54 Lovett, Little Silver, N. J.

SELL: Xmitter 10–20–40–80 variac controlled 800 watts cw 500 fone AM, NBFM, VFO. Receiver BC-312-HX, Q5'er, 10-meter converter. Dual 10–20 3-element beams, rotator. Complete station, $350.00. Also Eastman 8mm magazine F1.9, $90. Consider Leica accessories in trade. Harold Hart, W1MKZ, 139 Brook St., Wellesley, Mass.

HALLICRAFTERS HT-9 transmitter, $90.00; HRO receiver $115.00; 80-meter walkie-talkie BC-459A, power supply; need Meissner shifter, sail or outboard boat, Argus camera. Krueger, 10330 Hamilton, Chicago, Ill.

HRO, voltage regulated power supply; coils .54–30 Mc.; bandspread; noise limiter, $119.50. Navy RAO .54–30 Mc. two RF stages; noise limiter; hot on ten. $79.50. Hargrove, 26 Sunnycrest, Little Silver, New Jersey.

FOR Sale: Hallicrafters SX-28A less speaker, $125.00. Meck T-60 transmitter w/coils for 10–20–40 and 80 meters, $100.00; VHF-152, $59.00; Lester Lafayette VHF converter, $25.00; Hallicrafters T-54 television receiver, $90.00; Echophone commercial receiver, Model EC3, $20.00. Edson L. Hart, jr., Salineville, Ohio.

SELL: Hammarlund SP-400-X Super Pro, complete with matching speaker and power supply, excellent condition, $245.00, F.o.b., M. B. Rotnem W9CRQ, 613 13th Street, Menominee Wisconsin.

FOR sale: One BC-683-B 27 mc. to 39 mc. receiver with dynamotor and one BC-684-A FM-transmitter. 30-watt output, with dynamotor and 90 xtals. Best offer over $75.00. Robert G. Wagner, WØAGL, 410 Peak Street, Lead, South Dakota.

BC-348-P converted. Large, regulated power supply, housed in speaker cabinet. Noise limiter. Includes a BC-453-B (Lazy man's Q5-er) which can be switched in or out. Plenty sharp and plenty hot. $110.00. Also 150w. transmitter with 1000 V. power supply $35.00. Code oscillator $5.00. Instructograph with build-in oscillator and ten tapes $20.00. Write or 'phone. John A. Smets, 2329 Farwell Avenue, Chicago 45, Illinois. Sheldrake 3-1090.

FOR sale: 8X-42. Good set. Need money. First $150.00 gets it. Arnold C. Brackmeier, 4204 Florida Avenue, Cincinnati 23, Ohio.

12 V. BC-348 (BC-224) converted A.C. with manual $70.00. Pair 4-125-A's 1Kw. final $45.00. 3300 V., 400 ma. power supply, $35.00. UTC VM-5, 600-watt multi-match modulation transformer, $25.00; driver, $5.00. 600 V., 750 ma. power supply, $15.00. 20-meter Premax vertical, $15.00. Two 12 hy., 500 ma. chokes, $5.00. Selling out. Write for list. XX J. Lane Ware, 5401 SW 4th Street, Miami, Fla.

COLLINS 75-A receiver in top condition. First $295.00 or best offer gets it. WØFUB, 3430 E. Avenue, N.E., Cedar Rapids, Iowa.

New Thordarson 125-watt multimatch, BC-348-O, RAX, TA12, wide variety of radio gear, sell or trade for photographic equipment. Ted Chadek, 3242 McKinley, San Diego 4, Calif.

FOR sale: BC-221 frequency meter; new with original heavy canvas carrying bag. $69.50. James W. Craig, Jr., 239 Preston Avenue, Lexington, 27, Kentucky.

BARGAINS: New and reconditioned Collins, National, Hallicrafters, Hammarlund, RME, Millen, Meissner, Sonar, Meck, etc. Reconditioned S38 $25.00, S4OA $59.00, SX42 $179.00, NC57 $59.00, NC173 $139.00, NC 240 D $149.00, HQ 129 X $129.00, RME45 $99.00, DB22A. VHF 152 A, HF-10-20, RME84, RME69, HFS, NC200, NC183, HRO, SX43, SX28A, SX25, SP400X, HT9, BC610, T350XM, Supreme AF100, Collins 75A1, Collins 32V1, etc. Shipped on trial. Terms. List free. Henry Radio, Butler, Missouri.

QST's wanted: December 1915 thru July 1916. Cash or swap for 1917–1919 issues. Louis Rizoli, W1AAT, 100 Bay View, Salem, Mass.

QSL's, Stationery, all kinds printing for the Ham. Samples free. W4HUD, Box 322, High Point, N. C.

WHERE do you get personal attention and prompt service? At northern New England's foremost amateur radio supply house. Carl Evans, W1BFT, Evans Radio, Concord, N. H.

FOR sale: Mobile 75-meter transmitter. AVT-112-A. M. E. Haase, WØPSD, Box 286, Fergus Falls, Minn.

SELL: BC-348-S has built-in 110 V. A.C. supply $60.00, BC-221 metal cabinets original calibration books $75.00, BC-454, brand new $6.00, like new Gon-Set 3-30 $28.50, SCR-522 with tubes, good condition $30.00, JC-696 and BC-459 in mounting rack, excellent conditions $25.00, 813's $6.00, 811's $2.00. R. H. Sneed, W5RY, 643 Eagle Avenue, Jackson, Mississippi.

QSL, SWL cards. Jaggi, W5FAV, 6118 Goliad, Dallas, Texas.

QSL's — New, Different, Appealing. Samples, Larry's QSL Shop, Opportunity, Washington

NEED urgently five RCA AVT-112A transmitters. Will pay cost plus percentage. W1EFW, Southington, Conn.

RCA communications receivers CGR 32-2 (1937 twins), 1.43-26.24 mc. in 6 bands, AC or batteries, 12 tubes, U.S. Coast Guard Marine service super-het circuit, with service manual. 19" x 10½" panel; depth 16¼". Wt. of pair in cabinets 180 lbs. MacKay receiver FTR-128, AC-DC, 15-650 Kc. in 4 bands. Cabinet wt. 42 lbs. J. D. Lane, Box 81, Boston 67, Mass.

SELL: Rare technical manual on SCR 211 (BC221) Freq. Meter. Profusely illustrated $1.25 each. W3NB 1717 Lang Place, N.E., Washington 2, D. C. Frank A Dunan.

WILL swap new BC-348 or pay cash for new or good used Bendix RAI receiver. W3DL, 1628 Naturo Road, Towson, Md.

RECORD-changer parts for leading makes. We ship everywhere. Friend's Wholesale Distributors, 106 North Sixth St., Philadelphia 6, Penna.

ALUMINUM tubing, etc. Beams for amateurs, TV, FM. Lists free Willard Radcliff, Fostoria Ohio.

"TAB" sensational 6V Carter Dynamotors 400V/150 Ma, $8.98; 250V/100 Ma, $4.98, both: $12.49. Guaranteed tube bargains! 6J6, 6AK5, 6AG5, ea 37¢. 6C4, 24¢; 388A, 40¢; 954, 14¢; 955, 16¢. 1N34 crystal, 84¢. GE-2J1G1 Sysyns, used tested pair, $1.49. Tuning meter 5 Ma., 98¢. 30CM/12" UHF mobile Hamband antenna, AT5/ARR1, 39¢, 4/$1. Hi-Gain Dynamic mike transformer plus excellent fidelity dynamic mike, both $1.49. Write for bargain "Tabogram". "TAB", Dept. 11Q. 6 Church St., N.Y.C., N.Y.

ART-13 wanted. Will pay up to $100.00. For sale: new Brush tape recorder, complete, $150.00. W8ZT, 229 Navajo, Pontiac, Mich.

URGENTLY needed: 5 RCA AVT-112A transmitters. Will pay cost plus percentage. Civilian Air Patrol, Conn. Wing Supply and Maintenance, Zimmerman, Nipsic Road, Glastonbury, Conn.

NEW design 3-element 10-meter beam, $24.75, optimum spacing RO.2 A O.15 D. Easy to tune, light weight, rugged construction. Write Essanar Industries, 2744 West 37th Place, Chicago 32, Illinois.

WANTED: Harvey UHX-10 transmitter. W1BB.

SUPER Gloss QSLs — SWLS! Samples. Cushing, W1HJI. Box 32A, Manchester, N. H.

WANTED: Instruction book for operation and maintenance of radio set SCR-274-N. State condition and price and revised date. C. L. Harvey, 582 Rose Drive, Whittier, Calif.

WANTED: BC-610E coil and tuning unit for 75 meters. BC-939A. Must be in good condition. J. G. Gehm, WØLAL, Kirksville, Mo.

CASH and carry sale: Temco 500GA transmitter with remote control, like new, 500-watt phone and 750-watt cw. Cost $1500.00. Best cash offer will take. Selling out. William S. Johnson, 521 Eighth St., Ocean City, N. J.

GASOLINE driven 120-volt 60 cycle generators, 300-watt, bargain. See our full page ad, July '49 QST. The Mytronic Co., 121 W. Central Parkway, Cincinnati 2, Ohio.

SELL: APA-11 pulse analyzer, $75.00, with diagram. W6QT, 2805 Russell Berkeley, Calif.

FOR sale: BC-325 transmitter with phone patch and remote control. 1500–18,000 KCS. 400 watts c.w. 150-watts phone, $595.00. Walla Walla Radio Club, P.O. Box 941, Walla Walla, Wash.

WANTED: National MB-150 tuner or 3 foot enclosed rack. Can swap pair guaranteed unused 813's. W2YWG/9, 110 E. Elm, Alton, Ill.

WANT high power? Trade well-built Kw xmitter PP 810s–810's MOD 6 ft rack and Par-Metal gray crackle, metered, for small commercial rig, 100 or 200 watt xmitter. HT-9. 32V1, etc. Travelling. Can't use a big rig. F. L. Jones, WØSTM, El Dorado, Kans.

FOR sale: HT-9 (1948 model), completely neutralized. Coils for 160 through 10 meters, $295.00. Kenneth Stedman, 305 N. Locust St., Valparaiso, Ind.

WANTED: Rcvr covering 15–500 Kc., prefer Navy RAK-7 or similar. State price and condition. WØXRE, O. C. Vidden, Fertile, Minnesota.

BARGAINS: New and used transmitters-receivers-parts: Globe King, $299.00; new 150-watt phone $199.00; 60-watt phone, $99.00; Globe Trotter, $57.50; HT-17, $39.50; New Meissner Signal Calibrators, $29.95; TR-4, $19.95; MB-611, $39.00; Pierson KP-81, $219.00; HRO STA1, $199.00; SX-43, NC173, HQ-129X, $139.00; RME-45, SX-25, $99.00; Howard 430, $29.50; S-38, $29.95; S-41, $22.50; latest signal shifter, $59.00; DB22A, $49.00; BC-610's, AF100, and many others. Large stock trade-ins. Free trial. Terms financed by Leo, WØGFQ. Write for catalog and best deal to World Radio Labs, 740–42–44 West B'way, Council Bluffs, Iowa.

NOTICE: Owners of BC-221 frequency meters: BC-221 manufacturer has small lot AC power supplies with modulator, designed to fit BC-221 battery compartment. Only $9.85 each, complete with tubes. Send check to Rauland-Borg Corporation, 3523 West Addison St., Chicago 18, Illinois.

FOR Sale: Sonar radio transmitter 75-watt 80 to 10 meters, consisting VFX680, exciter CW-NBFM, Amplifier 50 PS50 power supply, all tubes, coils. Model HT-18 Hallicrafters VFO, model 90881 Millen RF-500 watt power amplifier; pair 8005 tubes, all practically new A-1 condition. Power supplier, tubes, meters, miscellaneous parts. Write for complete list. Selling out cheap. R. M. Krauss, 206 Wehatsheaf Lane, Abington, Penna.

BRING your Ninth Edition of Nilson & Hornung up-to-date with "Key and Answers to New Radiotelegraph Questions". $1.00 postpaid. McKenzie, W2SOU, 245 Poplar, Hackensack, N. J. Watch for announcement about Element Seven.

QSLS? SWLS? Immediate service! No cheap trash! Samples, 10¢. QSL-printer Sakkers, W8DED, Holland, Michigan. Dealer for DB-22A, VHF-152A, HF-10-20, Bliley, Electro-Voice, Lambda Oscilloscopes. Agency for all radio magazine subscriptions and renewals.

CHRISTMAS cards, "ham styled". 20 assorted, $1.00. Narvestad, Granite Falls, Minn.

SELL/Trade RA20 pack new $7.00. Frequency meter set 90600 Millen, like new, $7.00. TCA416XO Amplifier Corp America PP 6L6 Osc/Amplifier with conversion parts for hi-fi speech amplifier, very good, $19.00. 500-watt final, kit new, almost complete and pair A-1 V70D tubes, $45.00 cost. Sell for $34.50. Many other items. See my ad last month for items wanted. Myron Lawson, W5ACL, 4010 River Drive, Houston 17, Texas.

CASH and carry. Complete station. Half kilowatt phone transmitter in metal rack. National NC-100X receiver, like new, with excellent ten-meter band. Also all other station equipment such as National oscilloscope, extra meters, relays, tubes, mikes, wavemeter, phone monitor, portable equipment and motor-generator. $250.00. Also complete library of QST magazine. Years 1931 to present. Excellent condition. Best bid. M. W. Grove, W3BWV, 724 Hill Top Drive, Cumberland, Md.

FOR Sale: Meissner 150-B converted for all bands, must sacrifice, $225.00. 300 watts power output. F. Ballard, 410 West End Ave., New York City 24, N. Y.

FOR Sale: TelRad 18A frequency standard; 10-100-1000 Kc markers; 100 Kcs thru 45,000 Kcs. New, in original carton, $20.00. BC-375E transmitter; used but in excellent condition, $12.50. RG8U coaxial cable, 52 ohm, 04¢ per ft. Antenna tuning unit BC-306, $4.00; will trade by value for BC-459A; with mounting and power supply. John H. Ashley, W40SC, Ware Shoals, S. C.

SELL: 325W. Phone P.P. TZ40 finals and mods., can use VFO exciter and audio drivers as 50 w. phone, 6 ft. relay rack mounted, fully metered, 20 and 10-11 meter coils. J. H. Long, W2PQA, 32–261 70 St., Flushing, L. I., N. Y. FI 8-8739.

Transmitter and power supply components for sale cheap. Write for list. W1GS, 53 Westwood Road, West Hartford, Conn.

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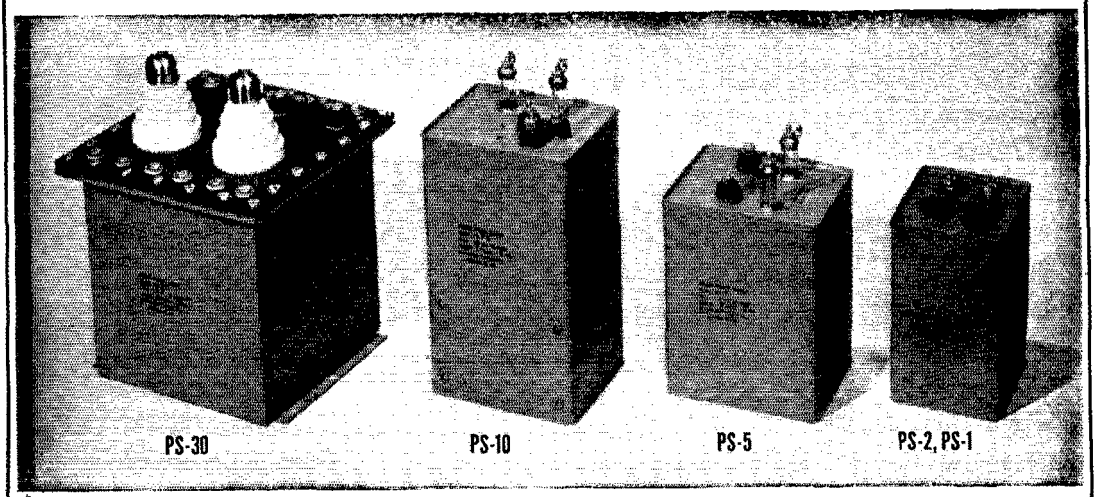

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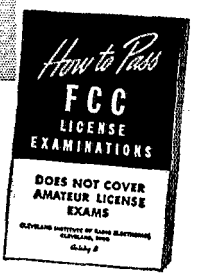

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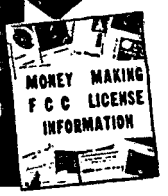

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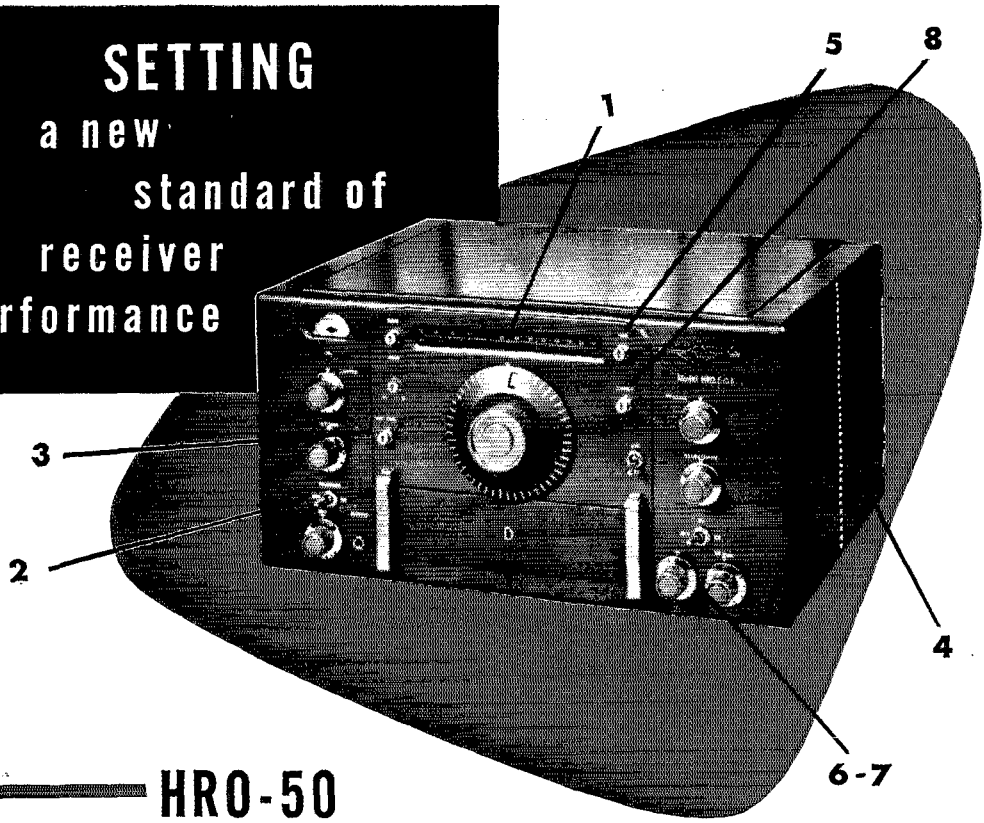

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The RCA 811-A and 812-A supersede the 811 and 812, and can be used respectively in their sockets without circuit changes.

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To get all the tube power, performance and life *you* pay for . . . buy genuine RCA tubes in the familiar black and red cartons. For complete data on the new RCA 811-A and 812-A tubes, see your RCA tube supplier, or write RCA, Commercial Engineering, Section 48KM, Harrison, New Jersey.

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