QST devoted entirely to amateur radio
Ultra compact, lightweight, these UTC audio units are ideal for remote control amplifier and similar small equipment. New design methods provide high fidelity in all individual units, the frequency response being \( \pm 2 \text{ dB} \) from 30 to 20,000 cycles. There is no need to resonate one unit in an amplifier to compensate for the drop of another unit. All units, except those carrying DC in Primary, employ a true hum-balancing coil structure which, combined with a high conductivity outer case, effects good inductive shielding. Maximum operating level +10 DB. Weight—5 \( \frac{1}{2} \) ounces. Dimensions—1 \( \frac{1}{2} \)" wide x 1 \( \frac{1}{2} \)" deep x 2" high.

### Ultra Compact High Fidelity Audio Units

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Application</th>
<th>Primary Impedance</th>
<th>Secondary Impedance</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-10</td>
<td>Low impedance mike, pickup, or multiple line to grid</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>50,000 ohms</td>
<td>$15.00</td>
</tr>
<tr>
<td>A-11</td>
<td>Low impedance mike, pickup, or line to 1 or 2 grids</td>
<td>50, 200, 500 ohms</td>
<td>50,000 ohms</td>
<td>$16.00</td>
</tr>
<tr>
<td>A-12</td>
<td>Low impedance mike, pickup, or multiple line to push pull grids</td>
<td>50, 125, 200, 250, 333, 500 ohms</td>
<td>50,000 ohms</td>
<td>$16.00</td>
</tr>
<tr>
<td>A-18</td>
<td>Single plate to two grids</td>
<td>8,000 to 15,000 ohms</td>
<td>80,000 ohms overall, 2,31 turn ratio overall</td>
<td>$14.00</td>
</tr>
<tr>
<td>A-24</td>
<td>Single plate to multiple line &amp; 6 MA unbalanced D.C.</td>
<td>8,000 to 15,000 ohms</td>
<td>80,000 ohms overall, 2,31 turn ratio overall</td>
<td>$15.00</td>
</tr>
<tr>
<td>A-30</td>
<td>Push pull low level plate to multiple line</td>
<td>8,000 to 15,000 ohms</td>
<td>80,000 ohms overall, 2,31 turn ratio overall</td>
<td>$15.00</td>
</tr>
<tr>
<td>A-35</td>
<td>Push pull low level plate to multiple line</td>
<td>8,000 to 15,000 ohms</td>
<td>80,000 ohms overall, 2,31 turn ratio overall</td>
<td>$15.00</td>
</tr>
<tr>
<td>A-36</td>
<td>Audio choke, 300 henrys @ 2 MA 6000 ohms D.C., 75 henrys @ 4 MA 1500 ohms D.C., inductance</td>
<td>8,000 to 15,000 ohms</td>
<td>80,000 ohms overall, 2,31 turn ratio overall</td>
<td>$15.00</td>
</tr>
</tbody>
</table>

The above listing includes only a few of the many Ultra Compact Audio Units available . . . write for more details.

**United Transformer Co.**

560 Varick Street, New York 13, N. Y.

Export Division: 15 East 40th Street, New York 16, N. Y. Cable: "AURAM"
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- buffer.
- doubler, tripler, quadrupler, etc.
- final tube, singly or in push-pull.

Input (see ratings) is high enough to power a rig that's respected. Frequency is up to 60 mc at max ratings, or well above the 6-meter operating band.

The audio end also finds Type GL-807 a natural for modulator work and speech-amplifier service. You phone men may judge the tube's worth from the fact that a pair in Class AB1 operation will put out 120 w, ample to modulate a quarter-kilowatt transmitter.

Two things especially make the GL-807 such a keen ham-rig performer. It's a tube designed with the amateur's needs in mind; so its ratings lie in the area of greatest usefulness. It's a beam power tube, and this means maximum output with minimum drive—in short, efficiency.

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**GL-807**

**BEAM POWER AMPLIFIER**

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- doubler, tripler, quadrupler, etc.
- final tube, singly or in push-pull.

Input (see ratings) is high enough to power a rig that's respected. Frequency is up to 60 mc at max ratings, or well above the 6-meter operating band.

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**ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR**

**GENERAL ELECTRIC**

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**Christmas Greetings**

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Newcomers in ham radio are greatly helped by the remarkable sensitivity, selectivity, stability, and the accurate calibration of the Collins 75A-1 receiver.

The more significant commendations, however, come from seasoned amateurs who, like WØSQO, have literally worked the world for years with less advanced, less thoroughly engineered equipment. This is true whether their chief interest is in DX or traffic.

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The very high accuracy and stability of the 75A-1 are due to (1) the use of quartz crystals in the first conversion circuit, (2) the inherent accuracy and stability of the vfo in the second conversion circuit, and (3) linearity and absence of backlash in the tuning mechanism. The stability is such that on c-w reception extreme variation in the supply voltage causes a change of only a few cycles in the note. Rejection to image frequencies is greater than 50 db for all bands.

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458 South Spring Street, Los Angeles 13, California
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3. Beryllium copper contact spring, silver plated
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5. Steady end plates
6. Long creepage paths
7. Low minimum capacity — maximum tuning range
8. Small size — end plate only 1 1/2" square

Other capacities and spacings available on special order.

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Also Available in .080" Spacing

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<tbody>
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Also Available in .080" Spacing

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NBFM or CW
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...the New HT-19 Transmitter...

- Designed for the modern-minded Ham. Maximum flexibility on 5 Bands—3.5, 7, 14, 21, and 28 MC. High stability, low FM distortion (measured at less than 5%). Provisions for applying AM from external modulator. 125 watts output.

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More Hallicrafters instruments are available to you today than ever before. Here for your information is a complete list of major models:

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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.

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

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"It Seems to Us..."

ulMO-ulXAM-8AB

Twenty-five years ago — on November 27, 1923 — the radio world was astounded by the establishment of the first amateur two-way contact across the Atlantic Ocean.

The achievement electrified the amateur body. It amazed the professionals, too, for the wavelength used was in the vicinity of 100 meters — practically u.h.f. in those days, and a wave considered worthless by most authorities. It broke open the short waves: it started a general exodus well below 200 meters by both amateurs and commercials, almost disrupted the already inadequate radio legislation in this country, and started the radio art toward its search for propagation knowledge.

Such an historic event was not mere chance, of course, but the result of many months and years of planning and work. QST, just getting into full swing in its campaign to drop spark in favor of c.w., had started plugging also for more amateur interest in the wavelengths below 150 meters; and, in 1922 and early 1923, under the guidance of QST's technical editor, a small group of stations was conducting tests on wavelengths down to 90 meters. But there was no great trek to follow the few amateur pioneers who dropped to that unexplored territory. Perhaps it was because of professional belief in the superiority of longer waves (we didn't talk frequency in those days; it was wavelength) that amateurs crowded the 200-meter end of our 150-200-meter band; perhaps it was because special licenses were necessary for wavelengths shorter than 150 meters. But this is neither the time nor place to philosophize on the vagaries of human nature, to wonder why so many of us are reluctant to venture in the realm of the unknown and the untried. The fact is that it remained for just a handful of adventurous hams to pioneer in the region below 150 meters. The leadership of a few amateurs blazed a trail toward new horizons of communications, a trail which was to be eagerly followed by the body of amateurs and commercials alike.

In the ARRL transatlantic tests during the autumn of 1921, American amateur 200-meter stations had been heard in Europe for the first time, mostly at a special receiving installation in Scotland set up by Paul Godley, 2XE, under ARRL sponsorship. The 1922 tests were another stride forward — two-way transatlantic communication loomed as a definite possibility when several two-hundred meter European stations were heard on this side for the first time. One of these was French 8AB, at Nice, France.

Let us pick up the story now by quoting from Two Hundred Meters and Down.

The owner of 8AB was Leon Deloy. During the summer of 1923 Deloy visited the United States to study American amateur methods, with the avowed determination to be the first to span the Atlantic. He went to the A.R.R.L.'s national convention in Chicago; he bought American radio gear; he consulted with John L. Reinartz, 1QP-1XAM, concerning his new station. He lived, thought, acted and worked with one objective — to work across the Atlantic. Returning home to France in early autumn, he applied all the information he had received, completed his new station and tested with British 2OD in October, and in November cabled A.R.R.L. Traffic Manager Schnell that he would transmit on 100 meters from 9 to 10 p.m., starting November 25th.

Over the traffic routes of the A.R.R.L. flashed the electrifying news. Many a
station commenced listening. From the very first, SAB and the identifying cypher group "GSJTP" were audible in Hartford. The next night, the 26th, Deloy transmitted again and, having been advised by cable that he was being heard, sent two messages, which were copied not only by Schnell and K. B. Warner at IMO, but also by Reinartz at 1XAM. One was a message of greetings from French to American amateur radio; the other made a schedule for an attempt at two-way work the following night.

The night of November 27, 1923, both Schnell and Reinartz were on the air. Schnell had secured special permission from the Supervisor of Radio at Boston to use the 100-meter wavelength, and everything was in readiness. At the stroke of 9:30 the strangely-stirring 25-cycle gargle from SAB came on the air. For an hour he called America, then sent two more messages. At 10:30 he signed off, asking for an acknowledgment. Long calls from IMO and 1XAM and then . . . there he was, asking Reinartz to stand by, and saying to Schnell, "R R QRK UR SIGS QSA VY ONE FOOT FROM PHONES ON GREBE FB OM HEARTY CONGRATULATIONS THIS IS FINE DAY MIM PSE QSL NR 12."

It was, indeed, a fine day. The job was done, though it is interesting to note from articles about it in QST that no one knew exactly why. QST's technical editor, for instance, speculated on the reasons for it, and several similar long-distance records that were made shortly thereafter, as follows: "We are for the first time doing consistent 3500-mile work because we are (for the first time) using antennas that are large — very large — for the waves at which they are working. Working an antenna that way gives high radiation efficiency." To experimenters of that day such an explanation seemed quite logical; at least, nothing better was immediately forthcoming. In those days the ionosphere was believed to exist, but little was known about it and its behavior was a matter for conjecture. The ionosphere was still a playing field of the theoretical physicists, not something to be reckoned with by practical radioists, and it was to be another 18 months before Reinartz presented in QST his ionized-reflecting-layer hypothesis.

Yes, the job was done, and done by a handful of pioneers who refused to consider that it was impossible.

Twenty-five years is a long time. It is all the more remarkable, then, that the three principals in the first transatlantic QSO are still alive today and still ardent amateurs. Although Deloy, now a retired vineyard owner, living in Monaco, has not been able to keep an active station in recent years, he maintains a thorough academic interest in amateur affairs. Fred Schnell, W9UZ, a captain in the Naval Reserve, has for some years been out in Chicago running the police radio system. John Reinartz, W3RB, also a captain, USNR, is a research engineer and general good-will agent for the Radio Corporation of America. The leaves of laurel can find no more worthy brows than those of Messrs. Deloy, Schnell and Reinartz.
Building a Series-Tuned VFO Unit

A Highly-Stable Substitute for 3.5- and 7-Mc. Crystals

BY DONALD MIX, * WITS

Within the past few months, one of the chief topics of discussion on the air has been the series-tuned Colpitts VFO. Most of those who have tried the arrangement have met with sufficient success to arouse a considerable amount of enthusiasm. After doing some work with the arrangement, there is no question in our minds that the circuit is superior to the conventional high-C oscillator on several counts.

By far the most important improvement over the high-C circuit is the series circuit's relatively small change in frequency with change in plate voltage. This may not mean much to the 'phone man, or to the c.w. man who doesn't find it an advantage to key his oscillator. But it is of great significance when the oscillator must be keyed for break-in c.w. operation. For the first time, it offers the possibility of oscillator keying with both chirps and clicks reduced to negligible dimensions.

* Assistant Technical Editor, QST.

Voltage-Frequency Stability

In keying an oscillator, a well-nigh insurmountable problem has been posed by the fact that the plate voltage must change from zero, when the key is open, to the operating voltage when the key is closed. Unless the oscillator is insensitive to voltage changes, the frequency will swish as the voltage rises from zero to full value, producing the well-known chirp. The only way to avoid or reduce chirp under such a condition is to minimize the time lag in the keying circuit so that the time interval required for the voltage to rise from zero to maximum is so short that the ear cannot detect the change in frequency. Unfortunately, however, the reduction of clicks requires slowing down the rate of rise (and decay) in voltage when the key is opened and closed. Therefore, the only measure available to reduce chirps has been in opposition to the requirements of key-click reduction. With the series-tuned Colpitts circuit, the voltage-frequency stability is sufficiently good to make it possible to introduce
enough lag in the keying circuit to reduce clicks without bringing in a noticeable chirp, even at frequencies as high as 28 Mc.

Another advantage of the series-tuned circuit is that the tube is shunted by the low impedances of large condensers. This means that any effect that the tube and its load can have on the frequency of the tuned circuit will be small. Tube lead length becomes relatively unimportant at normally-used oscillator frequencies and therefore the tube and the heat it radiates can be well isolated from the frequency-determining tank circuit. These points, when combined with the fact that the tank current circulating through the coil is very small compared to that in a high-C circuit, mean that frequency drift can be brought to a very low value.

**Mechanical Problems**

One characteristic of the series-tuned circuit that might be called a disadvantage is that it is more sensitive to mechanical vibration. The coil becomes of large physical size, more difficult to construct and mount against the effects of vibration. The larger coil has a more-extensive field to be affected by vibration of near-by metal or dielectric. When it is considered that it may require a change in tuning-condenser capacitance of only 20 µfd, or so to cover the entire 80-meter band, it is not difficult to understand how vibration or any other form of instability in the tuning condenser can affect the frequency.

**Maintaining Oscillation**

Several of those who have tried the series-tuned VFO have encountered trouble in maintaining oscillation over a sufficiently-wide frequency range. It is obvious that as the series tuning capacitance is reduced, the coil — so to speak — becomes more and more nearly disconnected from the remainder of the circuit. Therefore there must be some minimum value of series capacitance beyond which oscillation can be maintained without trouble.

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Fig. 1 — Circuit diagram of the series-tuned VFO.

 OSC. — 1.75 Mc.  
 1.75/3.5 Mc.

C1 — 50-µfd. per section variable (Millen 23050).
C2 — 100-µfd. variable (Millen 19100).
C3, C4 — 0.001-µfd. zero-temp.
C5, C6, C7, C8, C9 — 100-µfd. mica.
C10 — 0.01-µfd. paper.
C12 — Approx. 75-µfd. variable (Millen 22100 with 3 stator plates removed).
C13 — 220-µfd. mica.
C14, C15 — 16-µfd. 450-volt electrolytic.
R4 — 1000 ohms, 10 watts, adjustable.
R5 — 50,000 ohms, 10 watts.
L1 — 140 μh. (National AR-160).
L2 — 3.5 Mc.—16 turns No. 22, 1½ inches diam., 5½ inch long.
— 1.75 Mc.—37 turns No. 22 d.c.c., 1¼ inches diam., close-wound.
L3, L4 — 14-μh. 100-ma. filter choke (UTC R-19).
J1 — Closed-circuit jack.
RFC1, RFC2 — 2.5-mh. r.f. choke.
S1, S2 — S.p.s.t. toggle switch.
T1 — Power transformer: 350 v. r.m.s., 90 ma.; 5 volts, 3 amp.; 6.3 volts, 3.5 amp.

cannot be maintained. The range over which the circuit will oscillate depends principally upon the Q of the tank coil, the mutual conductance of the tube and the size of the series tuning capacitance in relation to the capacitances shunting the tube. The circuit will oscillate more readily with an increase in the Q of the tank coil, with an increase in the mutual conductance of the tube, and by increasing the size of the tuning condenser in comparison with the size of the tube-shunting capacitances. On the other hand, the frequency stability is increased with a decrease in the capacitance of the tuning condenser relative to the tube-shunting capacitances. Therefore, for best frequency stability, the tuning capacitance should be small and the tube-shunt-
ing capacitances large. If the oscillator will not function over the desired frequency range, the $Q$ of the coil should be increased or a better tube selected. If neither of these is possible, the only alternative is to increase the size of the tube-shunting capacitances. A change in the latter will have a relatively small effect upon the frequency of the tuned circuit, while an increase in the tuning capacitance will naturally require a reduction in the size of the coil to keep the oscillator tuning to the same frequency.

**Practical Circuit**

The preceding considerations have been kept in mind in the design of the VFO unit shown in the photographs. Referring to the circuit diagram of Fig. 1, a 6AG7 pentode is used in the electron-coupled series-tuned Colpitts oscillator circuit. $C_1$ is the bandspread tuning condenser which covers the fundamental range of 1750 to 2000 kc. $C_2$ is a padder to provide a fixed minimum circuit capacitance. $C_3$ and $C_4$ are the tube-shunting capacitances.

In three different models tested, trouble was experienced with a slight but annoying intermittent hop in frequency. This was finally eliminated by the substitution of an air condenser for a low-temp-mica tuning-condenser padder and by shifting to a dual-section tuning condenser with the sections connected in series so as to eliminate bearing contact.

Since the screen, which serves as the plate in the oscillating circuit, is grounded, the cathode is above ground potential and therefore must be returned to ground for d.c. through an r.f. choke.

The output circuit is nonresonant ($RFC_3$) and is capacity coupled to a 6L6 output stage that may be operated at either 1.75 or 3.5 Mc. This permits feeding a crystal-oscillator stage that normally operates with either 3.5- or 7-Mc. crystals, without danger of oscillation in the crystal-oscillator stage, since it may always be used as a doubler. The tuning condensers of the oscillator and amplifier are ganged.

A power supply is included in the unit. Screen and plate voltages for both stages are taken from a VR-tube voltage divider. The regulator tubes are used both as a convenient voltage-divider arrangement and to limit the shaping of the keying characteristic entirely to any key-click filter that may be used with the unit.

**Construction**

In the unit shown in the photographs, the frequency-determining tank is isolated from the rest of the circuit by enclosing it in a standard steel box $5 \times 6 \times 9$ inches. The tuning condenser is mounted on the top plate of a $4 \times 4 \times 2$-inch steel box with metal brackets that space the bottom edges of the condenser end plates $\frac{1}{4}$ inch from the plate. The rotors of the condenser must be insulated from ground.

The coil is removed from its original mounting, the link removed, and the coil remounted on a $\frac{3}{8}$-inch cone insulator at the forward end and a small feed-through insulator at the rear. The first quarter turn at the front end of the coil is broken loose and a short connection between the adjacent tuning-condenser terminal and the coil at this point is made with a piece of heavy wire. This serves as a brace for the coil against vibration. Another short piece of heavy wire goes from this same point to a small feed-through insulator set directly below in the top plate. This feed-through insulator and the one at the rear end of the coil serve in making connections to the condensers on the under side of the plate.

The adjustable padder, $C_2$, is mounted centrally on the under side of the plate with its shaft pointed toward the right. The end of the shaft is slotted for a screwdriver and holes are drilled in the sides of both inner and outer boxes so that the padder may be adjusted from the outside after the unit has been assembled. The mica condensers, $C_3$ and $C_4$, are fastened alongside the padding condenser by cementing them to the plate with Duco cement to eliminate movement.

The top lip of the small box may have to be notched out in a few places before the top plate will fit in place.

Discarding the bottom plate of the small box, the height of the tuning-condenser shaft above the lower edge of the box should be measured carefully and large clearance holes cut centrally in the outer box at this same level. Placing the smaller box inside, with its rear face against the back wall of the outer box and with the
Underneath the shelf. The oscillator tube is to the left, the amplifier to the right. The terminal strip to the right connects to a similar strip fastened to the base chassis.

Underneath the shelf. The oscillator tube is to the left, the amplifier to the right. The terminal strip to the right connects to a similar strip fastened to the base chassis.

tuning-condenser shaft lined up with the shaft holes, the position of the smaller box should be marked on the rear wall. Then the top plate should be removed, the small box replaced and holes marked in the bottom of the outer box so that the smaller box can be fastened in place with screws up through the bottom. With this done, a grommet hole for the leads to the oscillator tube should be drilled simultaneously through the rear of both boxes near the oscillator-tube socket. Three leads — connections to the grid condenser, $C_6$, to the cathode, and to the ground point of the screen by-pass condenser of the oscillator tube ($C_7$) — are bunched together and brought out through this hole.

With the oscillator-tank unit fastened in place within the large box, and flexible insulated couplings on each end of the tuning-condenser shaft, the dial can be lined up and its mounting holes marked on the front of the outer box. The lower edge of the dial plate will overhang approximately a half inch at the bottom of the box.

The remainder of the r.f.-circuit components are assembled on a 2½ × 8-inch aluminum shelf fastened to the rear of the box to isolate the tank components from the heating of the tubes. The amplifier tuning condenser, $C_{12}$, must be insulated from the shelf. The height of the shelf is adjusted, after the condenser has been mounted, so that its shaft lines up with the tail shaft of $C_4$. Wiring and associated small parts are placed under the shelf. All power-supply connections and the key connection are made to a 5-point lug strip at the left-hand end of the shelf.

The entire unit is guarded against mechanical vibration by mounting the box on rubber grommets. A grommet is placed in each of the four corners of the bottom of the box. These are duplicated in the top of the 10 × 12 × 3-inch chassis which serves as a base. Machine screws with washers at either end are passed through both sets of grommets to fasten the floating box to the chassis. Care should be taken in locating the grommet holes in the chassis to provide $\frac{1}{2}$ inch or so of clearance between the lower overhanging edge of the dial plate and the chassis, so that the dial is free from contact with the chassis.

A duplicate lug strip is fastened to the chassis directly below the terminal strip on the shelf. The two strips are then connected together with highly-flexible wire bent to form half loops between the terminal strips. This is done to minimize any vibration that might be transmitted from the base chassis to the box through the connecting leads. Similar flexible connections are made to anchorages on the chassis for the output leads.

The output coil, $L_2$, is wound on a standard 1½-inch diameter 5-prong plug-in form (Bud). The paddler condenser, $C_{11}$, is mounted inside the form where it may be adjusted with a screwdriver.

The power transformer, rectifier, the two VR tubes and their voltage-dropping resistor, $R_4$, as well as the bleeder resistor, $R_5$, are mounted along the rear edge of the chassis. The filter chokes and condensers are placed underneath, since they develop no appreciable heat. A 115-volt power connector and two coaxial output connectors are

Bottom view of the completed series-tuned VFO unit. Power leads are cabled. The coaxial cables go to the two r.f. output connectors.

(Continued on page 108)
New Life for Old Receivers

Crystal-Controlled Converters for 14, 21 and 28 Mc.

BY BYRON GOODMAN,* WIDX

You don't hear many complaints about a receiver's performance on 3.5 and 7 Mc. The stability is good, and all T9 signals sound T9. The sensitivity is always adequate for the job. If you want more i.f. selectivity, you add a Q5-er. Images are no problem.

Depending on the receiver, you may or may not have complaints about its 14-Mc. operation. Here the drift starts to show up in some cases, images are a problem if you have only one r.f. stage, and there may be no d.c. signals on the band (indicating high-frequency oscillator modulation). On 28 Mc. you are a very fortunate individual indeed if you have never seen room for improvement. Perhaps you have added a preselector to knock out the images, or an R9-er to hop up the sensitivity, but neither of these dodges has contributed a thing to the stability.

The Collins 75A receiver has the answer, of course, in its use of crystal-controlled high-frequency oscillators, as many operators are discovering. This article will describe a family of converters that can be added to your present receiver to give greatly-improved stability and some increase in sensitivity, depending on what you now use. But don't expect much if your present receiver is a clunk on 3.5 Mc.—if it isn't perfectly satisfactory there now, the best you can expect from the converters is your present 3.5-Mc. performance on 14 and 28 Mc. Further, if you have the front end of your present receiver loaded down with R9-ers, all the converters can offer you is a shade better sensitivity (you'll have to measure it to tell the difference—it won't show up by ear) and your present 3.5-Mc. stability and tuning rate. But even that is an advantage, as you can readily see.

You will have noticed that the talk is about "converters" and not a single "converter." Separate converters for each band are to be described, since it is felt that this results in the simplest construction and the best chance for maximum performance. Anyone who wants to take the circuit and make a bandswitching job is welcome to do so, but with individual units you can invest in one and, if you like the performance, add the others as time goes on. These little converters can be shoved out of the way when not in use, or you can rig up a switching scheme for antennas, power and output.

Since the converters are identical except for

* Assistant Technical Editor, QST.

- The title of this article is no overstatement—these crystal-controlled converters will hop up your receiver and give you 1949 performance. All that's needed is a receiver that works quite well on the low frequencies, and these converters. A crystal-controlled high-frequency oscillator gives you stability, and a neutralized-triode r.f. amplifier gives you sensitivity.

A 28-Mc. crystal-controlled converter. The adjustable antenna coupling can be seen at the left front. The tube shields, from left to right, cover the triode-connected 6AK5 r.f. amplifier, the 6AK5 mixer and the 6C4 cathode follower. The unshielded tube is the 6L6 oscillator-multiplier.

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Fig. 1 — Wiring diagram of the crystal-controlled converter.

- **C\textsubscript{1}** - 10-µfd. mica.
- **C\textsubscript{2}** - 20-µfd. midget variable (Johnson 160-110).
- **C\textsubscript{3}, C\textsubscript{4}, C\textsubscript{10}, C\textsubscript{13}, C\textsubscript{14}, C\textsubscript{15}, C\textsubscript{16}, C\textsubscript{17}** - 680-µfd. mica.
- **C\textsubscript{6}** - 5-µfd. midget variable (Johnson 160-102).
- **C\textsubscript{7}** - 11-µfd. midget butterfly (Johnson 160-211).
- **C\textsubscript{8}, C\textsubscript{9}** - 470-µfd. mica.
- **C\textsubscript{10}, C\textsubscript{11}, C\textsubscript{12}, C\textsubscript{18}, C\textsubscript{19}** - Twisted wire. See text.
- **C\textsubscript{13}, C\textsubscript{14}**, **C\textsubscript{20}** - See coil table.
- **R\textsubscript{1}, R\textsubscript{2}** - 220 ohms.
- **R\textsubscript{3}** - 2200 ohms, 1 watt.
- **Rs**, **R\textsubscript{10}, R\textsubscript{11}, R\textsubscript{12}, R\textsubscript{13}, R\textsubscript{14}** - 470 ohms.
- **R\textsubscript{15}, R\textsubscript{16}** - 82,000 ohms.
- **Rs** - 0.18 megohm.
- **R\textsubscript{12}** - 82,000 ohms.
- **All resistors 3/4-watt unless otherwise specified.**
- **L\textsubscript{1}, L\textsubscript{2}, L\textsubscript{3}, L\textsubscript{4}, L\textsubscript{5}, L\textsubscript{6}** - See coil table.
- **J\textsubscript{1}, J\textsubscript{2}** - Cable-connector sockets (Jones S-101).
- **RFC** - 750-µh. r.f. choke (National R-50).

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The Circuit

The converter uses the harmonic of a crystal oscillator to provide an exceedingly-stable high-frequency-oscillator signal. For example, in the 10-meter converter a 12.25-Mc. crystal doubles to 24.5 Mc., and this signal is fed to the mixer. By tuning the amplifier (your present receiver) following the mixer over the range 3.5 to 5.2 Mc., you are, in effect, tuning across the 28-Mc. band. The r.f. circuits in the converter are tuned to 28 Mc., and only have to be touched up when going from one end of the band to the other.

The wiring diagram is shown in Fig. 1. A neutralized triode-connected 6AK5 is used for the r.f. amplifier, on the thesis that it is about the hottest r.f. amplifier you can get. It does check out beautifully on a diode noise generator, but there is some question as to its necessity on 14 and 21 Mc., where the atmospheric noise is generally high enough to limit the maximum usable sensitivity. A pentode-connected 6AK5 could probably be used with no detectable difference in performance on 14 and 21, but the triode is easy to handle and you don't lose anything by using it. And using high-impedance circuits with the pentode might give trouble from regeneration, unless the stage were neutralized. Adjustable antenna coupling and a Faraday screen are included to accommodate various antenna systems and to eliminate capacity coupling to the antenna line. The r.f. stage runs at 105 volts on the plate, since this gave the best noise figure. The separate plate lead also offers an opportunity to kill the converter by opening this circuit. A 6AK5 pentode mixer was selected as being easy to handle and quiet enough so that its noise doesn't impair the over-all performance. A triode mixer might have been used, but the pentode runs with low current and is quiet.

The plate circuit of the mixer is tuned to the center of the receiver tuning range by setting L\textsubscript{4} to resonate with the various shunt circuit capacities. The circuit has a low Q and there is little variation in gain over the range. A 6C4 cathode follower is used as a low-impedance coupling to the receiver input.
One section of a 6J6 twin triode is used for the crystal oscillator, and the other half serves as a frequency multiplier. To minimize the other harmonics existing in the plate circuit of the multiplier, the plate is tapped down on $L_3$.

### Construction

So much for the circuit details which, while important, do not tell the whole story. For example, to get the best possible r.f. circuits, within the space limitations, B & W "Miniductors" were used for $L_1$, $L_2$, and $L_3$. Their $Q$ is well above that obtainable with smaller-diameter coils, and they are easy to handle. The new Johnson midget variables seemed made for the job of tuning the signal circuits, and they do much to hold down the size of the converter to something reasonable. To insure good shielding and low-resistance ground paths, an aluminum chassis was used in preference to the more common steel jobs.

The converter is built on a $5 \times 9\frac{1}{2} \times 3$-inch aluminum chassis, with several shield partitions to reduce unwanted interstage coupling. The most important shield is the one that straddles the r.f. amplifier socket and separates the grid and plate circuits of this stage. The grid tuning condenser, $C_2$, is mounted on bakelite insulating washers, and its ground lead returns to the common ground at the tube socket, to eliminate stray coupling through chassis currents. If you don’t do this, you may have trouble neutralizing the amplifier.

A $2\frac{1}{4}$-inch diameter hole is punched in the chassis, so that the externally-mounted antenna coil, $L_1$, can be coupled to the grid coil, $L_2$. The Faraday screen is then mounted across this hole on the underside of the chassis. A fairly simple method of constructing the Faraday screen has been devised, so no one need have any fears about that phase of construction. To start, cut a piece of $\frac{3}{8}$-inch-thick polystyrene (Millen Quartz-Q) to measure $2\frac{1}{2} \times 3\frac{3}{4}$ inches, and drill a pair of holes at one end to clear No. 6 screws, for mounting the finished shield. (These are the same screws that hold the mounting strip for the antenna condenser, $C_1$, visible in the first photograph.) At the opposite end of the poly sheet, drill a small hole in each corner, for securing the wire used in making the shield. Then wind No. 20 tinned wire tightly around the poly sheet in the long direction, spacing it with string or more No. 20 wire. When the winding is finished and secured at both ends, unwind the spacing string (or wire) and remove it. If you have done the job carefully, you will have neat parallel lines of wire across the polystyrene, all equally spaced and all lying fairly flat. Then apply two or three heavy coats of Duco cement to one side only, allowing sufficient time between coats for the cement to harden thoroughly. When this has been done, it will be found an easy job to cut each wire on the uncremented side. Straighten out the wires so that you now have a flat sheet of parallel wires, and trim off the wires at the mounting-holes end of the sheet along a line inside the mounting holes. The underneath photograph of the chassis and Fig. 2 show what this looks like. When trimming these wires, be careful to see that no wire is left touching an adjacent one. Trim the wire ends at the other end.

### Coil Table for the Crystal-Controlled Converter

<table>
<thead>
<tr>
<th>Coil</th>
<th>14 Mc.</th>
<th>21 Mc.</th>
<th>28 Mc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$L_1$</td>
<td>23 t. No. 24</td>
<td>9 t. No. 24</td>
<td>10 t. No. 20</td>
</tr>
<tr>
<td>coil diam.</td>
<td>(B&amp;W 3012)</td>
<td>(B&amp;W 3016)</td>
<td>(B&amp;W 3016)</td>
</tr>
<tr>
<td>$L_2$</td>
<td>21 t. No. 24</td>
<td>10 t. No. 20</td>
<td>9 t. No. 20</td>
</tr>
<tr>
<td>coil diam.</td>
<td>(B&amp;W 3012)</td>
<td>(B&amp;W 3015)</td>
<td>(B&amp;W 3016)</td>
</tr>
<tr>
<td>$L_3$</td>
<td>23 t. No. 24</td>
<td>22 t. No. 24</td>
<td>16 t. No. 24</td>
</tr>
<tr>
<td>coil diam.</td>
<td>$\frac{3}{4}$-inch</td>
<td>$\frac{3}{4}$-inch</td>
<td>$\frac{3}{4}$-inch</td>
</tr>
<tr>
<td>$L_4$</td>
<td>Slug-tuned coil (CTC 1-Mc. LS3 with 200 turns removed)</td>
<td>(Coils for $L_1$ and $L_2$ are wound on $\frac{3}{4}$-inch diameter CTC LS3 forms)</td>
<td></td>
</tr>
<tr>
<td>$L_5$</td>
<td>No. 32 enam.</td>
<td>No. 32 enam.</td>
<td>No. 32 enam.</td>
</tr>
<tr>
<td>coil wound</td>
<td>20 t. No. 28</td>
<td>20 t. No. 28</td>
<td>20 t. No. 28</td>
</tr>
<tr>
<td>$L_6$</td>
<td>22 t. No. 28</td>
<td>20 t. No. 28</td>
<td>20 t. No. 28</td>
</tr>
<tr>
<td>$C_1$</td>
<td>75 µfd.</td>
<td>75 µfd.</td>
<td>33 µfd.</td>
</tr>
<tr>
<td>$C_2$</td>
<td>22 µfd.</td>
<td>22 µfd.</td>
<td>22 µfd.</td>
</tr>
<tr>
<td>$X_{total}$</td>
<td>6000 kc. (triples)</td>
<td>5875 kc. (triples)</td>
<td>12,250 kc. (doubles)</td>
</tr>
</tbody>
</table>
to about ½ inch from the polystyrene. Clamp the shield in a vise, between two pieces of wood, and wrap each wire end around a piece of No. 12 tinned copper, as shown in Fig. 2. With a good hot iron, run a bead of solder along the bus, and your shield is finished. Work fast, and no heat will reach the poly. The shield is mounted with the smooth side exposed through the hole, and one end of the No. 12 bus is grounded at the r.f. tube socket.

The grid coil, L2, is supported by its leads and a couple of drops of Duco cement that hold its grounded end to the Faraday shield. The antenna coil, L1, is mounted by its leads on a piece of ¼-inch diameter polystyrene rod. The rod is supported by a shaft bushing. A small wire pin through the rod at the back of the bushing and a rubber grommet between the bushing and the control knob give a soft friction lock that holds the coupling in any position. Flexible leads run from the coil to C1 and the shield of the RG-59/U coaxial line.

The r.f. plate coil, L3, is cemented to a small piece of polystyrene sheet that is supported by two small brackets. The neutralizing condenser, C6, is supported by one terminal of C7 and a stiff wire lead back to the grid pin on the tube socket. The coupling condenser, C9, is simply an insulated wire wrapped once around the lead from C8 to the grid of the mixer. It is brought out of the oscillator compartment through a polystyrene or rubber grommet.

Adjustment

After the usual last check of the wiring, connect a power supply and remove the 6AK5 r.f. amplifier from its socket. Listen in on your receiver at the crystal frequency, and if you don't find the crystal signal, adjust L5 until you do. Then set your receiver on the proper harmonic frequency and peak L4 for maximum signal, as indicated by your S-meter. When you have done this, you can probably squeeze out a little more by readjustment of L5. Then back off on L5 a little, because there is no need to run the crystal at full zizz.

Then tune your receiver — its antenna circuit must complete the cathode circuit of the 6C4 follower — to about 3.8 Mc. and peak L4 for maximum noise. The adjustment is not sharp, because of the low Q of the circuit. If your receiver has an antenna trimmer, don’t forget to peak it too. Then plug in the 6AK5 r.f. amplifier and, after the tube has warmed up, rock C5 and C7. Unless you are very lucky, you will find several settings where you are greeted by birdies and squawks. Through the hole in the bottom plate, use an alignment tool to adjust C8 a little at a time, until you lose all of the unpleasant sounds with any settings of C3 and C4, and you have your r.f. stage neutralized. Connect the antenna, peak C2 and C7 on the first signal you find, and you’re in business. You will do all of your tuning with your regular receiver, and C2 and C7 are used only to peak the signal when you make a big frequency excursion. The adjustable antenna coupling provides some measure of gain control for the unit, but it is generally best to use fairly tight coupling and hold the gain down in your regular receiver. If a really strong local opens up, you can back off a little on the coupling. The antenna coupling was designed for low-impedance input, and will work well with 50- or 75-ohm line. If you use 300-ohm Twin-Lead, it is better to leave the (Continued on page 108)
In one way or another practically every one of our bands has got us into difficulties because of interference to broadcasting. That is no news. But it may be news that we have one band that has given us at Headquarters a continuing headache because of TVI — with no amateur operation whatsoever! It's not a superhigh band, either; the one we have in mind is 21 Mc.

It all started back during the latter days of the war. The various U. S. preparatory meetings for the next international radio conference had come and gone, and we had emerged from them with a brand-new band in our pockets — 21 Mc. Well, no, not exactly in our pockets. The band was in the American allocations set-up for postwar, but only in the status of a proposal. In that part of the spectrum individual nations may propose, but only an international conference does the disposing. Although an international conference was in prospect, it actually didn’t materialize until two years later. So we had not an actual band, nor anything resembling a certainty of one — only hopes; hopes based on American support and some evidence of friendly interest on the part of a few other nations.

In the meantime the Engineering Department of the Radio Manufacturers Association had been working out the technical details of standards for postwar television. Among the things considered for standardization was the choice of intermediate frequency for television receivers, and eventually an agreement was reached on where the television i.f. should be placed. Although the i.f. channel is approximately 6 megacycles wide, its location in the spectrum is specified in terms of the center frequency of the sound i.f. channel; once this is specified everything else automatically falls into line. In the autumn of 1945 RMA advised FCC that its Engineering Department was proposing a standard in which the sound i.f. channel would lie in the range 21.25-21.9 Mc., the exact frequency within those limits to be selected by the individual manufacturer. The manufacturer’s association also asked FCC to keep the region from 21 to 28 Mc. as clear as possible, specifically recommending that steps be taken to curb the operation or power of stations assigned frequencies in that region so that interference to TV would be minimized.

The League protested this choice of i.f. immediately, pointing out to both FCC and RMA that we expected to have a band at 21 Mc. and that the past history of home-receiver design offered no hope for anything except that an amateur 21-Mc. transmitter would blast the 'speakers from TV receivers for possibly miles around. FCC was sympathetic, but having no jurisdiction over receivers could take no practical steps. It could and, so far as we are aware, did turn a deaf ear to the plea for special privileges for TV insofar as the operations of other services were concerned. RMA expressed concern, but took no action; the i.f. channel had been decided on after long consideration and in their opinion was the best available compromise; the potential interference from all the services in that part of the spectrum was a pretty severe headache to them, too. We had no band — in fact, only one or two of the prewar bands had come back at that time — there was no television broadcasting, no receivers had been manufactured. In short, there was no way for us to prove our point — despite the certainty that if hams had been on the air on 21 Mc. no receiver designer in his right senses would put any part of a television i.f. channel near us.

In June of 1946 RMA adopted its Engineering...
Department’s recommendation and 21.25–21.9 became the RMA standard for the sound i.f. channel. To all appearances the die was cast. The manufacture of television receivers on the RMA basis got under way and soon was going at full steam. The only glimmer of brightness in the picture, for us, was the fact that a considerable number of manufacturers had chosen to work between 21.7 and 21.9, which at least was a few hundred kilocycles removed from where our band was expected to be. But an international conference sometimes turns up with the unexpected; there was no assurance that, if we got a band near 21 Mc. at all, it would start at exactly 21 Mc. The give-and-take of international negotiation might find us winding up near 22 Mc.—or anywhere else in that region.

There was one small hitch. The Hartford area at that time had no television broadcast service. There was a handful of widely-scattered receivers owned by superenthusiast optimists who lived from one temperature inversion to the next in the hope of seeing New York transmissions. A test in Hartford would mean little or nothing. Some place near New York, far enough away to be in the “fringe” of the service area but near enough to have sufficiently-good service to tempt lots of people to buy receivers, would be ideal. In South Norwalk, Conn., which is just such a place, there was an amateur who had done a lot of constructive work on harmonic reduction for eliminating TVI. Philip S. Rand, WIDBM. So we asked Phil how he’d like to put a transmitter on 21 and run the tests—the “reward,” the honor of being the first American ham to operate on 21 Mc.—but sans QSO! FCC was interested and willing, and by midsummer the operation was authorized, the transmitter finished and K2XBH was on the air.

Test transmissions were put out at intervals during the summer, at first without warning and later with newspaper publicity. Of four spot frequencies authorized by FCC, one at 21.235 Mc. was used for most of the work because it was closest to 21.25. It happens that 21.25 was selected by the largest TV receiver manufacturer, RCA, for its sound i.f., while most of the others are near 21.9. The data secured were of considerable significance: Receivers having a 21.25-Mc. sound i.f. reported interference at distances up to three miles from the transmitter. Receivers having a sound i.f. of 21.9 Mc. did not get interference, even at a distance of a few hundred yards. In every case, no matter what the i.f., the inter-

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ference was in the sound channel alone; there was no interference with the picture. At distances of a quarter mile or more, traps in the receiving-antenna leads eliminated the interference on the 21.25 sets, but closer in they did not do much good, at least with receivers of current design. But changing the i.f. to 21.9 instead of 21.25 cleaned up even these receivers a few hundred feet away. We know now that we can live in peace with our neighbors and operate on 21 Mc. — if the i.f. is near 21.9 Mc. But not if it's 21.25. By now, RMA knows it, and FCC knows it. They, as well as we, know that the trouble is in the receiver, not the transmitter.

During this last summer the RMA committee studying the television i.f. has come out with a recommendation to abandon the present standard and to adopt a new one higher in the spectrum, the suggestion being that it ought to be placed somewhere in the region of 40 Mc. It will probably be quite a long time before definite action is taken, and receiver production on the present basis will no doubt continue for at least a year. It looks as though, eventually, we shall have no 21-Mc. i.f.-interference problem. But for many years to come the hundreds of thousands of sets produced under the present standards will be with us. The K2XBH tests have pointed the way to the cure for this situation — realigning the existing receivers, when necessary, to 21.9 Mc.

For our own checks during the tests, receivers were borrowed from GE, RCA, and Hallicrafters, each of which uses a different intermediate frequency. The GE receiver has the sound channel at 21.9 and the Hallicrafters at 21.75. When the tests showed that this interference was peculiar to sets with 21.25-Mc. sound i.f., representatives of the RCA Service Company spent several days in the Norwalk area checking their receivers and trying various means to eliminate the interference. Although their standard measures proved completely effective in many cases there were some — when the receiver was quite close to the transmitter — where a complete cure could be effected only by shifting the sound i.f. to 21.9. They decided, therefore, that whenever they experience 21-Mc. interference from amateur operation that does not yield to their standard approaches, they will shift the sound i.f. to 21.9 Mc. All this is still in the future, of course, but is something to keep in mind when and if you run into TVI after the 21-Mc. band is opened. We might remark, in passing, that the RCA Service Company people are not only well aware of the amateur interference problem in all its angles but are ready to help both the amateur and the set-owner to clean up interference cases. As usual, the organization is rather liberally sprinkled with hams and ex-hams right through the ranks up to the top!

In conclusion, we want to amplify on the phrase "the transmitter was finished" used a few paragraphs back. Only four words, but there is a world of meaning in them. This was not just a 21-Mc. transmitter; that would have been easy. For the test to mean anything the transmitter had to be on 21 Mc. only. No harmonics strong enough to cause any interference inside a television channel and thus throw doubt on the results. As part of the test program FCC measured the field strengths of the three principal New York television stations at the location of K2XBH — one of the best in the area for receiving New York — and found them below the 500-microvolt figure commonly accepted as the lower limit for rural areas where the noise is supposed to be low. The harmonics had to be substantially eliminated.

This meant a lot of work on Phil Rand's part, and how successfully it was accomplished is attested by the fact that with the receivers sitting in the station just as they are shown in the photograph it was possible to look at television programs without a trace of interference, with the K2XBH transmitter going full blast with 700 watts input. The TV receiving antenna was right in the line of fire of the 21-Mc. folded dipole used in the tests and only about 100 feet away. Because the 21-Mc. field strength at the TV antenna was several thousand times the strength of the television signals it was necessary to use 21-Mc. traps in the Twin-Lead at the receivers to prevent simple overloading, but that was all. Running K2XBH meant, too, giving up other ham operation for several months so the time could be devoted to making the test transmissions, collecting and correlating the results, getting the material together for the report required by FCC for any experimental operation, and conferences not only with League headquarters but FCC and receiver manufacturer's representatives. Much that was done could not have been done had it not been for the sympathetic interest in the tests on the part of Gen. Leslie R. Groves, head of the Remington Rand Laboratory of Advanced Research, where Phill is on the staff, in making both time and laboratory facilities available as needed. But still it was mostly time taken from W1DBM's other activities that went into running K2XBH for the good of the game — which, we submit, exemplifies the true amateur spirit.

Next month QST will include a complete description of a single-sideband exciter unit based on the W2KUJ article in the June issue. This exciter features a choice of double- or single-sideband signal with any desired amount of carrier, and simplified band changing. You may have seen the unit already — it has been demonstrated by W1DBM at several conventions.

C. W. Ham, WANYX, of Beam Street, Shelby, N. C., puts out a potent signal on 10-meter phone. — W6EH

QST for
A V.H.F. Man's VFO
A Frequency-Control Unit with N.F.M. for V.H.F. Use

BY C. VERNON CHAMBERS, * W1JEQ

The VFO is considered to be an almost indispensable part of most modern stations where operation is concentrated on the lower frequencies but crystal control is still king on the v.h.f. bands. While operating habits and band occupancy are such that variable frequency control is not an absolute "must" for the v.h.f. man, it can be highly useful, especially when combined with a reactance modulator for narrow-band f.m. Here is a unit that was designed primarily with the specialized needs of the v.h.f. enthusiast in mind. The frequency-control dial is calibrated for direct reading 11, 10, 6 and 2 meters.

The construction of a reasonably-good VFO for our lower-frequency bands is no great problem. With proper attention to the well-known factors governing oscillator stability, a frequency-control unit can be built that will give an entirely satisfactory account of itself on 20, 40 or 80. But when we listen to the high-order harmonics of some of these units we learn why most v.h.f. stations still stick to crystal control. Many a note that sounds acceptable on 3.5 Mc. is pretty fuzzy on its 15th harmonic, 52.5 Mc. And it usually takes no very careful listening on 144 Mc. to pick out the stations that are using other than crystal control.

Even on 10 or 11 meters it is not too easy to obtain a pure d.c. note, especially when the oscillator frequency is modulated for narrow-band f.m. Completely clean signals are the exception rather than the rule for 10-meter n.f.m., a fact that has tended to give that form of modulation a bad reputation with the more critical listeners. N.f.m. doesn't have to sound fuzzy, but the fact remains that it often does.

The frequency-control unit described herewith has a degree of frequency stability that is adequate for high-order frequency multiplication, and the design of the audio portion is such that little or no hum is introduced in the reactance-modulation process. It has its own speech amplifier, designed specifically for the purpose, and the over-all gain is only just enough to provide adequate deviation for 10- and 11-meter operation. Somewhat more is available for 50-Mc. use, because of the additional frequency multiplication, and at 144 Mc. the maximum deviation is up to 30 kc., permitting use of the unit for semi-wideband f.m. on that band.

The Clapp Oscillator

The oscillator uses the now-famous Clapp circuit1 which provides exceptional stability with a minimum of complication. The tuned circuit covers a range of 3395 to 4500 kc., with the oscillator doubling in its plate circuit. It is followed by a straight amplifier which builds the output up to about three watts. Output frequency is 6.75 to 9 Mc., in four ranges that are individually calibrated for multiplying into the 11-, 10-, 6- and 2-meter bands. The actual oscillator circuit is made up of the 6AG7 control grid, cathode and screen, in the manner of the electron-coupled type of oscillator, with the plate circuit operating on the second harmonic. The 6AG7 provides a fair degree of isolation between the plate and grid circuits, and having the output on the second harmonic makes the frequency of the oscillator almost completely independent of the tuning of the plate circuits of the oscillator and amplifier. Even at 50 Mc. the frequency changes

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less than the audio range as these circuits are tuned through resonance.

A reasonable amount of bandspread for each of the bands from 2 to 11 meters is provided by incorporating separate padders for each, switched by a front-panel control. The complete range of the oscillator could be covered by a single tuning condenser, but the spread for each band would be considerably reduced thereby. A glance at the schematic diagram will show that the padders are switched into the circuit in the order of the amount of padder capacitance, rather than in the order of the frequency of the band of operation.

The 50-Mc. band, requiring the lowest parallel capacitance, is the first position, followed by 144, 28 and 27 Mc., in that sequence.

Three ranges are available for calibrations on the National MCN dial. The 2- and 11-meter bands, requiring only 25 and 20 divisions respectively, are placed at opposite ends of the top scale. The 50-Mc. band occupies 55 divisions on the middle scale, and the 10-meter band 80 divisions on the bottom scale.

The second r.f. stage, also using a 6AG7, is a straight amplifier operating on 6.7 to 9 Mc. Output is taken off through a coaxial line which
may be plugged into the crystal socket of most transmitters using crystals in that range. Ordinarily the unit is used as a crystal substitute in this way, though it may be link coupled to the grid circuit of any low-powered stage operating in this range. Though the dial is calibrated only for 27 to 148 Mc., there is no reason why the unit could not be used for operation on 7 and 14 Mc. as well. It will also serve, of course, for those portions of the 220- and 420-Mc. bands that are in harmonic relationship with the oscillator frequency range.

**The Audio Portion**

Frequency modulation is accomplished by means of a reactance modulator and a speech amplifier, both using 6BA6 miniature tubes. With a crystal microphone a deviation of approximately 500 cycles at the oscillator frequency is possible at ordinary speech levels. This is adequate for n.f.m. work on 10 or 11 meters, as a result of the eight times frequency multiplication. Approximately 10 kc. deviation is possible on 50 Mc., and as much as 30 kc. on 144 Mc., permitting semi-wideband f.m. on that band. This may be useful on 144 Mc., as receivers of the SCR-522 variety require considerable swing to produce an intelligible response. The deviation control is controllable to any lesser swing by means of the control, $R_s$.

A switch ($S_2$) is provided, by means of which the heaters of the speech stages may be cut off when c.w. or amplitude modulation is to be used. Cutting in the reactance-tube heater shifts the oscillator frequency noticeably, however, so it is advisable to leave $S_2$ closed if n.f.m. and other emissions are to be used on the same frequency. The deviation control should be backed off when c.w. or a.m. is in use.

**Mechanical Details**

The general arrangement of the parts should be clear from the photographs. The front view shows the panel arrangement, and the distribution of the principal components above the chassis. At the left are the oscillator and amplifier tubes, with the oscillator coil, $L_1$, directly in back of them. The main oscillator tuning condenser and its vernier dial are at the center, with the audio and regulator tubes at the right. The microphone jack and modulator heater switch are at the lower right on the front panel, with the deviation control, the bandswitch, and the oscillator-plate and amplifier-plate tuning controls arranged across the panel in that order. The chassis is a standard $3 \times 5 \times 10$-inch size, and the aluminum panel is 6 by 11 inches. A $5 \times 10$-inch aluminum plate, not shown in the photographs, covers the bottom of the chassis. A rectangular hole is cut in this plate for access to the variable padders below the chassis.

The bandswitch used required some modification. In its original form it has a disk that shorts out all unused contacts. This disk must be cut through the center, so that one-half may be removed. As may be seen from the schematic diagram, the connection between the oscillator coil and the switch is made to the No. 1 terminal, rather than to the regular wiper contact.

Power-supply connections are made through a plug and cable on the back wall of the chassis, and the coaxial output terminal is on the same wall at the opposite end. It will be noted that no power transformers are contained in the unit. The filament transformer and power supply were made external purposely, to avoid any possibility of a.c. modulation of the oscillator frequency through mechanical vibration or stray a.c. fields.

**Calibration and Use**

The power supply for the VFO should be well-filtered and capable of delivering 300 volts d.c. at 60 to 70 ma., and 6.3 volts a.c. at 1.9 amp. Socket voltage measurements are approximately as follows: 20 volts on the audio-tube screens, 150 volts on the 6AG7 screens, 50 and 150 volts respectively on the speech-amplifier and reactance-modulator plates, and 300 volts on the 6AG7 plates. Cathode current for the oscillator should be about 10 ma., and the output stage, at resonance, 30 ma.

Since the VFO dial settings should

(Continued on page 108)

Bottom view of the VFO unit. Note the mounting of the trimmer condensers on metal pillars to reduce vibration.
A Novel Microwave-Measuring Technique
Radio-Frequency Adaptation of Michelson’s Interferometer
BY ROBERT E. GLADFELTER,* AND LOUIS K. DAVIS,* W0VWW

In studying physical optics one is introduced to Michelson’s Interferometer, an instrument that plays an important part in the study and measurement of light waves. Since light waves and radio waves are both transverse waves and tend to behave in the same manner, Michelson’s Interferometer is adaptable to the investigation of either.

The purpose of the construction of a large-scale interferometer is to make use of the same principle that is involved in the original Michelson’s interferometer — i.e., interference — to study radio waves and to be able to measure the wavelength of a transmitter, as well as its frequency, if its wavelength is in the category of a few meters. Credit must be given to Mr. C. L. Andrews 1 for the original construction of the large-scale Michelson’s Interferometer.

Interference in this sense has to do with light waves interfering with each other causing alternate dark and light portions. With radio waves also, one wave either tends to nullify or reinforce the effect of another wave. Two sources must be present having the same frequency and amplitude. Fig. 1 is a simple picture of how interference occurs. It is included to help clarify the reason for alternate increases and decreases in radiation received from the interferometer.

1 "Microwave Optics." C. L. Andrews, American Journal of Physics, November-December, 1946, Volume 14, No. 6. Published by American Institute of Physics, 57 East 55th St., New York 22, N. Y.

Principle of Interferometer
In the schematic diagram, Fig. 2, the oscillator at the left is used as a source. $M_h$ is the half-reflecting and half-transmitting mirror set at 45° to the axis of propagation. This mirror is made of 2-inch mesh chicken wire. The energy divides, part reflecting to $M_1$ and part going straight on to $M_2$, where both paths of radiation are again reflected. That from $M_1$ reflects directly back through $M_h$ and on to the intensity meter. That from $M_2$ reflects back to $M_h$ where it is again reflected by $M_h$ to the intensity meter. These two individual waves, traveling in the same direction, are now the basis for the interference obtained. By sliding $M_2$ in either direction the phase of Ray 1 is changed, thus governing what happens to the interference pattern at the intensity meter; i.e., the waves may nullify or reinforce each other.

The waves are definitely polarized; therefore, the dipoles of both the oscillator and intensity meter must be parallel to each other.

Construction of Interferometer
The construction of the interferometer is relatively simple. It involves two aluminum mirrors and a piece of 2-inch mesh chicken wire. The mirrors are 1 foot square, and the half-reflecting mirror is 18 inches long and 1 foot tall. All three are mounted on wooden supports. The sliding mirror moves on two lubricated pipes mounted on a wooden base. It also has a handle in back to slide it back and forth along the track, as may be seen in the photograph of the complete set-up.

Fig. 1 — Diagram showing the operation of Michelson’s Interferometer, as used in measuring light waves.
Construction of Intensity Meter

The intensity meter takes the place of an eye to detect the interference bands. It is a crystal detector hooked directly to a microammeter. There is a quarter-wave stub that acts as an insulator and provides a return for the d.c. meter current. A circular disk reflector is set one-fourth wavelength in back of the receiving dipole to reflect more radiation. Full scale on the meter is 20 microamperes; however, at close range the needle deflects considerably farther to the right past full scale. The meter is sensitive enough for close-range experiments.

Dimensions can be found on the diagram of the intensity meter, Fig. 3. Photographs of the oscillator and intensity meter are also shown.

Operation and Technique of Measuring

To measure the wavelength, the interferometer is set up as shown in Fig. 2, with the source relatively close to $M_0$, in order to nullify the effect of stray radiation coming obliquely from the oscillator which would cause bothersome interference. The dipoles of the oscillator and intensity meter must be on the same level to get maximum intensity.

With the interferometer lined up correctly the meter will register the amount of radiation coming through. As $M_2$ is slid back the meter fluctuates because of increases and decreases in radiation reaching the dipole. By slow movement of $M_2$ the nodes and antinodes can be detected. At a node the meter will record a minimum; therefore the position of $M_2$ for each successive node can be recorded. These positions of minimum are spaced a half-wavelength apart along the scale beside $M_2$. Each node occurs when there is a change in path difference of one wavelength. Since Ray 1 must travel down and back, a half-wavelength change of $M_2$ causes this required path difference. Refer to Fig. 2.

Conclusion

The practical use of Michelson's Interferometer adapted to radio waves is not so much for studying interference, but for enabling one to measure the wavelength of a microwave oscillator, and consequently its frequency, in an extremely simple manner with accuracy depending upon the care used in measuring. An average wavelength should be computed by making use of the full distance that the sliding mirror is capable of moving.

We want to express our sincere appreciation to Prof. Winston Cram under whose guidance this work was started and carried out.

Strays

W2JSJ reminds us of an old dodge for quickly obtaining a rough check on the frequency of a quartz crystal, which should prove handy to those fellows who grind their own. If you have an old t.r.f. receiver around, insert the blank into the detector coil and a “plop” will be noted as you tune across the crystal frequency.

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FRANCE

The Réseau des Émetteurs Français announces the Second European DX Contest, which will be held November 27th-28th for c.w. and December 12th-13th for 'phone in celebration of the 25th anniversary of the first trans-Atlantic QSO on short-wave (100 meters), which took place on November 27, 1923, between 8AB in France and 1MO in the U.S.A. The R.E.F. offers commemorative certificates to participants in the contest who most nearly approach the working conditions of 8AB and 1MO and who will send R.E.F. a QSL confirmation of their contact on the 80-meter band between Europe and the rest of the world during the contest.

The January, 1924, issue of QST gives details of the equipment used by these stations and the conditions under which they worked. 1MO was using a haywire receiver, consisting of a regenerative detector and a one-stage audio amplifier, and a full-wave self-rectifying transmitter using two UV-203-As on each side of the cycle, running less than ½ kw. 8AB had a brand new Grebe short-wave receiver and a transmitter with an unrectified 25-cycle input of 1 kw. Conditions were good, with strong signals both ways.

GREAT BRITAIN

The Radio Society of Great Britain on September 1, 1948, celebrated an important event in the history of the Society. That day marked the initiation of the regular transmissions of standard-frequency signals for use by British amateurs. The headquarters standard-frequency station, operating under the call GB1RS, transmits marker signals on the hour from 0600 to 2400 GCT, on a frequency of 3500.25 kc. Transmissions are in Morse code at a rate of 12 words per minute. The initial announcement on the hour is followed by a long dash. While the accuracy of the frequency used cannot be certified until the transmitter has been in operation for a period of time, the goal is one part in a million (3.5 cycles at 3.5 Mc.)

The establishment of this new service for British hams was made possible by the generosity of Sir Ernest Fisk, managing director E.M.I., Ltd., and numerous other concerns and individuals who contributed apparatus or assistance.

BELGIUM

The 25th anniversary of the founding of the Union Belge des Amateur-Émetteurs was celebrated on August 8, 1948, by an international hamfest at Ostend. Mr. Deloer, EBP2, founder of the Réseau Belge, the predecessor of U.B.A., and Mr. Mussche, ON4BK, reenacted their first QSO on the occasion of the founding of the society 25 years ago.

Mr. L. Richard, ON4UF, U.B.A.’s chairman, and Mr. Marcel Dupuis, ON4EY, district manager of West Flanders, related the history, in both French and Flemish, of the Belgian membersociety of I.A.R.U. The hamfest ceremonies were concluded by congratulatory speeches on the achievements of the society and its members by L. J. v.d. Toolen, PA6NP, chairman of the Netherlands society, and Pierre Herbet, F8BO, council member of R.E.F.

(Continued on page 110)

The occasion of this happy gathering was the first postwar meeting of the Johannesburg, Pretoria and East Rand branches of the South African Radio League, which was held on February 27, 1948. The smiling gentleman in the exact center of the front row is ZS6Z, president of S.A.R.L.; on his right is ZS6A, vice-president of S.A.R.L. They are completely surrounded by well-known South African OM’s, XYL’s and YL’s.
More on TVI Elimination

Improvements in Methods of Harmonic Reduction

BY PHILIP S. RAND, * W1DBM

In this article the author describes the methods used to eliminate interference with television from a 75-meter 'phone transmitter, coming up with a harmonic-reducing kink that will improve things on any band. W1DBM's three transmitters, one each on 80, 20 and 15, all can be operated at 800 watts input without harmonic interference to any of the New York television channels — on a receiver sitting right next to the transmitter.

After spending three months in television-interference experimentation last summer on 21 Mc, with a Class I experimental license, we felt the urge to get back on 75-meter 'phone. We wanted to find out how serious the TVI situation was on this band, especially with receivers in the same building.

The television receiver on which we made the tests was an RCA 8TS30, a table model with a 10-inch picture tube. This set was installed in the operating room about four feet away from the relay rack housing the transmitter. Its antenna was a standard RCA dipole with reflector, mounted on a 30-foot mast and fed with 75 feet of 300-ohm ribbon. This antenna was directly under one end of the 75-meter antenna and the 300-ohm line paralleled the latter about 35 feet below. The TV set's i.f. amplifiers had been previously realigned to place the sound i.f. at 21.9 Mc., with the picture i.f. correspondingly higher. The inside of the cabinet had also been lined with copper screening to give some additional shielding to the set, and a bottom pan had been put on the chassis.

The 75-meter transmitter starts off with a BC-221-J frequency meter as the VFO, a 6AG7 buffer, and a 6V6 amplifier all on one chassis. Then follows an 829-B bandswitching amplifier which is link-coupled to a 4-125-A driver. The final amplifier consists of a pair of 250-THs in push-pull, normally run at 700 watts input. These three stages are all on separate chassis. The final is link-coupled to a three-wire folded-dipole antenna through a 600-ohm open-wire transmission line. This antenna is 65 feet high with its center directly over the house so that the feeder drops vertically down to the shack.

In the period since the appearance of the TVI article in May QST I have become completely surrounded by television receivers. This is mentioned only to emphasize the unbelievable growth of television and its acceptance by the general public — even in a locality that is outside the "rural-coverage area," defined by FCC as the area in which the signal strength is 500 µv. per meter or better. TV signal strengths in Norwalk, Connecticut, were measured at 9 to 294 µv. per meter. With TV stations being built all over the country it will only be a matter of a year or two before almost every ham in the country will

Double wavetraps for filtering out the fundamental signal at the input terminals of a television receiver. Each trap is tuned to the transmitting frequency. The L/C ratio is not particularly critical but the traps will work better if they are low-loss.

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find himself similarly surrounded. Therefore it is of utmost importance that everyone find out all he can about TVI, its cause and cure.

One thing is certain: It is a waste of time to modify your present rig just enough so it won't bother a TV set a couple of city blocks away. Next month there will be a new one only one block away, and then one two houses away, and finally all your neighbors will have television. You might just as well undertake the whole job while you're at it. Of course, there will be exceptions. For example, if you operate maritime-mobile in the middle of the Atlantic or live in a shack in the Arizona desert, you may be able to ignore TVI!

So it was with fingers crossed that I pushed the "on" button on the 75-meter rig — and watched the picture on the screen disappear. A neon bulb would light on the TV chassis. I could pull arcs off the TV feeders with a lead pencil and could read 4-Mc. r.f. on the sewer pipe in the bathroom. I checked with my neighbor across the street and found he had lost his picture on all channels, too.

Further telephoning, however, showed that the interference was all located within a 500-foot radius.

**Preliminary Cleaning Up**

The obvious first step was to get rid of the r.f. on my TV set. The TV antenna was moved to the backyard so the feeder could come in at right angles to the transmitting antenna. At the same time a twin-coax feeder was also installed and fed down through the center of the mast and run to the house underground. This removed the terrific amount of r.f. from the TV set, but there was still no picture on any channel. A little figuring showed that the 6th harmonic would land right in the picture i.f. and the 14th and 15th harmonics would land on Channel 2. In fact there could be a harmonic every 4 Mc. all through the TV channels. Checking with the "Little Gem" showed slight traces of the 6th and 15th harmonics near the front end of the final tank condenser and in the power leads.

Next, a dummy lamp load was substituted for the antenna but the TVI was still there. At this point the final amplifier was turned off and a lamp load put on the 4-125-A driver. There now was no TVI on any channel. How was the driver different than the final? It had been filtered, trapped and shielded as described in May *QST*.

In fact all the rest of the rig had had this treatment. This indicated that possibly the treatment that had been so effective on 10 meters would work equally well on 75. The following evening, with the help of W1KII, the final was filtered and shielded with copper screening.

The transmitter could now be operated with 800 watts input into a lamp load with no TVI on the receiver four feet away. But on connecting the antenna again all channels still were jammed.

The interference was now worse on some channels than on others, and varied all the way from severe crosshatching to what looked like complete blocking. With the TV antenna disconnected the screen looked fairly clean, so it was decided to equip the TV-receiver feeder with double wave­traps, one set tuned to 24 Mc. and the second to 4 Mc. This cleaned up some of the higher channels but had no effect on the lower ones. Apparently the TVI was being caused by a mixture of 4 Mc., 24 Mc. and 60-80 Mc.

The a.c. wiring in the house was still loaded with 4-Mc. r.f., induced by the field from the antenna directly overhead. Therefore an r.f. filter similar to the one shown in Fig. 3 of the May article was wound up for the a.c. line feeding the TV receiver. This further cleaned up Channels 4, 7, 11 and 13, but left Channels 2 and 5 with severe crosshatching. As this looked like harmonic interference a six-inch wire antenna or probe was placed at the outlet of the TV receiver.

Copper screening makes a good r.f. shield but is definitely not photogenic — although it doesn't look bad "in the flesh." These three amplifiers show three different ways of constructing shields of window-screen material.
added to the "Little Gem," as shown in Fig. 1, and a small hole was drilled in the front panel so the probe could be poked in under the front end of the final tank condenser. Sure enough, there was still a little r.f. at 60 Mc. and some more around 80 Mc.

The frame of the tank condenser was by-passed for r.f. only at the rear end, so a 0.003-µfd. 5000-volt mica condenser was installed to by-pass the front end. This partly cleared Channel 2, but made no change in the interference in Channel 5. We debated installing harmonic traps in the plate leads as had been done in our 10- and 20-meter finals; however, harmonic traps are a little fussy to tune so we preferred to avoid using them if possible.

**Short-Circuiting the Harmonic**

While reneutralizing the 250-THs to be sure they were on the button we happened to check their interelectrode capacities in the *Handbook* and noticed that the plate-to-filament capacity was only 0.7 µfd. This started us thinking. How could any harmonic r.f. get to the filament from the plate? Certainly not through a condenser of only 0.7 µfd. It must flow through the tank circuit and back.

At 7 and 14 Mc. a 3.5-Mc. tank circuit has very low impedance and thus harmonics in this range tend to be shorted to ground. However, in the 56- to 80-Mc. range there is enough inductance in the plate lead and condenser frame to be series-tuned to one of the higher harmonics. Just which harmonic or harmonics are built up this way depends on the layout of parts, physical shape of condensers, length of leads, length of r.f. filament returns, and so on.

But suppose we give the harmonic r.f. a nice easy direct path through, say, a 50-µfd. vacuum condenser connected directly from plate to filament. A quick check showed this would be a resistance of only 40 ohms at 80 Mc., compared with 2500 ohms for the plate-filament capacity of the tube. Well, it was worth a try. So two of the SCR-274 (ARC-5) antenna vacuum condensers were temporarily connected, one from each plate cap to each filament center-tap. Lo and behold, no TVI on any channel — with 800 watts 4 feet from the TV receiver. Because of the added capacity it was necessary to use a 7-Mc. coil to tune the tank to resonance.

The use of vacuum condensers to help control harmonics is very desirable from several standpoints. Their construction — concentric cylinders in a vacuum with glass insulation and heavy connectors — makes them have low losses, high voltage breakdown, and low inductance. They add a substantial amount of capacity to the tank circuit in an efficient, small, easy-to-mount form. They may be connected from plate to filament, from grid to filament, or both. Fig. 2-A shows a typical single-ended r.f. amplifier or one half of a push-pull amplifier. Capacity $C_{pf}$ is the plate-to-filament capacity of the tube and amounts to 0.7 µfd. for a 250-TH. $C_{gf}$, the grid-to-filament capacity, is 5 µfd. The heavy lines show the path that the harmonic takes to get from either the plate or grid back to the filament. This long path usually has about the right amount of inductance and capacity to be series-resonant in

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*Fig. 2* — The harmonic return circuits are shown by the heavy lines. Vacuum condensers, because of their low inductance, are especially good for shorting the harmonics directly from plate (the most important point) to filament and grid to filament. A trap in the plate lead, as shown at C, will prevent a particular harmonic from getting into the tank circuit.

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the range 56–100 Mc. In addition to the path in heavy lines the harmonic current undoubtedly divides and partly flows through the tank coil from where it is coupled to the antenna.

Fig. 2-B shows the use of vacuum condensers from plate to filament and from grid to filament to provide short, low-inductance paths for the harmonic current. Although the greater part of the harmonic goes directly to filament through the vacuum condenser a small part probably will continue to flow through the tank circuit. In Fig. 2-C a harmonic trap has been installed in the plate lead, following the vacuum condenser, to prevent the harmonic from getting into the tank.

Now don’t get me wrong and assume that all your TVI problems will be licked if you corner the surplus market on 50-µfd. vacuum condensers. You can’t cure TVI by any one means. The last thing you try, the one that finally cures the TVI completely, would have helped only a little if it had been tried first. You have to stop all the leaks.

TVI Review

Let’s go over once again some of the most important steps to be taken in licking TVI:

**Design and layout:**

1) Do your frequency multiplying in very low-power stages and build up the power on the output frequency with “Class B” amplifiers — amplifiers biased to cut-off or less.

2) Lay out the final amplifier for the shortest possible r.f. path from plate to cathode.

3) Add capacity directly from plate to cathode on each tube in the final. Vacuum condensers are ideal for this purpose because of their low inductance and physical shape. This step is particularly important with triodes because their plate-filament capacitance is usually very low. The added capacitance is part of the tank circuit, so the tank coil must be made correspondingly smaller.

4) Shield all stages (copper screening is OK) to prevent direct radiation of harmonics.

5) With ‘phone, use of f.m. instead of a.m. will lessen interference because it eliminates “modulation bars” in the picture. Carrier interference is the same in either case, however.

**Operating:**

1) Make sure that the final is perfectly neutralized.

2) Keep the grid bias as low as possible. The closer to cut-off the better, provided the amplifier will modulate properly when a.m. is used.

3) Don’t overdrive. Keep the grid current below ratings — just enough for proper modulation, when a.m. is used.

4) Clean up key clicks and sideband splatter. These can ruin the picture even when there is no harmonic interference.

**Cleaning up off-frequency radiation:**

1) Make sure that the rig is completely free from parasitic oscillations.

2) Filter all wiring before it leaves the chassis so harmonics will not be radiated from the power and control leads. The a.c. line feeding the final filament transformer needs especially good filtering. It is also advisable to have one “main” line filter for the entire a.c. supply to the set.

3) In 14- and 28-Mc. transmitters, install parallel-tuned traps (high-C) in each plate lead to trap out the desired harmonic.

**In the antenna system:**

1) Use a separate antenna tuner. It not only helps discriminate against harmonics coupled by ordinary means but also tends to reduce coupling through stray capacity.

2) Use stubs on the transmission line to trap out harmonics in the line. Stubs are sometimes helpful and sometimes not, but are worth a trial if there is still interference after all the steps listed above have been taken.

**At the TV receiver:**

1) If your fundamental signal overloads nearby receivers, install parallel-tuned traps in each feeder lead right at the receiver input terminals. These traps should tune to your fundamental.

2) Install an a.c. line filter if the receiver is close enough so that there is evidence of fundamental-frequency r.f. on the a.c. wiring.

(Continued on page 114)

Showing how the vacuum condensers are mounted alongside a tube. The leads connecting the condensers should be as short as they can be made.
WHAT BANDS AVAILABLE?

Below is a summary of the U.S. amateur bands on which operation is permitted as of November 1st. Future changes will, as usual, be announced by W1AW bulletins. Figures are megacycles. A0 means an unmodulated carrier, A1 means c.w. telegraphy, A2 is m.e.w., A3 is a.m. 'phone, A4 is facsimile, A5 is television; n.f.m. designates narrow-band frequency- or phase-modulated radiotelephony; and f.m. means frequency modulation, 'phone (including n.f.m.) or telegraphy.

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Band Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.500-4.000</td>
<td>A1</td>
<td>Class A only</td>
</tr>
<tr>
<td>3.850-4.000</td>
<td>A3</td>
<td>Class A only</td>
</tr>
<tr>
<td>3.850-3.900</td>
<td>n.f.m.</td>
<td>Class A only</td>
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<tr>
<td>7.000-7.300</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>14.000-14.400</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>14.300-14.320</td>
<td>A2</td>
<td></td>
</tr>
<tr>
<td>14.200-14.350</td>
<td>n.f.m.</td>
<td></td>
</tr>
<tr>
<td>27.160-27.430</td>
<td>A0, A1, A2, A3, A4</td>
<td>f.m.</td>
</tr>
<tr>
<td>28.000-29.700</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>28.500-29.700</td>
<td>A3</td>
<td></td>
</tr>
<tr>
<td>28.500-29.000</td>
<td>n.f.m.</td>
<td></td>
</tr>
<tr>
<td>29.000-29.700</td>
<td>f.m.</td>
<td></td>
</tr>
<tr>
<td>50.0-50.5</td>
<td>A0, A1, A2, A3, A4</td>
<td>f.m.</td>
</tr>
<tr>
<td>51.0-51.5</td>
<td>n.f.m.</td>
<td></td>
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<tr>
<td>144</td>
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<td>220</td>
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<td>420</td>
<td>A9, A1, A2, A3, A4, A5, f.m.</td>
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<td>1,215-1,300</td>
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<tr>
<td>2,300-2,450</td>
<td>A0, A1, A2, A3, A4, A5, f.m.</td>
<td></td>
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<tr>
<td>3,300-3,500</td>
<td>A0, A1, A2, A3, A4, A5, f.m.</td>
<td></td>
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<tr>
<td>5,650-5,925</td>
<td>A9, A1, A2, A3, A4, A5, f.m.</td>
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<tr>
<td>10,000-10,500</td>
<td>Pulse</td>
<td></td>
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<tr>
<td>21,000-22,000</td>
<td>Pulse</td>
<td></td>
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<tr>
<td>All above 30,000</td>
<td></td>
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</tbody>
</table>

1. Until January 1, 1952, FCC may order this band vacated in certain areas if it is required for distance-measuring equipment; in which case, amateurs in such areas only may employ 235-240 Mc. in lieu thereof.

2. Peak antenna power must not exceed 50 watts.

SMITH SUCCEEDS DELLINGER AS C.R.P.L. HEAD

For over two-and-a-half decades, amateur radio has enjoyed closer relations with the National Bureau of Standards than with any other Government agency outside the military — save FCC itself. From the fading tests of 1920 through the present 28-Mc. observing project, the cooperation between the Radio Section of the Bureau of Standards and ARRL has been extensive and mutually profitable. It is especially pleasant, therefore, to pay tribute to Dr. J. Howard Dellinger, world-renowned allocation and propagation authority who retired earlier this year as chief of the Central Radio Propagation Laboratory of the Bureau, and to his recent successor, Dr. Newbern Smith.

Dr. Dellinger, perhaps best known for his discovery of the coincidence of sunspot activity and radio fade-outs, the so-called Dellinger Effect, is a native of Cleveland, Ohio. He was a student at Western Reserve University from 1903 to 1907, received his bachelor of arts degree from George Washington University in 1908 and his Ph.D. degree from Princeton in 1913. In 1932, he was presented with a doctorate of science by George Washington University.

In 1907 Dr. Dellinger became a member of the staff of the Bureau of Standards. Four years later, when the SS Titanic tragedy brought the immediate practicality of radio to public attention, he initiated radio research at the National Bureau of Standards and was named Chief of the Radio Section when it was established in 1919. One of his early experiments led to the practice of broadcasting market reports in Morse code by the Department of Agriculture in 1921, the first regularly-scheduled broadcasts in the world. It was he who conceived the idea and initiated the standard radio-frequency broadcasts from WWV. In 1928 and 1929, Dr. Dellinger was loaned by the Bureau to the Federal Radio Commission as its chief engineer.

The service rendered by Dr. Dellinger during World War II was especially noteworthy. At the beginning of the war, he was chosen by the Armed Forces Joint Communications Board to set up and direct the work of the Interservice Radio Propagation Laboratory. The assignment of IRPL was to collate data which made it possible to predict radio characteristics for the armed services. In 1946 IRPL was reorganized as the

Happenings of the Month

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Central Radio Propagation Laboratory and its prediction service made available for civilian as well as military use, with Dr. Dellinger as its chief.

Author of numerous papers on radio and allied subjects, Dr. Dellinger is also radio editor for *Webster's Dictionary*. He is a member of the Institute of Radio Engineers, the Washington Academy of Sciences, American Geophysical Union, and an honorary member of the *Associazione Italiana de Aerotecnica*. He was IRE vice-president in 1924, its president in 1925 and received the IRE Medal of Honor in 1938. He served as vice-president of the Washington Academy of Sciences in 1935, 1939 and 1941. He is vice-president of the International Scientific Radio Union and still serves as chairman of both the Radio Technical Commission for Aeronautics and the Radio Technical Commission for Marine Services.

In the field of radio legislation, in which he has been active since 1916, Dr. Dellinger's career encompasses practically all of the legislative parleys in that period. The veteran Bureau of Standards radio chief has been an outstanding American technical expert and scientist at all major conferences and meetings, including those of the International Radio Consultative Committee, and has headed many propagation and scientific committees at international conferences which have contributed immeasurably to the progress of international communications.

Dr. Dellinger also served since 1922 as representative of the Department of Commerce on the U. S. Government Interdepartment Radio Advisory Committee, for whose creation and success he is one of those largely responsible, and was twice its chairman, in 1941-1943 and 1946-1948. He was a member of innumerable specialized technical committees. The studies of one of these, on communications policy in 1934, was embodied in the Communications Act of 1934.

Over all these years, he has been one of amateur radio's staunchest friends; at Washington, at international conferences, he has always expressed recognition of the value and utility of amateur radio and its contribution to the art.

It is only by appraising the duties which Dr. Dellinger is relinquishing that we can sense any degree of retirement; he plans to continue to act as radio consultant and advisor for a number of organizations and companies. With our gratitude to Dr. Dellinger for his valued friendship, we tender also our best wishes and the hope that his retirement years will be long, full and happy.

Dr. Newbern Smith, successor to Dr. Dellinger as chief of CRPL, brings to the Laboratory a background and record of achievement which admirably qualifies him for his new post. Widely acclaimed for his considerable research in ionosphere measurements, oblique-incidence radio transmission and radio critical frequencies in relation to solar eclipses and sunspot cycles, he served as technical head of IRPL during the war and, in that capacity, participated in conferences in London, Ottawa and Washington, followed by activity in later conferences in Geneva, Stockholm and Atlantic City. Dr. Smith has been with the National Bureau of Standards since 1935, at which time he was a physicist in the radio section. In 1946, he was named assistant chief of CRPL, a position he held until his new appointment.

Born in Philadelphia in 1909, Dr. Smith attended the University of Pennsylvania where he received his bachelor's degree in 1930 and his master's degree in 1931, both in electrical engineering. In 1935, he received his doctorate of physics from the same university. In 1930, he was awarded the Moore Fellowship in Electrical Engineering at the University of Pennsylvania and was an assistant instructor in electrical engineering in 1931 and a research assistant in 1933. The following two years he was a physics instructor at the Philadelphia College of Osteopathy. Dr. Smith was also a part-time member of the faculty of George Washington University and is a senior member of IRE and of numerous honorary fraternities.

An old-timer in ham circles, Dr. Smith was licensed in 1924 as 3QY, later W3QY, which expired in 1931 during the time he was on one of his many overseas trips. Several years later, he was able to squeeze in a limited amount of amateur activity with the call W3CHA. His extensive professional activities have taken so much of his time that he hasn't found time to get on the air in recent years; the major portion of his recreational time at present is spent in flying. However, he hopes to kill two birds with one stone in the near future by engaging in amateur aeronautical mobile operation, combining his flying and hamming. To Dr. Newbern Smith, then, we extend hearty good wishes for success in all things, including best DX and happy landings.

34 **QST for**
EXAMINATION SCHEDULE

The Federal Communications Commission will give amateur examinations during the first half of 1949 on the following schedule. Remember this list when you need to know when and where examinations will occur. Where exact dates or places are not shown below, information may be obtained, as the date approaches, from the Engineer-in-Charge of the district. Given dates are tentative and should be verified from the Engineer as the date approaches. All examinations are given on legal holidays. All examinations begin promptly at 9 A.M. except as noted.

<table>
<thead>
<tr>
<th>Location</th>
<th>Dates</th>
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</thead>
<tbody>
<tr>
<td>Baltimore, Md.</td>
<td>Some time in April</td>
</tr>
<tr>
<td>Beaumont, Tex.</td>
<td>329 P. O. Bldg.: Thursday, and by appointment.</td>
</tr>
<tr>
<td>Billings, Mont.</td>
<td>May 2</td>
</tr>
<tr>
<td>Birmingham</td>
<td>Jan. 5, Apr. 6</td>
</tr>
<tr>
<td>Bismarck, N. D.</td>
<td>April 13</td>
</tr>
<tr>
<td>Boise</td>
<td>Some time in April</td>
</tr>
<tr>
<td>Boston</td>
<td>1600 Customhouse: Monday through Friday, 8:30 A.M.</td>
</tr>
<tr>
<td>Buffalo</td>
<td>328 Federal Bldg.: Thursday.</td>
</tr>
<tr>
<td>Butte</td>
<td>Apr. 29</td>
</tr>
<tr>
<td>Charleston, Va.</td>
<td>Some time in March and June.</td>
</tr>
<tr>
<td>Chicago</td>
<td>246 U. S. Courthouse: Friday.</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>Some time in February and May.</td>
</tr>
<tr>
<td>Cleveland</td>
<td>541 Federal Bldg.: First and third Fridays each month, also by appointment.</td>
</tr>
<tr>
<td>Columbus, Ohio</td>
<td>Some time in January and April.</td>
</tr>
<tr>
<td>Corpus Christi</td>
<td>Mar. 10, June 9</td>
</tr>
<tr>
<td>Cumberland, Md.</td>
<td>Apr. 14</td>
</tr>
<tr>
<td>Dallas</td>
<td>500 U. S. Terminal Annex: Monday through Friday.</td>
</tr>
<tr>
<td>Davenport</td>
<td>Some time in January and April.</td>
</tr>
<tr>
<td>Denver</td>
<td>521 New Customhouse: First and second Thursdays each month, also by appointment.</td>
</tr>
<tr>
<td>Des Moines</td>
<td>Jan. 13, Apr. 7</td>
</tr>
<tr>
<td>Detroit</td>
<td>1029 New Federal Bldg.: Wednesday and Friday.</td>
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<tr>
<td>El Paso</td>
<td>Mar. 22</td>
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<tr>
<td>Ft. Wayne</td>
<td>Some time in February and May.</td>
</tr>
<tr>
<td>Framo</td>
<td>Mar. 16, June 15</td>
</tr>
<tr>
<td>Grand Rapids</td>
<td>Some time in January and April.</td>
</tr>
<tr>
<td>Hartford, Conn.</td>
<td>Some time in March.</td>
</tr>
<tr>
<td>Hilo, T. H.</td>
<td>Apr. 12</td>
</tr>
<tr>
<td>Honolulu</td>
<td>609 Stangenwald Bldg.: Monday.</td>
</tr>
<tr>
<td>Houston, Tex.</td>
<td>524 U. S. Appraisers Stores Bldg.: Tuesday and Friday.</td>
</tr>
<tr>
<td>Indianapolis</td>
<td>Some time in February and May.</td>
</tr>
<tr>
<td>Jacksonville</td>
<td>April 16</td>
</tr>
<tr>
<td>Juneau, Alaska</td>
<td>7 Shattuck Bldg.: By appointment only.</td>
</tr>
<tr>
<td>Kansas City</td>
<td>838 U. S. Courthouse: Friday, also by appointment.</td>
</tr>
<tr>
<td>Jacksonville</td>
<td>April 16</td>
</tr>
<tr>
<td>Klamath Falls, Ore.</td>
<td>Some time in May.</td>
</tr>
<tr>
<td>Knoxvile, Tenn.</td>
<td>Mar. 9, June 8</td>
</tr>
<tr>
<td>Las Vegas, Nev.</td>
<td>Some time in April.</td>
</tr>
<tr>
<td>Liburn, T. H.</td>
<td>Apr. 26</td>
</tr>
<tr>
<td>Little Rock</td>
<td>Jan. 19, Apr. 20</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>530 U. S. P. O. and Courthouse Bldg.: Wednesday at 9 A.M. and 1 P.M.</td>
</tr>
<tr>
<td>Memphis</td>
<td>Mar. 9, June 8</td>
</tr>
<tr>
<td>Miami</td>
<td>312 Federal Bldg.: Monday and Thursday.</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>Some time in January and April.</td>
</tr>
<tr>
<td>Mobile</td>
<td>May 2</td>
</tr>
<tr>
<td>Nashville</td>
<td>Feb. 8, May 11</td>
</tr>
<tr>
<td>New Orleans</td>
<td>400 Audubon Bldg.: Monday through Friday; when code test required, Monday, Tuesday, Wednesday, at 8:30 A.M.</td>
</tr>
<tr>
<td>Omaha</td>
<td>Jan. 20-21, Apr. 25-26</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>1005 Customhouse: Monday through Friday, 9 A.M. and 1 P.M.</td>
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<tr>
<td>Phoenix, Ariz.</td>
<td>Some time in April.</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>Feb. 8-9-10, May 3-4-5</td>
</tr>
<tr>
<td>Portland, Me.</td>
<td>Some time in April.</td>
</tr>
<tr>
<td>Portland, Ore.</td>
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<tr>
<td>Reno</td>
<td>Apr. 20</td>
</tr>
<tr>
<td>Roanoke</td>
<td>Apr. 2</td>
</tr>
<tr>
<td>St. Louis</td>
<td>Feb. 10, May 12</td>
</tr>
<tr>
<td>St. Paul</td>
<td>203 Upton P. O. Bldg.: Friday.</td>
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<tr>
<td>Salt Lake City</td>
<td>Mar. 16, June 15</td>
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<tr>
<td>San Antonio</td>
<td>Feb. 10, May 12</td>
</tr>
<tr>
<td>San Diego</td>
<td>220 U. S. Customhouse: By appointment.</td>
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<tr>
<td>San Francisco</td>
<td>328-A Customhouse: Monday and Friday.</td>
</tr>
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<td>San Juan</td>
<td>Class A, Monday through Friday.</td>
</tr>
<tr>
<td>Savannah</td>
<td>214 P. O. Bldg.: By appointment.</td>
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</table>

*Since the war many countries of the world have set up currency restrictions which either prohibit the sending of money outside their boundaries, or make it practically impossible. This has meant that hundreds of amateurs in other lands do not normally have the opportunity to renew their ARRL memberships and receive QST regularly. Yet to them QST is the lifeline of contact with American and world-wide amateur radio. As one of them said, "I'd gladly forego my bread ration if instead I could get QST regularly."*

At the end of the war ARRL did in numerous instances grant membership and QST to prewar members overseas on a credit basis, but of course we couldn't carry membership-subscriptions on that basis indefinitely and, in practically all cases, we have been regretfully obliged to discontinue these arrangements. It has occurred to us that perhaps American amateurs and club groups might wish this year to make a "care" package gift in the form of QST for Christmas. If it’s something you'd like to do, we'll be glad to make necessary arrangements. The foreign membership dues are $5. If you have a particular DX buddy in mind, give us his name — and complete address. If you have no special name, we can arrange to apply your remittance to a membership-subscription for a foreign amateur who cannot send his own money but wishes to renew. We'll let you know what amateur we select. And of course we'll send the recipient of your gift an appropriate note to tell him who his American patron is. Address ARRL, 38 La Salle Road, West Hartford 7, Conn.

December 1948
The Navy and the Amateur

An Address by the Chief of Naval Communications at the ARRL National Convention

BY REAR ADMIRAL EARL E. STONE,* USN

Distinguished Guests, Ladies and Gentlemen:

I am honored to have been invited here to address you during your fifth American Radio Relay League National Convention. My pleasure on this occasion is especially due to the friendliness, respect, and active cooperation that has existed between the ARRL and the Navy for many years. I expect that this same fine spirit will continue in the years ahead, for our mutual benefit, and in the national interest. There is an added reason for my pleasure at being here today. This is the first time I have ever been on this platform - but this great building is very familiar to me - for I grew up in Milwaukee. Of course, it’s been many years since 1914 when I went to Annapolis and put on my first Navy uniform. But there’s always real pleasure in coming back home again. But now let me tell you of the Navy’s great interest in, and great respect for, you - the members of ARRL.

As you all know, many amateurs came into the Navy both as officers and as enlisted men during World War II. To them, I know that we owe a great deal - for their contributions to the success which the Navy and the other services attained during that war. Those amateurs who entered the naval service and who, previously, through their devotion to their hobby, had developed into good c.w. operators and good radio technicians, were able to fill important billets immediately upon mobilization, often without any additional training. The Navy’s communication and electronics requirements upon mobilization were literally beyond normal expectations. The fine training which so many amateurs had voluntarily given themselves proved invaluable to the military services, especially during the mobilization period before our wartime training programs could become effective.

The enormous strides which have been made in the development of communications matériel - I mean the development of various mechanical means of transmission and reception, and of voice transmission and reception - have had a tendency to produce radio personnel who may be inclined to underestimate the importance of certain fundamentals. The Navy still considers c.w. operation to be the fundamental requirement of a radio operator. Today, if you have the money, it is easy to purchase radio transmitters and receivers complete - but the young amateur of today may fail to learn much that is fundamental if he passes up the opportunity of assembling some of his own equipment, not to mention missing the thrill that goes with building your own radio facilities. The newcomer in the amateur field will do well to follow in the footsteps of his older brother and learn by cutting and trying. The “know-how” which the amateur acquires by personally testing and experimenting is the priceless ingredient that makes the amateur the vitally important man in an emergency. “Know-how” coupled with resourcefulness has frequently meant success when success was urgently required.

I should like to state that no matter how mechanized and automatic Naval communications may become, I feel that we shall always need manual and voice operators (brass pounders and radiotelephone technicians) when the going is toughest. As one of my officers in Washington recently put the same thought: The “Phi Beta Kappa Key” boys will always be deserving of much praise for their various accomplishments, but in military communications the “Tap-a-Key” and “Cock-an-Ear” boys are the ones who really deserve a pat on the back.

A quick glance at a recent issue of the amateur call book indicates that there are perhaps more radio amateurs at the present time than ever before. This is a healthy and most welcome condition. I would like to recommend that each of you do everything practicable to sustain this newly-aroused interest. As you no doubt know, this increase in the number of licensed amateurs demands the greatest efficiency in utilization of available amateur frequency allocations. I submit for your serious consideration the idea of a.c. radiotelegraphy should be encouraged. The reasons for this are that: (1) More channels per kilocycle of spectrum can thus be obtained; and what is more important (2) amateur bands are rendered less vulnerable to reduction by reason of inefficient use, and (3) from the military viewpoint, more trained c.w. operators will be available to the three services in an emergency. Usually on each project we had a very few experienced Navy regulars plus many amateurs to do the pick-and-shovel work. Fortunately there usually were also some amateurs or other experienced men present, and often it was their “know-how” and “self-starter” characteristics that made the project successful. Naturally, I want to encourage and support you amateurs since I know first hand how essential you are to our national security and defense. I honestly feel that as a group, and individually, you deserve the “can do” title, and that you will certainly continue to deserve that appellation of accomplishment and praise if you adhere to the old fundamentals and keep your ranks full of patriotic Americans.

It is our policy in the Navy actively to support the activities and the program of the amateurs. We do so at international radio conventions and at home with Congress, the Federal Communications Commission, and with other Government departments and agencies. We shall continue to do so. As you doubtless know, a large percentage of our Naval Reservists, particularly in our electronic-warfare programs, are also amateurs in good standing. We constantly urge our licensed amateurs to use the Naval Reserve communication equipment on amateur business in the amateur bands. They must, of course, be licensed, and in that role they operate this equipment using amateur call signs and procedures. Most of them have been issued distinctive amateur calls containing a Naval Reserve identification, and their ham

(Continued on page 188)
THE untimely passing early this year of our good friend Francini, M1A, whose brief period of operating had just started to put San Marino on the postwar DX map, left that tiny republic without an amateur active in DX circles. There is one other amateur in the country, M1B, but he is interested mainly in rag-chewing on 7-Mc, phone.

Continual inquiries by amateurs in the States as to the possibility of working San Marino led us to give thought to a possible "expedition" to that "rare" country. Discussing our idea with W1FH, W2BXA and W3JNN during rag-chews, we were further encouraged to go ahead with the necessary groundwork.

San Marino's 38 square miles, 2500 feet high atop Mt. Titano in central Italy, is but a pin point on the map of southern Europe. Established in the year 1231, the country lays claim to being the oldest republic in Europe. It maintains an army, issues its own stamps and coins, and makes foreign treaties. Its 12,000 inhabitants — mostly vintagers and herdsmen — live a tax-free existence!

With a full picture of our objective in mind, we set about, getting the necessary permission for portable operation from this exclusive DX point. Numerous inquiries of San Marino officials went unanswered. It was then that we decided to advise M1B of our plans. He was most cordial and reassuring in his response. There was no official licensing there, he informed us. His own activity was tolerated but kept under constant surveillance by authorities because of a constant fear of international complications. An offer of full hospitality in his home ended all indecision — we had to go to San Marino.

After deciding on a date for our venture, we notified our ham friends in the United States, loaded our car with a portable rig and a receiver, and started from Urbania, Italy, early on the morning of Saturday, August 21st. Unfortunately, we had left our road map at home, so we advanced through driving rain toward San Marino wholly dependent upon the instructions of wayfarers. We soon found ourselves in a labyrinth of mountain roads, meeting only an occasional farmer or shepherd. One shepherd told us our goal was 30 miles away; a half hour later another informed us we had 50 miles to go! After hours of what seemed aimless driving, the top of Mt. Titano broke through the rain clouds. M1-land at last! And an especially welcome sight for IIHR whose arms were very weary after driving the car around the many tortuous mountain curves. The unguarded border was crossed without incident, and it wasn't long before we had searched out the home of M1B, who welcomed us heartily and warmed us with food and refreshment.

It was then that we felt the true precariousness of our position. Despite the fortification of M1B's hospitality, cold chills began to run up and down our spines as we visualized ourselves signing not

DX Holiday in San Marino

BY GIANCARLO MARTELLI,* IIPL, AND STELIO RIGUCCI,** IIHR

* Via della Scchia 4, Bologna, Italy.
** Urbania, Pesaro, Italy.
IIPL/M1 and IIHR/M1 but instead IIPL/PRISON and IIHR/PRISON!

But we were in rare M1-land now, and with the fellows in the States on the job listening for us, action was needed. After choosing a likely site, we proceeded with the risky task of installing an antenna. We selected an ancient tower and a tree for supports, which meant it would be necessary for the skywire to cross a large walk. M1B cautioned us to go about our job quietly and to avoid drawing the attention of any passers-by. Several times our nervousness caused near short-circuits of a power line. On another occasion, the wire became entangled in the tree branches. Borrowing a walking stick from an innocent-looking bystander who was curiously watching us, we freed it with little difficulty.

Later that night — when the Ws were rolling through in fine style — we learned that the bystander was the Policy Minister of San Marino. Yes, we had visions of prison doors closing in on us!

It was late Saturday afternoon when we fired up our 6V6-parallel 807 rig. Our first CQ was answered by G8IH, followed in turn by several other Gs and TF3EA. Signals were good and we looked forward to a busy night with the gang in the States.

W1LVH opened up for the Ws, being worked at 2250 local time. Hardly had we signed with him than it seemed all hell had broken loose. For a whole night the battle of kilowatts, VFOs and rotary beams raged. Never before has so much r.f. been pumped in one direction on one frequency in the 14-Mc. band. We had difficulty reading calls despite the attempts of many amateurs, including W4CC, to police the frequency.

The Eighth District started with WSBRA, the Ninth with W9VW, and the Seventh with W7DL. At 0352 Sunday the California gang signaled their presence with W6ITA leading off, followed closely by W6DZZ, W6PFD and W6VFR. The signals that the Ws put through the East Coast QRM were amazing! Not to be overlooked, the Midwest was heard from next in the person of W0YXO. KP4KD was lead-off man for a string of KP4s and VE3BBR sneaked through for our sole Canadian contact.

Sunday night was spent resting up and operating ‘phone from M1B’s shack. One of the lucky Ws to make the grade was our old friend of DXCC fame, W1FH, whom we had previously worked on c.w. from our own portable set-up.

We pulled switches at dawn on Monday, August 23rd, with W6FSJ just getting under the wire for our final QSO. Our contacts numbered almost 150, cards for which have already been mailed to the respective bureaus.

We wish to thank the W gang for their great interest in our trip, and our only regret is that we couldn’t work more stations than we did.

Now, if someone would only go to Monaco or Andorra! For our own part, we are now speculating on another adventure. . . . What say to IIPL/HV and IIHR/HV, gang?

OUR COVER

A few years ago a youngster by the name of Jane Bieberman suddenly took an interest in the strange clatter which often came from the den of her home in Bala-Cynwyd, Pa. She investigated. Although she didn’t understand then much of her dad’s resulting explanation of what amateur radio was, she discovered the sounds were radio code, and she decided she wanted to learn it. With the help of her dad, she did, and soon could copy 5 w.p.m. OM W3KT was very proud of his daughter’s accomplishment, but he made no attempt then to push her toward an amateur license because of her tender age — 6 years.

This spring, however, Jane announced that she wanted to become a ham, W3KT, by profession a schoolteacher, made certain she started right: He sent code to her carefully by hand, and later with a war-surplus keyer (WIAW practice schedules were well past Jane’s bedtime). He gave her basic instruction in radio fundamentals before turning to the License Manual for rehearsal, so there would be no learning parrot-fashion. On August 20th little Jane sat down in the Philadelphia RI’s office and took the amateur exam, which she passed with flying colors. “I did have a little trouble with some of the diagrams,” Jane says, “but the code was easy and the written part not too hard.” And so it was that Jane Bieberman, just turned ten years, became W30VV and probably the world’s youngest licensed amateur radio operator.

Her first QSO was an experience that unnerved her — she trembled so that she had to ask her dad to finish it. But she’s had numerous successful and enjoyable contacts since, mostly on 50-Mc. ‘phone rig at W3KT, to talk to members of the Frankford Radio Club. And, of course, she helps W3KT in his duties as W3 QSL manager. But Jane’s folks are not too sure about this radio business, now that they think it over. When she should be practicing on the piano, she’s often found up in her bedroom tuning up on 7 Mc.!
Jungle Job—100 Watts

A Portable Transmitter for Rugged Country

BY CHARLES C. FULLER, * HCIES

Upon my return to the States from Ecuador, in 1946, I knew beyond question that any transmitter for jungle operation had to be portable. An Indian cargador who, in the Quito capital—at almost 10,000 feet up—can load 200 pounds on his back and trot down the street, is completely fagged at low altitude after a day’s journey through jungle mud carrying a maximum of 75 pounds.

Therefore, the prime consideration was weight, including transport case, spare tubes, coils, crystals, trouble-shooting meter, etc. Of equal importance were power supply and source. One doesn’t recharge batteries in the deep bush. Gasoline is dangerous, difficult, and expensive to carry in quantity. And, since the rig was also to be used in Quito on commercial 115-volt 60-cycle lines, the decision was to utilize for jungle power a modified 115-volt 60-cycle 500-watt generator, and to build the rig for conventional a.c. power. The receiver could then be operated from the same source. The rating of the generator becomes modified somewhat in the bush—it might be called a “2-Indian-power” job!

Past experience had proved that 100 watts of c.w. will get out very well under any average condition. Chief operation was to be on 7 and 14 Mc., with 80 and 10 meters as auxiliary bands. A push-pull output stage is a personal preference over single-ended affairs, because the p.p. stage is symmetrical, balances out even harmonics in good fashion, and is generally easier to handle. Since a clean note cuts through QRM, it seemed that sixty AT-cut rocks would weigh less than a good VFO, while keeping power requirements down to a minimum.

Another point to consider was that one doesn’t just run around the corner in the jungle to buy a new bias battery. It takes an Indian runner some six weeks to get in and out of the bush, and then he is still 100 km. removed from a radio store! With all these and other considerations in mind, the rig worked out to be a 6V6 Tri-tet crystal oscillator driving an 815 p.p. final, with blocked-grid keying. The negative voltage for the oscillator and amplifier was to be furnished by a 117Z6 in a circuit that had been proved and debugged years ago at my QTH of W9DUP, where it was in use right up to Pearl Harbor Day. One of the new selenium rectifiers might be used to replace the 117Z6, but there was no time to try it.

The 815 was selected for several reasons. It requires very little drive, it is compact, and no neutralizing is necessary with proper handling. While its ICAS rating is 75 watts maximum input, it can be run at 100 when everything is properly tuned. We have had no trouble with the tube running at the higher input.

For the power supply, a transformer rated at 600-0-600 volts at 200 ma. was available. An 83 rectifier seemed logical, and the usual condenser-input filter was used to keep the voltage up. Actually, the power supply gives only 560 volts at 180 ma., which can be accounted for either by a peculiarity in Ecuadoran power or the overenthusiasm of the transformer manufacturer. If the 815 were to be run at rating, a 500-volt 175-ma. supply would be adequate.

With the design fairly well established, a trip to Kansas City located enough AT-cut blanks to make up—with those I’d cut and ground myself—the sixty crystals. Thanks are due and freely given to the engineers at Crystal Products Co. for their fine cooperation in lapping those blanks to 6990 kc., from which point all have been ground and etched to desirable spots in the 7-Mc. band.

By the greatest luck in the world, a scouting trip to Chicago for parts turned up a simple 40-watt rig built into an SW-3 cabinet. The owner was building to higher power. One look at that compact outfit and it was evident that it could

* P.O. Box 2850, Quito, Ecuador.


A 100-watt transmitter complete in an SW-3 cabinet does a noteworthy job at HCIES, if the wallpaper is any indication.

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Fig. 1 — Wiring diagram of the two-stage “Jungle Job.”

C₁ — 100-µfd. midget variable (Hammarlund APG-100).
C₂ — 0.01-µfd. 600-volt paper.
C₃ — 0.047-µfd. mica.
C₄ — 50-µfd. variable (Hammarlund SM-50).
C₅, C₇ — 0.02-µfd. 600-volt paper.
C₆, C₈ — 3-30-µfd. mica compression trimmer.
C₉ — 50-µfd. variable (Hammarlund SM-50).
C₁₀ — 0.02-µfd. 600-volt paper.
C₁₁, C₁₂ — 3.3-30-µfd. mica compression trimmer.
C₁₃ — 0.01-µfd. mica.
C₁₄ — 50-µfd. per-section variable (Hammarlund MCD-50-S).
C₁₅ — 0.01-µfd. 1600-volt paper.
C₁₆ — 100-µfd. variable (Hammarlund SM-100).
C₁₇ — 12-µfd. 150-volt electrolytic.
C₁₈ — 2-µfd. 800-volt oil-filled, flat.
C₁₉ — 2-µfd. 1000-volt oil-filled, round.
R₁ — 20,000 ohms, 1 watt.
R₂ — 15,000-ohm potentiometer.
R₃ — 100 ohms, ½ watt.
R₄ — 0.47 megohm, 2 watts.
R₅ — 39,000 ohms, 2 watts.
R₆ — 40,000-ohm 100-watt wirewound, adjustable (Ohmite Dividohum).
R₇, R₈ — 20 ohms, 1 watt.
I₁ — 14 turns No. 22 d.c.c., ⅜-inch diam., ⅜ inch long. Grid taps 13 turns each side of center.
I₂ — 3.5 Me. 50½ turns No. 18 enam., 2½ inches long. Grid taps 13 turns each side of center.
7 Me.: 26 turns No. 18 enam., 2½ inches long. Grid taps 8 turns each side of center.
14 Me.: 12 turns No. 18 enam., 1 inch long. Grid taps 4½ turns each side of center.
28 Me.: 5½ turns No. 18 enam., ⅜ inch long. Grid taps 1¾ turns each side of center.
All I₄ coils wound on Bud ⅛-inch diam. ribbed-bakelite forms.
I₅ — 3.5 Me.: 66 turns No. 20 enam., 2½ inches long. Output link 3 turns.
7 Me.: 33 turns No. 14 enam., 2½ inches long. Output link 1 turn.
14 Me.: 17 turns No. 14 enam., 1½ inches long. Output link 3 turns.
28 Me.: 8 turns No. 14 enam., 1½ inches long. Output link 1 turn.
All I₆ coils wound on Johnson ⅛-inch ribbed-porcelain forms. Links wound over center of coil, on 8 strips of polystyrene.
I₇ — 30 turns No. 14 enam., 1½-inch diam., 2 inches long, close-wound, self-supporting on polystyrene strips. Taps at 11½ and 19½ turns.
I₈ — 15-henry 200-ma. choke (Stancor C-1721).
I₉, I₁₀ — 6.3-volt pilot lamp.
I₁₁, I₁₂ — Closed-circuit jack.
MA — 0-200 milliammeter.
RFC₁, RFC₂, RFC₃ — 2.5-mh. r.f. choke.
RFC₄, RFC₅ — 12 turns No. 26 enam., close-wound on ⅛-inch diam.
S₁ — See text.
S₂ — D.p.d.t. switch.
S₃, S₄ — S.p.s.t. switch.
T₁ — 600-0-600 v. 200-ma. secondary; also 6.3 volts at 4 amp., 5 volts at 4 amp.

be revamped for 100 watts and converted to my design with a minimum of work. I bought it.
There was only one fly in the ointment. The rig had to be rebuilt, all of the coils wound, everything put into as near-perfect shape as possible, all with no testing until it was plugged in, months later, almost two miles high in the Andes at Quito!
The reason? My QTH had 25-cycle current. And being pressed for time, there was no chance to test the rig elsewhere.
With Handbook, soldering iron and a prayer,
the work began. Shortly the original owner wouldn't have known his baby. And some nine months later when unpacked at Quito — after having suffered a rigorous train-truck-ship-plane journey that smashed a heavy padlock on the case — and hooked to a 40-meter Zepp, the first CQ (as 1JC1CF) brought an instant reply and report of 479 from W2AYN. The second call raised W1BSS and a 579.

Only one bug developed. This was a v.h.f. parasitic that was cured with two traps. These traps can be left out during any original construction — if parasites show up, put in the traps and tune them until the little beastsies disappear.

The Circuit

Most of the features of the circuit will become apparent after a glance at Fig. 1. It will be noticed that a switch, S1, is shown for shorting out the Tri-tet-oscillator cathode coil when straight-through operation is desired. This switch is simply a bent corner on a rotor plate of C1. When the condenser is turned full “in,” the plates short. Grid current of the 815 is read by plugging in a low-range meter at J1 — J2 is for the key. The closed-circuit jack, J3, is for a relay that can be used to short the input of the receiver, for convenience in break-in operation, or the relay can be used to key a sidetone oscillator for monitoring purposes. The jack is a convenient device since, by plugging in a dummy plug, the cathode circuit is opened and only the crystal oscillator will operate. The resistance of the relay winding adds a little cathode bias to the 815 stage.

The meter switch, S2, allows either oscillator or final plate current to be read. S4 is the line switch for the entire transmitter, and S5 is the “stand-by” switch for removing all plate and screen voltages.

In the antenna circuit, provision was made for either series or parallel tuning of the antenna coil. The jumper is used across the top two terminals for parallel tuning — it is opened for series tuning. A small lamp is loosely coupled to the antenna coil to indicate resonance, and another lamp in series with the crystal serves as a crystal-current indicator.

The bias supply furnishes about -75 volts. With the key “up,” this voltage is applied to the oscillator and amplifier grids. With the key down, oscillator bias is developed across R1 and amplifier bias across R2 (and the cathode-circuit relay, if used). Resistor R4 prevents a heavy drain on the bias supply when the key is down. By adjusting R2, proper bias for the 815 can be obtained over a wide range of excitation conditions.

Construction

A complete detailed description of the parts arrangement within the SW-3 cabinet will be omitted, on the basis that one is not likely to try to duplicate the transmitter exactly. However, it might pay to point out a few of the dodges necessary to sandwich all of the parts into such a small space.

The 815 is mounted close to the tank coil, with the socket rotated to bring the two plate connections of the 815 into proper position. The 815 is surrounded on the coil and meter side by a shield made from a smaller tube shield that was modified with a pair of shears. A sturdy baffle shield is used between the grid coil, L3, and the 815. The antenna tuning condenser is mounted on the front panel above the chassis, and the 815 grid- and plate-tuning condensers are mounted below the chassis. The cathode-tuning condenser, C1, is mounted under the chassis and is adjusted from above with a screwdriver. The adjustable grid leak, R2, is mounted on the chassis and is operated by a knob. The meter switch, S2, and the stand-by switch, S5, are on the front panel.

A top view of the 100-watt transmitter shows that there isn't much spare room inside the cabinet. The 815, antenna coil and plate tank coil can be seen alongside the plate transformer. The grid coil, oscillator tube and bias rectifier tube are on the other side of the baffle shield.

A final touch — and one that is very convenient — is the complete wiring diagram drawn in ink on white paper and fastened inside the top cover.

Tuning & Adjustment

The transmitter tuning is conventional, of course, and only a few high spots will be men-
The tuning condensers (except antenna), resistors and fixed condensers are all mounted under the chassis. One round filter condenser can be identified in the lower left-hand corner; the other filter condenser is flat against the side wall, alongside the plate-tank tuning condenser. The oval-shaped gadget visible at one end of the bleeder resistor is a Bradleystat, well-known and identifiable as a variable resistor to old-timers but unknown to newcomers to the game. It is used as an adjustable grid leak in this transmitter.

 tioned. When working on 7 Mc., the cathode condenser, $C_1$, is shorted out by turning it full “in” and engaging $S_1$, mentioned previously. The oscillator alone can be checked by putting a dummy plug at $J_2$ and opening up the 815 cathode circuit. After checking the oscillator, by observing a plate-current dip with tuning, using a loop and small flashlight bulb coupled to $L_4$, or listening to the signal in a receiver, the 815 amplifier is tuned in the normal manner. The tube manufacturers recommend that tetrodes and pentodes never be operated unloaded for any length of time, and that procedure is followed at HClIES. A 75-watt lamp can be connected across the “series” antenna posts to furnish a dummy load for test purposes. If you must check the 815 with no load, don’t sit on the key for more than a few seconds at a time.

A low-range milliammeter plugged into $J_1$ will read grid current, and this should run around 3 or 4 ma. It is adjusted by the tuning of $C_4$, the setting of $R_3$ and the position of the grid taps on $L_4$. $R_2$ will normally be set around 10,000 or 12,000 ohms, but some variation from this value may result in slightly better efficiency. The operating grid bias should be minus 45 volts or so—you can work back from there.

Depending upon your antenna system, series or parallel tuning of the feedline can be used. A tap on the antenna coil allows some variation in the antenna inductance for best tuning. When operating in the 80-meter band a 150-µfd, mica condenser is bridged across $C_{12}$. The oscillator is run straight-through ($S_1$ closed) and an 80-meter crystal is required. For 14- and 28-Mc. operation, 7-Mc. crystals are used, with $S_1$ open and a 14- or 28-Mc. coil at $L_2$.

Operating voltages at the taps on $R_3$ are 105, 200 and 300, corresponding to resistances to ground of 19,000, 28,200 and 31,400 ohms. These voltages should be checked when the rig is running fully loaded, with 150 ma. to the 815 plates.

If you have been wondering about heat generation in the transmitter during operation, rest assured that the little rig is always run with the cover open. This is a “must” for anything of this nature if forced ventilation isn’t used.

If parasitics are present they will probably be of the v.h.f. type, and will manifest themselves during preliminary tests by double-dip resonances in the final, lack of pronounced dip, fuzziness of the signal as heard in the receiver, or by general erratic behavior in tuning. It is suggested that the trap in the screen lead be tried first. If this does not result in a complete cure, then the grid-lead trap should be added.

Performance

Properly built and adjusted, this rig is a top-flight job. Seventy-five countries were worked in less than three months. WAC can be made practically every night. Grand average of S reports is S6-7. An S9-plus is not infrequent. W11NF consistently reports us 86-7, and VKs, ZLs and many others regularly give us S8-9. They won’t believe we’re running only 100 watts. Most work has been done on 40 and 20. Eighty is strictly local at present, and 10 is rarely used due to an exceptionally bad line noise which peaks there. In the 14th DX “test,” one exchange was made in less than every three minutes of working time, and during one solid two-hour stretch an exchange was completed every 1.6 minutes—which certainly means a good, solid signal.

The antennas in use are carefully-pruned half-wave 7-Mc. Zepps. Recently another “screwball” 14-Mc. center-fed half-wave, formed into a square inside the shack, and fed in parallel with a full-wave on 14 Mc., has been used. Opposed to all hidebound theory, instead of canceling out (one antenna being practically folded back on itself), the two in parallel get signs into some corners of the world with a pattern we haven’t yet been able to dope out!

Special jungle QSLs are being planned for contacts made during “inside” QSOs, but there will be quite a bit of delay before their actual mailing. Have patience, fellows, and we hope eventually to BCNU.
The following Naval Reserve amateur calls have been assigned since the last list appearing on this page:

- KLNRQ Lawrence, Mass.
- K2NRK Huntington, L. I., N. Y.
- K4NAW Raleigh, N. C.
- K4NRW Chattanooga, Tenn.
- K5NAN Harlingen, Texas
- K5NAC Whidbey Island, Wash.
- K5NAW Del Rio, Texas
- K5NAP Big Spring, Texas
- K5NRB Austin, Tex.
- K6NAG Grass Valley, Calif.
- K6NAH Ojai, Calif.
- K6NRT San Diego, Calif.
- K6NEK Fort Bragg, Calif.
- K6NRK Chico, Calif.
- K6NRH Hollywood, Calif.
- K7NAB Corvallis, Ore.
- K7NAC Lincoln, N. B.
- K7NRX Boulder City, Nev.
- K7NRY Billings, Mont.
- K8NAG Grass Valley, Calif.
- K6NAB Aurora, Ind.
- K6NRZ Neenah, Wis.
- K6NRX Michigan City, Ind.
- K6NRZ Terre Haute, Ind.

Cmdr. D. S. Wicks, USN, W3JDK, who has been planning officer for the Naval Reserve Electronic Warfare Program since its inception in the spring of 1946, has been ordered to new duty as staff electronics officer for the commander-in-chief, Atlantic Fleet, Admiral W. H. P. Blandy. Cmdr. F. G. Blasdel, USN, W3AOW, has taken over the EW Program planning as W3JDK's relief.

Cmdr. G. E. Talbutt, USNR, W5AUL, has reported for duty as head of Reserve communications in the Fifth Naval District headquarters, Norfolk, Va. A member of the prowar Naval Communication Reserve, and on active duty continuously since 1941, Cmdr. Talbutt has been a licensed radio amateur since 1930.

George Bird, RM2c, USNR, W5HGC, in charge of EW Platoon 8-16, Pawhuska, Okla., once again earned a "well done" for engineering radio, telephone and lighting services for the 1948 International Roundup Cavalcade held in that town in July. Using Naval Reserve equipment and with the aid of several Reservists and amateurs, W5HGC did an effective job which brought favorable publicity to the Navy and the amateur radio fraternity.

As a matter of policy, radio stations and organizations of the Naval Reserve cooperate with amateurs, the Red Cross and municipal officials in providing communications and electric power in emergencies.

In Washington, the National Red Cross generously made space available in its headquarters for Naval Reserve Electronic Warfare drill quarters. This space has been equipped by the Navy with a fine radio station, including an Autotune 1-kw. 'phone/c.w. transmitter as one of the four fixed transmitters installed, plus some portable equipment. Diesel-electric emergency generators make this station self-sufficient in case of commercial power failure. A "10-20" rotary beam some 150 feet above the street level makes DX contacts easy.

The station is under the command of Cmdr. Lewis Sieck, USNR, W4KMG, who is in command of EW Officer Company W-2 in Washington, D. C. The amateur call of the station is K3NRW, and on Navy frequencies the call N0AAB is used.

Lieut. Frank Huston, USNR, who is deputy head of National Red Cross telecommunications, acts as liaison between the Red Cross and the Navy, assisted by Mr. Allen Richter, W3OGQ, who supervises Red Cross radio communications. This Reserve radio station is located in the same building as the National Red Cross teletype facilities, making possible close cooperation and joint operations in the event of disasters throughout the nation. Members of local amateur radio organizations are also cooperating in making this an effective emergency communications center. In addition to W4KMG, a partial list of the amateurs who will operate the station includes: W3s QL, ED, EIS, ECP, JDK, OGQ, OIV, FWX, ACW; W4s IA, KQM; W5CVL.

A corner of the station at the Naval Reserve Training Center, San Diego, showing the equipment devoted to amateur radio operation under the call K6NRT. Pictured inspecting the station are, L to R., W6RCB, W6BVY, W6YTF, W6ZTA, W6LRO and W6DBZ.

December 1948
Mobile in Miniature
A 10-Meter Transmitter Built into the PE-103
BY M. JOFFE,* W2BNY

MOBILE OPERATION has come to stay, and most hams who own cars have, at one time or another, had the desire to install a rig in the car. In many cases it has been impossible to find sufficient space for the equipment without sacrificing passenger comfort or baggage room. It is therefore proposed to show that an installation can be made in a very minimum of space while still maintaining a high order of efficiency.

When the writer's new car finally arrived, the first project was to install a 10-meter rig. To start the proceedings, arrangements were made to obtain a PE-103 dynamotor unit, so the whole rig takes up no more room than the power supply. The coax line to the antenna leaves through the connector above the jack. The cable at the right is for power connections to the transmitter.

The intended function of the ruined relays and breakers was to prevent damage to the dynamotor should the 6-volt winding be accidentally used with a 12-volt source, and to prevent burnout should it be overloaded for extended periods. However, with a bit of care and intelligence, protective relays and breakers are unnecessary. Contemplating the situation, we had a happy thought: since they were not usable, why not remove all of them with the exception of the 6-volt starting relay, thus leaving a large empty space in the dynamotor mounting case? Measurements indicated that by using miniature tubes a rig could be built to fit into the space left vacant, so the whole transmitter would take up no more room than the PE-103.

One of the photographs shows the bottom of the mounting plate after removal of the unessentials. To drop the 450-volt output of the dynamotor to 250 volts for the speech and driver stages, two resistors were installed in the space formerly occupied by the 12-volt starting relay. A 16-µfd. electrolytic is used across the 250-volt tap for further filtering. According to the circuit of the PE-103, the filter consists of only a 2-µfd. oil paper capacitor, and since this capacitor was also removed, a pair of 16-µfd. electrolytics in series was fitted into the end bell of the high-voltage side of the dynamotor (see Fig. 2). In order to equalize the voltage each of the electrolytics was shunted by a half-megohm resistor. A surplus Jones barrier strip was used because we were unable to obtain the mate to the power take-off plug on the base of the dynamotor. In addition, a 3-contact microphone jack was installed so that the transmitter could be operated by unplugging the remote-control cord and sub-

Underneath the chassis of the transmitter. Although there is little space to spare, there is no crowding. Slugtuned coils in the exciter stages save space and are sufficiently broad-band to operate over a reasonable frequency range without retuning.

* 2306 Ocean Ave., Brooklyn 29, N. Y.

QST for
The Transmitter Circuit

The transmitter was planned to be as straightforward as possible, no trick circuits with fussy adjustments being considered. This boiled the design down to a triode oscillator followed by two triode doublers in cascade, and a beam-power output stage operating as a straight-through amplifier. Because they are relatively cheap and draw only 150 ma. for filament current, 6C4 tubes were used in the triode positions. The output tube is an instant heater 2E24. The top view of the transmitter shows the general layout, and the circuit is given in Fig. 1. In line from the front-panel center to the rear of the chassis are the crystal-oscillator tube, the first doubler and the second doubler. The final amplifier, located at the right, was taken out of its socket to show the antenna-matching network capacitors and inductance. Because of the restricted height of the case, the under part of the chassis had to be limited to a depth of 1 1/2 inches. Even so, all the parts are accessible without having to unsolder "layers," as may be seen in the bottom view.

The plate inductances of the oscillator and multiplier stages are slug-tuned, and are broad enough so that no retuning is required when substituting the microphone plug. A 'phone-tip jack was used to supply the heater and control voltage.

Fig. 1 — The 28-Mc. mobile transmitter circuit.

C1, C5, C6, C9 — 0.006-µfd. mica.
C2, C3, C4 — 50-µfd. mica.
C7 — 35-µfd. variable.
C8 — 140-µfd. variable.
C10 — 25-µfd. electrolytic.
C11 — 0.1-µfd. paper.
R1 — 75,000 ohms, 1/2 watt.
R2, R3, R4 — 27,000 ohms, 1/2 watt.
R5 — 40,000 ohms, 10 watts.
R6 — 0.27 megohm, 1 watt.
R7 — 0.56 megohm, 1/2 watt.
R8 — 200 ohms, 20 watts.
R9 — 25,000 ohms, 10 watts.

L1 — Slug-tuned, 1/4-inch diameter, 62 t. No. 36 enam., close-wound.
L2 — Slug-tuned, 1/4-inch diameter, 15 t. No. 33 enam., close-wound.
L3 — Slug-tuned, 1/4-inch diameter, 9 turns No. 28 enamelled, close-wound.
L4 — 15 turns, 1/2-inch diameter, 8 turns per inch (B & W 3006).
RFC1 — 2.5-mh. r.f. choke (Millen 34102).
T1 — Carbon-microphone-to-grid transformer (UTC "Ouncey").

Bottom view of the PE-103 cover plate after removing unused parts and installing dropping resistors and by-pass condenser.
changing crystals. The forms we used are one-half inch in diameter and an inch long; most surplus dealers have slug-tuned coils that can be modified to suit. Should it be impossible to obtain slug-tuned coils, regular coils may be used and tuned by means of the new ultramidget air capacitors. If relatively small wire is used to wind the coils and the tuning capacitance is kept small, the Q will generally be low enough so that the circuits will not require retuning when covering a small frequency range. Using the thin wire specified to wind the coils, the tuning is relatively broad with no apparent loss of over-all efficiency. It is possible to cover from 28.5 to 29 Mc. without the necessity of retuning the exciter stages. Should it be impossible to obtain powdered-iron slugs, brass or copper may be used, keeping in mind that iron increases the inductance as it enters the winding and brass or copper decreases the inductance. The total current drain of the exciter stages, speech amplifier and modulator, with the final amplifier loaded to 70 ma. drain on the high-voltage tap, is of the order of approximately 200 ma. With a 25-watt lamp serving as a dummy load, it is possible to light it up to full brilliancy while whistling into the mike. The final amplifier is parallel-fed and tuned by means of a pi network. It will load into almost any kind of antenna.

Modulator and Speech Amplifier

The modulator uses a pair of 6AQ5 tubes (shown, without shields) and another 6C4 triode in the speech amplifier. To eliminate the need for a relatively large modulation transformer and a push-pull input transformer, the modulator tubes were wired in parallel instead of push-pull. The stage of speech amplification insures sufficient drive for the modulators in case a low-output microphone is used. Parallel modulators can be coupled to the r.f. amplifier either through a conventional modulation transformer or by the Heising system. The latter was chosen because a center-tapped choke could be employed as the modulation choke. To save space, the "choke" used is the primary of a push-pull-output-to-voice-coil transformer. It is quite small physically and the primary can carry the plate current. The current through one side is adjusted by varying the antenna loading until it equals the current through the other side. This prevents core saturation and results in a fairly high value of inductance, allowing a greater audio voltage to be built up than would be the case if the center-tap had been left open and the winding used in the normal modulation-choke manner.

It will be noted that the plates of the 6AQ5 modulators are operated at 450 volts. This does

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no harm if the bias and screen voltages are set so that the tubes are operated within their plate-dissipation ratings.

To do away with a clumsy high-capacity cathode by-pass capacitor in the speech amplifier, grid bias is obtained from the 6-volt battery. If the positive side of the battery is grounded, wire the grid return to the hot side of the heater circuit as shown in Fig. 2. However, should the negative side be grounded, wire the cathode to the hot side of the heaters and ground the grid return to chassis. In the latter case, the heater is placed 6 volts positive with respect to the grid.

Power Circuits and Antenna

The wiring of the dynamotor and control circuit, Fig. 2, is so arranged that it is not possible to start the dynamotor without first closing the heater switch. If the car battery has its positive side grounded, wire the circuit as is, but if the negative is grounded, use the dotted circuit.

The total drain on the 6-volt battery while transmitting is of the order of 22 or 23 amperes, and in the stand-by position the transmitter draws only 1.5 amperes.

The antenna used by the writer is a three-section whip, each section being 39 inches long. These antennas may be obtained for a very reasonable figure in the surplus market. The sections screw together, which is a most desirable feature, especially when garaging the car; most door frames are too short to accept the additional 9 feet in height. A spring-type mount is bolted to the rear splash apron at a point that has double thickness. The antenna is coupled to the transmitter by means of a quarter-wave section of RG-8/U cable, which measures 5 feet 6½ inches at 29 Mc. The exact length was determined by means of a grid-dip meter and checked with a Q-meter.

Results

In the short time the rig has been in use, dozens of enjoyable contacts have been made with locals and skip stations. No super DX has as yet been talked off a congested highway onto a side road while traveling in New Jersey. On my way home from work, the XYL tunes the home receiver to the frequency and knows exactly when to set the food on the table, so little time is lost in the process of feeding! Besides, it saves her from worrying when heavy traffic makes the going slow.

Strays

Famous last words:

"Gulp . . . don't carry dial-light bulbs and Chiclets in the same coat pocket." — KL7GV

December 1948
A new kind of “fist” is coming into being—a heavy, firm style that will make each dot carry across separately—the transocean fist.—February, 1924, QST

EAST, WEST AND NORTH, ocean barriers were toppled decisively in the closing weeks of 1923 as amateur radio, suddenly grown to international stature, achieved two-way communication across the Atlantic, the Pacific, and the vast expanses of the Far North. The procession of history-making feats of this period is enthusiastically chronicled in the pages of early QSTs.

To start, mid-November saw a 200-meter DX record of 4600 miles established when ARRL operator Donald Mix, 1TS, frozen in with the MacMillan Arctic Expedition 700 miles from the North Pole, worked into sunny Hawaii and 6CEU, the station of R. Smith. This accomplishment wasn’t to stand for long, however. Within eleven days, on the 26th, Charles York, 7HG, of Tacoma, Wash., successfully contacted JUPU who gave his location as Tokio, Japan, a new record of 4650 miles.

Meanwhile, throughout the breadth of North America, United States and Canadian amateurs went ahead with routine preparations for what was to be the final onslaught on the path to the Continent...the Fourth Transatlantics. Spirits were bolstered by the one-way achievements of the previous two years’ tests; certainly the winter of 1923–24 would see two-way work accomplished.

Hopes on this side were especially pivoted on the determined activity of Leon Deloy, French 8AB, who earlier in the year had visited the United States to confer with amateurs and League officials, complete arrangements, and procure American equipment, the latter including a Grebe CR-13 receiver and specifications for a Hartley transmitter using series antenna tuning condensers à la Reinartz. With installation completed, Delay cabled ARRL Traffic Manager Schuem, 1MO, that he would commence 100-meter transmissions to America on November 25th. French 8AB was heard from the start, both at 1MO, where QST’s editor K. B. Warner was acting as second op, and at 1XAM, the station of John L. Reinartz.

Success seemed imminent as schedules were made for a two-way attempt on the night of the 27th. This date will long remain inscribed in the annals of amateur radio history. Promptly at the appointed hour the signals of 8AB broke through, calling America for one hour. And then, in response, both 1MO and 1XAM called, hopefully. Deloy heard both stations, worked both stations. The Atlantic path had fallen.

In the flush of these first contacts, Deloy transmitted a message of greeting to ARRL’s Don Mix, aboard the MacMillan Expedition’s Bowdoin. It was copied solid by 1XAM, who phoned it across town to 1HX, operated by Boyd Phelps and S. Kruse of the ARRL staff. 1HX relayed to Major Lawrence Mott, 6XAD, Catalina Island, Calif. Promptly, the message was sent on to Jack Barney, Canadian 9BP, at Prince Rupert, B.C., who delivered to Mix at WNP—“Radio Wireless North Pole.” Later on the night of the 27th, 1HX, 6XAD and WNP combined forces to make possible a 12,300-mile round trip relay in the astounding time of five minutes and six seconds.

Two-way work with French 8AB continued for many nights thereafter; then, on December 8th, the first Anglo-American two-way work was recorded. 1MO, K. B. Warner operating, and British 2KF, the station of J. A. Partridge, London, were parties to this “first”; on one occasion (Continued on page 116)

Left: Mix in the radio shack of the Bowdoin, WNP; center: Schnell and Deloy discuss Transatlantic plans; right: Reinartz works on his Hartley transmitter, featuring “series antenna condensers.”
ARRL Week and Member Contest-Party

ARRL Week, January 16th–23rd, Includes V.H.F. SS and GPR—Citations for Outstanding Work—Call-Pin Awards for Each Section Winner in 7th Annual Party

BY F. E. HANDY, * W1BDI

The seven-day period starting January 16th has been designated as ARRL Week. A special message1 from League President Bailey to ARRL members will be sent from W1AW and all OBS appointees daily during this week. The week follows closely the V.H.F. SS of January 15th–16th, to be announced fully in January QST. A feature performance Wednesday and Thursday, January 19th–20th, will be the Governors-President Relay with messages handled all the way by amateur radio from each state capitol to the newly-elected President of the United States on the eve of his inauguration. During January there also is a Code Proficiency Run scheduled from W1AW, W8CO and W0OWP (10 P.M. EST, Thursday, January 13th) so that CP credit for the Member Party can be secured in January if not previously applied for. The entire League field organization will climax the observance of ARLL Week on January 22nd and 23rd by taking part in a Member Operating Party, following a simple scoring plan, and with call-pin awards.

ARRL Week is not connected with Party scoring at the week-end but stresses the opportunity for each ARRL member to do one thing a day toward some betterment of himself as an amateur or toward the betterment of our ARRL. Our League organization "of, by and for the amateur" is as strong as the sum of knowledge, station performance and individual loyalties. ARRL's status depends not only on our practical operating and experimentation, but on what we make of our organization by personal support of its Emergency Corps, section networks, contact with directors, and through participation in every phase of League activities and plans. This is the week to get started in these things!

Organizational ideas for your ARRL Week observance follow. Can you manage to select or add proper items and accomplish one per day for seven days? Interest one young person in amateur radio; help him to follow through. Catch up on QSLs. If you work 'phone, try a little c.w.; if c.w., try a little voice work. Join the Emergency Corps, as supporting or full member; provide for emergency equipment (a) in your station, (b) in car, or (c) build a transportable unit, as complete as possible. Report into your section traffic net, c.w. or 'phone. Go after some up-until-now neglected awards or aims in amateur radio. Pay radio club dues; renew or extend ARRL membership. Make three new members of RCC, or earn it yourself, if not a member, by seeking a radio rag-chew with a member. Ask your SCM about an appointment along lines for which you are interested and qualified. Copy the Code Proficiency Run (January 13th) and submit it for ARRL certification. Originate ten messages to old ham friends through your station. Can you do one-per-day?

ARRL Week Citations

There's no scoring for the activities during the Week, but there will be a special letter of recognition from President Bailey for what he deems the most constructive report of projects initiated or implemented in the direction of "better or fuller ARRL organization" during this week! While the week-end operating test (Member Party) is limited to the field organization (see page 6), we have ARRL members all over the world who may well become mutually acquainted by International QSO during ARRL Week. In recognition of this, the ARRL president will certify by special letters to each pair of member-operators their claims confirmed by QSL-to-ARRL covering two-way work, constituting legitimate amateur communication over the greatest distances that can be accomplished between any two points in the world during ARRL Week, on each of the following amateur frequency bands: 3.5–4, 7–7.3, 14–14.4, 28–29.7, 50–54 and 144–148 Mc. What will be the greatest DX to be reported between any two members of ARRL ('phone-'phone, c.w.-c.w., or c.w.-voice but not cross-band work) in any of these six bands, during the week January 16th–23rd? Status as full member in U.S.A.-Canada or associate ARRL membership in other lands is required and the contact will have to be good enough to ascertain status and exchange signal reports.

*Communications Manager, ARRL.

1 W1AW will send the message from President Bailey ahead of any other official bulletins on 3555, 7125, 14,100, 28,000 and 50,000 kc., and 146 Mc. (c.w. simultaneously), at 8:00 P.M. and 1340 midnight EST, starting Sun., Jan. 16th, continuing through Sat., Jan. 22nd; also Sun., Jan. 23rd at 8:00 P.M. Information will be repeated on voice on 3950, 14,280 and 29,000 kc., at 9 and 11:30 P.M. EST. Over 500 OBS appointees throughout the country will also send the same message, as many times as feasible, on different bands and frequencies, throughout the week.

(Continued on page 118)
V.H.F. SWEEPSTAKES — JANUARY 15th & 16th

Last year's V.H.F. SS Contest, the first of its kind, broke all records for a v.h.f. affair, establishing it as a major ARRL operating activity. But it could have been ten times as big, and that's the goal for the Second Annual V.H.F. Sweepstakes, to be held January 15th and 16th. Plan now to take part — and get everyone you know who has v.h.f. gear to do likewise. Circle that weekend on your 1949 calendar, now! Rules in January QST.
W3RUE, of Robbinsdale and St. Paul, Minn., late in the evening of Oct. 1st. W3RUE, Pittsburgh, worked W9AB, W9PK, W8MYG, W2MEU, W3OJU, W3AMJ and W1LLL on the 17th. Several unidentified 'phone signals were heard on 144 Mc., but they were unreadable because of the pronounced aurora flutter. Let’s watch for the aurora effect, 2-meter gang — and get on c.w. and find out what we can do! W8NQD, Ashland, Ohio, says that some of the 50-Mc. aurora sigs were readable on voice on the 14th and 17th, but most of his contacts were made on c.w. W2AMJ, Bergenfield, N. J., confirms this partial readability of voice signals during these aurora sessions. Frank worked W30JU, W8NQD and VE3ANY on the 14th, all on voice. On the 15th he got WZ2SM and VE3AET, and heard several others. The 17th netted VE1QY, W1OKB, Essex Center, Vt., W9PK and W3RUE, and several VE3s and W8s were heard.

Late October provided some excellent 2-meter weather, too. The nights of the 25th and 26th were almost equal to the best that last year had to offer. W3RUE, Pittsburgh, Pa., worked W9s CQH, Lakeville, JMS, Cory, ZJO, South Bend, ASM, Indianapolis, and H0KQ, Demont, Ind.; ZHB, Zearing, BJH, Union, and TKL, Waukegan, Ill.; PZS, Milwaukee, and WWh, Racine, Wis.; W4FBJ, Shepperdville, Ky.; W8s RLJ, Three Rivers, Mich.; AKW, Cincinnati, and CYE, Miamisburg, Ohio. The Illinois and Wisconsin contacts represent hops of close to 500 miles. W4FBJ’s list for the 25th includes W9s JMS, FVJ, TKL, JVC; W8s AKW, CYE, WJC, WXV, UKE and RLJ; and W3s RUE, CTN and PGV, all in the Pittsburgh area. On the 26th W3GV, Erie, Pa., and W4FBJ worked, another hop well beyond 400 miles.

V.H.F. News Around the World

Philadelphia — 144-Mc. signals across the Atlantic? This question is bothering W3EKK, since he received what would appear to be a heard report from PA0JQ on his 144-Mc. signals. No explanation or reception details, other than the time and signal report, are included, but an investigation is being made in the hope of finding whether or not the report is authentic.

The Hague, Netherlands — With a view to establishing standards upon which all could agree, for the furtherance of v.h.f. progress in their own and neighboring European countries, the first Netherlands V.H.F. Conference was held in The Hague last summer. This was an opportune time for such an affair in view of the impending release of the 144- and 420-Mc. bands in several countries on the Continent. The following points were agreed upon:

The 5-meter band should be used as much as possible, as long as it remains open to amateur use, since it represents a good field for the newcomer. Crossband work between 5 and 2 meters should be encouraged, to promote interest in both bands. A fixed channel in the 80-meter band (3625 kc.) should be used for interchange of v.h.f. information.

On the technical side, it was proposed that no modulated-oscillator type transmitters or radiating receivers be used. Vertical polarization was suggested as an interim standard, with vertical polarization used experimentally, where interest warrants.

V.h.f. operators were urged to use all portions of the bands, rather than piling up at the edges. The use of c.w. for all calling and signing was urged. The signing of calls and locations frequently during test transmissions was recommended. Short QSOs during unusual propagation conditions were suggested, in order that all may have an equal opportunity for DX contacts.

All the above sounds like mighty progressive v.h.f. thinking. Results are already showing, in

A new low in antenna complexity is this 420-Mc. ground-plane suggested by W7KWO. It consists of a Type 83-1R coaxial fitting and five 6½-inch pieces of stiff wire. The form of some fine work on 144 Mc. in England and on the Continent.

Clacton, Essex, England — The prospect of two-way work on 2 meters across the English Channel and the North Sea to France, Belgium, and The Netherlands, spurred many Gs to action when the 2-meter band was officially opened on September 1st. The first QSOs with PA0 and ON are both believed to have been made by G6DH, the first, with PA0PN, having been made on Sept. 14th. This was the first QSO G6DH had on 145 Mc., his debut on the band having been delayed by the discovery, at the last moment, that his one 829 was more like a mercury-vapor rectifier than an amplifier when the high voltage was applied! The distance on this contact was about 110 miles. The first ON QSO was made with ON4FG on Sept. 26th, 155 miles. ON4FG has a 12-element horizontal array and is putting a
signal across to G6DH quite consistently on a daily sked which has been running for more than a month. FSZF is reported to be about ready to fire up, so the first G-F 2-meter QSO will very likely have been made before this appears in print.

The working range on 145 Mc. has been good right from the start in England, the Gs having gotten off on the right foot, with superb hetero receivers and crystal-controlled transmitters. G5BY has worked seven stations more than 200 miles distant, including G6DH, 240 miles, and G6OS, 287 miles. The receiver used at G5BY is the converter which was used in the first 50-Mc. transatlantic work in 1946, now much revised. It has two 954 r.f. stages, a 954 mixer, and a 955-6C4 oscillator-doubler for injection. Hilton is also set to go on 432.5 Mc. with crystal control. Another crystal job on 420 is ready to go at G6LK. Both use 832 tripplers in the manner described by W6OVK in June, 1948, QST.

Chatham Center, N. H. — V.h.f. society note: On Oct. 12th Eunice Randall and Kenneth Thompson were married in a little white church, the officiating minister being the Rev. Hollis M. French. But why in QST, say you? Well, the principals are perhaps better known as W1MPP, WIPS and W1JLK. The wedding guest list included calls well known in New England v.h.f. circles. The bride, in addition to being a leader in the activities of the Eastern Massachusetts Amateur Radio Association, is famous for having been probably the first woman to be heard over the air. She was a feature performer at WGI, Medford Hillside, Mass., one of the country's first broadcast stations.

Deerfield, N. H. — A job in an f.m. station has its good points, according to W1BWR, who is now operating nightly on 144 Mc. from an f.m. site atop Saddleback Mountain, an elevation of some 1200 feet. He is active from 9 P.M. on nightly.

Knoxville, Tenn. — After hearing about the work of W2TDW/4 from Clingman's Dome (July QST), W4QFI, W4PBU and W4ZZ decided to have a try. Though they were unable to reach the summit of the Dome (it's a half-mile climb from the end of the road) they set up at Collins Gap, the highest accessible spot, about two miles east of the Dome. Only one QSO, with W4LQE at Oak Ridge, a distance of 55 miles, was made, but the boys would like to try again. W4ZZ has had extensive hiking experience in the Smokies and Blue Ridge Mountains. He and W4LQE would be glad to go along on any future expeditions which may be in prospect for this area. W4ZZ may be addressed at 405 E. Hill Ave., Knoxville, Tenn.

Toronto, Ontario — Interest in 144 Mc. is at an all-time high in this area, according to VESAIB, and the volume of reports received in connection with the September V.H.F. Party bears him out.

Since February of this year, Les has worked 120 different stations on 144 Mc., 52 of them being VE3s. Several stations in the Toronto area are using flip-over arrays, but practically all contacts are made with horizontal polarization. The Toronto Emergency Net meets each Thursday at 7 P.M. Net frequency is 146.8 Mc.

(Continued on page 120)
How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:
Do you have trouble locating the 20-meter c.w. band lately? Maybe your receiver is more reliably calibrated than ours but we've been hearing almost as many steady carriers below 14,200 kc. as we do above.

It's this testing business.
Superfluous transmissions are bad enough on any amateur frequency but the activity can be particularly devastating on the DX bands. True, certain antenna and rig adjustments call for necessary on-the-air tuning and a small scattering of such occasional QRM must be anticipated. But a good deal of this "VVV ABC NST; Hello, one-two-three-four" hash going on is evidently attributable to plain carelessness plus lack of consideration for others.

Who, possessing all his marbles, would consider it proper to adjust his bug by diddling with it for several seconds (or minutes) while putting a few hundred watts or so into the antenna during the process? There do appear to be such characters. A goodly chunk of this absolutely unnecessary interference stems from people hunting parasitics, messing with keying characteristics, gazing at the hue of final tube plates, etc., all of which operations could and should be done while employing a dummy antenna.

Chronic testers also include those who habitually attempt to squeeze a last mil or two load on the final before calling on a slightly-changed frequency, unmindful of the proven fact that one has to cut an input almost in half before a difference in strength is noticeable. And, believe it or not, there are still amateurs who have no provision for cutting off the final when QSYing their VFO! It should be borne in mind by all of us that rarely can we press our keys, antenna loading, without causing grief for some one.

If all the lead pencils used to pull meaningless sparks off feeders were laid end-to-end, it would be difficult to walk across the street. So, Jeeves, you'll just have to find another way to intrigue our visitors. Now, the mail. . . .

What:
To open the eighty festivities out west, W6CIS reports working ZS2G. This contact completes Ken's postwar 3.5-Mc. WAC and he's wondering if any other sixes have made the grade. . . . W2AIS, who has worked his share of 80 DX, has gone to ZC6 to see what it's like to be the juice for a change. W2ESO says that Pat will concentrate on this band, call not yet known. . . . The Europeans are running rampant on 80 at this writing. Forty is again as good as it was last season, with lots of prefixes jamming the low end. W1YG picked off XP1A (7050), near Palestine, in an airborne deal. . . . W9KFO burned up the band for PY2AFF (7045), FA9IO (7020), CN5MZ (7040), LA7Y (7005), ON4QF (7050), GW5TW (7045), IWE (7040), F8ZW (7050), many Gs, KL7s and Zs. . . . The 6L6 at W5ONL surrounded KL7HI (7080), CM2GV (7015) and VK3OH (7025). An S28B coughed up KH6SZ (7150) and KL7HI (7060) for W3CJS.

We see by the mail that a few fellows are still trying twenty. W3NCF asked VR2BD (14,070), HP1BR (14,035), UBSKBA (14,060), CX4CZ (14,075), CX6AD (14,100), VP9CC (14,095), EA7CP (14,090), HK1GE (14,050), OH2NB (14,125), VP2GF (14,010) and PJ6X (14,050) for QSLs. . . . The situation at G6RH resembles M1B (14,289), HL1AB (14,315), VR2AP (14,120), KN6AF (14,080), ZK2AA (14,128), CZZAC (14,120), UB5KAG and a host of others. . . . Rambling with his new rhombic, WSKPL climbed onto MD2BU (14,100), ZK1AS (14,035), KM6AJ (14,035), ZB1AV (14,090), VQ2GW (14,050), MI3AB (14,005) and then went down to 28 Mc. . . . W9ELA set the

*DX Editor, QST. Please mail reports of DX activity to W9BRD's home QTH: 1517 Fargo Ave., Chicago 26, Ill.
alarm clock and rose early for AP4A (14,120), XZ2JB (14,092), C7LT (14,081), UA0PA (14,023), UA9HA (14,050), UL7BS (14,050), VS1CR (14,021), VS6AE (14,040), JA3NZ (14,062), J7ABN (14,114), CR9AN (14,110) and HL1BA (14,043) ....... Betwixt a few hurricanes, W4IYT dallied with TF3EA (14,041), EPIJ (14,045-100), HL1AE (14,125), W2WMV/C9 (14,028), OE5FS (14,050), W4DGW/KJ6 (14,265) and ISlAHK (14,070) ........ WITTJOX's gallon drizzled upon items like VU2GB (14,110), VK9WL (14,040), W6ZNT/KW6 (14,030), ZD9AA (14,060 t6) and HPILP (14,060) ........ An SJK beam captured HPlLL (14,315£), HBlED (14,297f), HH3DL (14,198f), VP3TW (14,395f), VP3MCB (14,160f), VP9S, UG6AB (14,075), UA6IA (14,077), et al, for W4GDQ. ........ Another microphone manipulator, W2MPA, bespeaks of HLlBK (14,170), HLlAA (14,155), ZElJX (14,170), CICH (14,320), C3EA (14,310) on Formosa, C7AC (14,150), KA6FA (14,070), Wr/JMCF/Cl (14,090) and CP1AQ (14,010) ........ Unable to get a rise out of TTIKY (14,048 t7), W4BPD cried on the collective shoulders of EP2B (14,045 t7), VP8AM (14,089), YU7AX (14,010 t8), HC7KD (14,080 t7), UJ8AF (14,014 t8), AP2F (14,050), AP4A (14,-115), ST2JB (14,030 t7), MP4BAB (14,110 t7), SUIKK (14,005), VU4AC (14,045), KAIUSA (14,080), VS6BD (14,025), HDPP (14,133 t8) and a rare Australian, VK8GW (14,080). That could be VK9GW if Gus's finger slipped on the mill. Notes unspecified indicate T9 or T9x quality. ........ Kittenish W9IU commences his letter "Dear Herb .... . . . [Now, I wonder whom he could mean? — Jeeves]. Anyway, Les deserves a hand for snagging birds like W3MPM/C7, VS6BC, ZC0UX, UN1AB, UC2LA, J6LPF, CR7HZ, H6EC and FK8AB. . . . . WJNC mentions JA9AC (14,050), VS1CV (14,110 t7) and KAIUSA (14,080), while W4IYT concentrated on HZ1AW (14,080), ZP3AW (14,080), KM6AJ (14,080) and some aforementioned Asians. Patiently awaiting his DXCC sheepskin, W4IUN twiddled his thumbs like this: c.w.: CT3AA (14,215), HA4EH (14,012), HA6Q (14,070), GC3EBU (14,017), VP8AI (14,075), VP5AK (14,070), PZ1WX (14,205) and UQ2AE (14,008);

... "Dear Herb .... . . . [Now, I wonder whom he could mean? — Jeeves]. Anyway, Les deserves a hand for snagging birds like W3MPM/C7, VS6BC, ZC0UX, UN1AB, UC2LA, J6LPF, CR7HZ, H6EC and FK8AB. . . . . WJNC mentions JA9AC (14,050), VS1CV (14,110 t7) and KAIUSA (14,080), while W4IYT concentrated on HZ1AW (14,080), ZP3AW (14,080), KM6AJ (14,080) and some aforementioned Asians. Patiently awaiting his DXCC sheepskin, W4IUN twiddled his thumbs like this: c.w.: CT3AA (14,215), HA4EH (14,012), HA6Q (14,070), GC3EBU (14,017), VP8AI (14,075), VP5AK (14,070), PZ1WX (14,205) and UQ2AE (14,008);

View the neat affair employed by Evans Dawson, VU2FS. A pioneer in Indian amateur radio since first licensed in 1923 as 2BV, VU2FS is currently to be found on 7, 14 and 28 Mc., A3. Power input ranges up to 50 watts with a pair of 807s in the final. [Photo courtesy E. Sirota] 'phone: C3EA (14,235), HL1BG (14,165), HZ1AB (14,370), IIAE (14,200) in Trieste, KP6AA (14,255), VP4TX (14,314), VP9DD (14,317), W6RE5/KG6 (14,255) and ZC6UN (14,378). Jim hankered after VR2AP (14,340f) and VR3A (14,370f) but no dice.

Ten is back on its feet again, should anyone need to be told. W6HG now has 66 countries with 48 watts by addition of I1GKF, OK1VA, MB9AD, OE5CU and VS6AM via A3. ........ Nifties at G6RH included FF8FP (28,280f), W6YOT/C6 (28,505f), AP2F (28,515f), VS6AE (28,370f), W71LE/KX6 (28,500f) and CR9AG (28,300f) ........ VP8AD (28,040) popped up for W70OUX, and W8KPL telegraphed with F08AA, FS9AB, W2WMV/C9, SP8XK (1), plus ZD4AB . . . . . . Log samples from W9ZUP feature VQ4CUR, VQ2DH, OQ5BQ, VP2GJ, VP3TR, CT1QY, ISAEX, HC1KU, J3AZA and D1AQV. ........ W4INO comes up with

Belfast's G16TK, operated by Frank Robb, has long been a standout on any band when Europe is coming through. Equipment shown here is capable of operation on all bands, 3.5 through 60 Mc. An 808 is generally used; receivers include an HRO, AR88 and CR100.
CT1PJ, CTIAS, VP3DCA, ST2MP, ZB1S, FARBG, CE3HN, ZS9G, ZD4AI, MD3MB, CN3EQ, VQ4ASC and VQ2DH, all via the voice route.

Where:

Box 1312, Barcelona, Spain, has been getting lots of business of late. We suggest you try the address for your doubtful EAs. Here we go with some new ones:

CM7MC
Manuel Coreta, Central Jaronu, Camagüey, Cuba

D4AON
Lt. R. N. Harding, AO 704838, W6QKS/D4, 7350th Air Base Gp., APO 742-A, Percent, New York City

EA3s
DY, MA and TA all to Box 1312, Barcelona, Spain

HASZ
Lt. P. Bomsch, Budapest XII, Nemtvogy-dut 12, Hungary

HPLPM
Sami Sermasi, Aeropi, Elmas, Sardinia, Italy

Ex-J9AA1

J9ACN
Apo 239-1, Percent, San Francisco, Calif.

KJ6AB
Apo 105, Percent, San Francisco, Calif.

OE7FR
(via RSGB)

OH2OP
Box 308, Helsinki, Finland

PJ3KO
(via ARRL)

PJ5PEE
(via ARRL)

PY7DN
Alain Moreira, Rua Quarante 614, Recife, Pernambuco, Brazil

PY8GL
P.O. Box 351, Manaus Amazonas, Brazil

ST20H
International Aeradio Ltd., Juba, Sudan

SU1KK
(via Egyptian bureau)

V508H
RCAF, Sawmill Bay, N.W.T., Canada

V92GJ
(via W4ITX or ARRL)

V98AR
J. W. Knox, Deception Islands, Percent, Port Stanley, Falkland Islands

VQ4CUR
P.O. Box 110, Mackinnon Road, Kenya

VQ4MRS
Ivan Morris, % East African Airways, Box 1010, Nairobi, Kenya

W6DLX/KW6
(to home QTH)

W6GTW/KL7
APO 944, Percent, Seattle, Wash.

W6NYT/KW6
% CAA, Wake Island

W9NCF/C1
Capt. H. J. Olson, 0164714, Box 10, Navy 3930, % KPO, San Francisco, Calif.

ZC6UN
% K2UN, United Nations, Lake Success, N. Y.

ZE2JN
3388 Queens Park, Bulawayo, Southern Rhodesia

ZL1MP
David Mitchell, % Bank of New Zealand, Auckland, New Zealand

For the above summary we appreciate the efforts of W1s LLL, MRP, QMI, VG; W2s CJX, HAZ, MPA, UTH; W3s AFW, ITW, OFI; W4IUIO; W6CNY; W4HIS, W6KX; W9UX; W9U0X.

Tidbits:
The Far East Amateur Radio League's PEARL News provides us with some very interesting reading. The boys are very well organized with a district communications manager for each J call area. Top DX totals there include J2AIN with 140 worked, J2CDJ 94, J3GNNX S1, J2HYS 80. Anyone curious as to what became of GW6AA/G2H can find him hiding behind the gear at ZL1MP. Dave is gunning for old friends on 14- and 25-Mc, c.w. . . . . . . Add legit Curacao stations: PJ5PEE and PJ5KO. The latter is currently quite active with 100 watts on 20. . . . . . Perusing a postal from Palestine, we hear from ZC6AA that only ZC6s AO, LA, LB and XY remain on the air at this writing. He is hopeful that full activity will recommence in the near future. . . . . . . HL1BA changed bands on the 20th of June and T/Sgt Frank Soltis, present operator, suggests those seeking QSLs for contacts prior to this date try the first licensee. Rudy Sermasi, Aeropi, Elmas, Sardinia, Italy

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unknown on Wake. "JB" hopes that FM8AD will make a New Year's resolution and purchase some QSLs. Amen. . . . VK3AWN is trying two 3-element beams in phase, end-to-end, and is amazing himself on 14-Mc. A3 -- ten quick new countries in a few days. . . . W6OMC, W1FII and others hasten to give us the latest VP8 scoop. Seems the bands are getting downright congested in that area. VP8s AM and AO inhabit Antarctica, VP8AL is in the Falklands, VP8AK on South Shetland Isles and VP8AP operates from the South Orkney group. VP8AM will QSP cards to VP8s AO and AP. . . .

HC2KJ, operated by Ernesto Feist of Guayaquil, is one of the more active Ecuador stations on 14 Mc. The neatly-constructed transmitter ends with an 812 final at 100 watts input. A new two-element rotary beam has been giving an excellent account of itself.

Tapping the W6 grapevine, we hear that G6ZO and LU6AJ are each now engaged (no, Jeeves, not to each other), somewhat curbing their DX activities. ZS6OL wants cards only via RSGB and RV2 is moving to Tahiti with 900 new cards on hand. The latter will clean up the QSL backlog 100 per cent in due time. EA8EDZ was honey-mooning in Spain but should be back in Rio de Oro by now. XE1AC is trying to get some EA6 boys to QSY from 40 to 20 'phone but perhaps they don't go for Yankee slang. ZD7AA is generally regarded as unsavory but cards from VR4AA are now leaking through. KB6AD left Canton for the U.S. and ZC1CL is toying with the idea of taking a little rig along on a DX field day to Kuwait; if he does, the line forms on the right! . . . . G8FA can't figure out why he receives SWL cards on c.w. from all over the world except the U.S. Perhaps the boys here get their tickets too fast in order to make signals themselves. . . . . The Post Office tips us off to the fact that Jerusalem is not considered a part of the State of Israel and mail for that city should be addressed "Jerusalem, via Israel." . . . . W5JSL, who has been pounding the brass at KX6AF, reports that W4FVI has taken over the job for him. To clear previous conflicting info, the KX6AF QTH is: % 169th AACS Sqn., Navy 824, FPO, San Francisco, Calif. W5JSL/ KH6 is now operating from the Hickam Field area. . . . . W6VKY, who had a hand in W3LYK/KC4 at Stonington Island, expects to be looking for pals on 28-Mc, 'phone in the near future. . . . . W4FVI, now plugging at KX6AF, says that KX6AF is scheduled to open up from Majuro Island shortly. . . . . An enlightening note from Navy Lt. Norm Mennenke, now operating TRIP, notifies us that he's responsible for TRIP contacts only as of August 1, 1948. Two rigs, of 400 and 200 watts, are employed with an HQ-120X inhaler. Various directional antennae are planned. . . . . KL7AD is back in the States, expecting to be on as KL7AD/W4 directly. Fil tried a bit of KL7AD/W6 activity while on medical leave from his CAA job in California. . . . . We regret to hear of the untimely passing of PK6XA, one of the more active hams in the N.E.I. area and quite well-known to the 14-Mc. morning gang. . . . . If G3FNJ's fist sounds familiar, here's why: He's none other than ex-SV1RX who has passed out new countries to a multitude. . . . . HIL1AY takes time out from hamming to engage in some softball. A star on the Korea outfit, Bob whacked a timely homer in a vital contest with a team representing the J9 garrison. Major Guy Blencoe, HIL1AA, who sends us this info, gets much more sleep per night now that he's cleared up the J8AAA QSL situation. . . . . VP2GJ, who has been floating around the various bands in nomad fashion lately, turns out to be one J. Padden, VE8QV, formerly of the ARRL technical staff. Jack pulled a VP7NG, taking to Grenada with him several pet theories as regards the proper ways to deal with the DX-versus-W/VE QRM problems. We hope to have a yarn on the trip and it should be interesting.

Jeeves, plagued by TVI like the rest of us, thought he had found the solution for the c.w. man. Observing that his dashes were doing about 90 per cent of the damage, he revised the code alphabet to consist of nothing but dots, the shorter the better. After practicing this pseudo-Morse goulash with diligence for a month, he suddenly realized that his pride and joy, a new de luxe electronic key, might just as well be relegated to the ash can if his system should be universally recognized. Now the poor guy is so burned up he can't handle either code!
Correspondence
From Members

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

TELETEYPE PIONEERS

Lone Rock, Wis.

Editor, QST:

In the October issue of QST I read "The Story of Amateur Radio Teletype." I would like to contribute more to that history.

Before the war Joseph A. Yezuel, W9JK, and I became interested in radio teletype and decided to do a little experimenting on our own. Both of us were working for GAA at the time and also both had previous experience with teletype. We were both located at Rockford, Illinois. After much time spent in searching for radio-teletype signals we found a few and then started trying to get our own equipment assembled. We finally picked up a lead which resulted in our securing two Type 12 machines.

After copying from commercial stations as far away as Hawaii we got the urge to transmit our own signals. FCC told us it would be permissible on the amateur frequencies. We then did some transmitting between our stations but this was all too-short-hand stuff and we couldn't find anyone else with equipment farther away. Then transfers and the war put a stop to that.

Since our machines did not have synchronous motors we were able to synchronize with most any reasonable transmitting speed by adjusting the motor governors, which was a great advantage at that time. Also, we went through interesting and sometimes discouraging work in bringing the distant signals up out of the noise and also in getting rid of the motor noises and key clicks and then correcting the marking or spacing bias we had introduced in eliminating the noises.

— G. W. Trumbel, W0MFU

SORRY!

New Haven, Conn.

Editor, QST:

Not very important, I guess, but on page 96 of Oct. QST you say (in "Happenings of the Month") "in its endeavor to get foreign amateur stations moved out of the amateur bands." Shouldn't it have been foreign commercial stations?

— L. W. MacLehman, W10KK


Editor, QST:

... October QST, page 96:

Tut! Tut!

— A. W. W. Timme, GSCWW

[Erroneous Note: We, of course, should have said "foreign non-amateur stations."]

MARITIME MOBILE

Box 653, Coco Solo, Canal Zone

Editor, QST:

Several recent violations of Canal Zone amateur radio regulations by maritime-mobile "W" stations have been noted. The three-mile limit of Canal Zone waters is to be observed and no amateur communications are to be conducted without first contacting the Signal Office, Quarry Heights, for permission to operate in C. Z. waters.

— H. D. Vorhauer, KZ5AX

MORE ON SINGLE SIDEBAND, ETC.

1334 Cannon St., E., Hamilton, Ont., Canada

Editor, QST:

After reading the letter by W5OLJ, I find myself compelled to write in defense of QST. How anyone can gripe because you fellows are keeping us up-to-date I'll never know. I personally have had no experience as yet with single sideband but anything that may relieve the overcrowded conditions of our bands today and make for QRM-free QSOs, I'm all for it. Does W5OLJ want QST to read like the column "Twenty-Five Years Ago"? After all, it's intended that the amateur should keep abreast of science and should at least be prepared to accept any advance that will make for better rigs. Maybe we all won't be using single sideband for a while, maybe for years, but it sure looks like the answer to some congestion existing in the bands today.

I'd like to take time out to thank all the fellows who are "hanging their heads against the wall" working out this business of single sideband and getting on the air.

Incidentally, for the fellows just starting up and wanting simple circuits, what's wrong with back issues of QST? If they are thinking of getting a ham license they undoubtedly know at least one ham who has a shelf full of QSTs that they could borrow through to their heart's content.

— J. W. Plindoff, VESBFF

1411 Summit Ave., St. Paul 5, Minn.

Editor, QST:

In my 25 years of ARRL membership I do not recall ever being so disturbed as I am over the letters of Messrs. Warner and Shupack in October QST. These men overlook (it seems almost purposely) a number of facts relating to the League and to our hobby.

In the early days we all had to feel our way along, with poor equipment, few facts to go on and very few men interested in it at all. Now we have a well-developed engineering basis for our equipment and operating, and the necessity for adequate training and policing of our activities so that all may share equally. Remember, we didn't need drivers' licenses in the early days, but would any of us care to take a chance on today's highways without suitable regulations?

In the early days we all had to feel our way along, with poor equipment, few facts to go on and very few men interested in it at all. Now we have a well-developed engineering basis for our equipment and operating, and the necessity for adequate training and policing of our activities so that all may share equally. Remember, we didn't need drivers' licenses in the early days, but would any of us care to take a chance on today's highways without suitable regulations?

Although the current average age of hams is around 35, the newcomers are still mostly youngsters as we were when we took up the hobby years ago; only now there are over 80,000 of us, many of whom have been at it for 15, 20 or even 30 years. Is it reasonable to expect a newcomer to assimilate enough know-how in one or two months to enable him to build and handle a kw.? Phone with the same assurance as a man who has had considerably more experience? In the same tenor, QST has grown up. Would you hold it down to the level of the newcomer who has many thousands of old men who look to it for new ideas and techniques? The Handbook and the League booklets give the solid facts of how to get on the air, and actually all this information appears in QST from time to time when there is need to modernize the simpler circuits. How, then, can one reasonably object to the appearance of a new method of transmitting, such as single sideband? Of course it seems complicated to most of us at first. So did a lot of other innovations which are now everyday practice. But we know that, with the concentrated thought of a mass of 80,000 interested beings, someone is surely coming up with a way to simplify it.

What do we want from our hobby, anyway? We still share.

(Continued on page 180)

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BREADBOARD-CONSTRUCTION HINT

How to mount a toggle switch on a breadboard construction job has been a problem that is hard to lick. They just aren’t built to be mounted on a board. It can be done, however, by opening the “eye” of a ½-inch screw eye with a screwdriver blade, putting the barrel of the switch inside the eye, and then clamping it there with gas pliers. The lock nut on the switch barrel can then be used to hold the switch firm, and the whole assembly can then be fastened to the breadboard by screwing the eye into the wood. — William J. Wright, W5KYK

A “SELF-POWERED” BIAS SUPPLY

Shown in Fig. 1 is a novel circuit that has been used successfully for quite some time. It eliminates the need for a fixed bias supply, yet provides fixed bias!

The VR tube is initially lighted by the grid driving voltage, and a charge is thus placed on the condenser. When excitation is removed, as when the key is up, the VR tube goes out, and the charge that remains in the condenser keeps the amplifier tube cut off.

For indoor and temporary installations, two lengths of ordinary lamp cord may be used. If you want to reverse the direction in which one motor shaft turns, merely reverse the connections of any two of the three delta wires. — Roy A. Long, W8YBL

WIRE-SAVING KINK FOR “SELSYN” USERS

It is often difficult to obtain a five-wire cable to connect synchro motors. This problem is simplified somewhat, however, by the fact that separate windings are used in the motors, thus permitting one wire to be used as a common lead serving both the line circuit and one of the delta circuits, as shown in Fig. 2.

For indoor and temporary installations, two lengths of ordinary lamp cord may be used. If you want to reverse the direction in which one motor shaft turns, merely reverse the connections of any two of the three delta wires. — Roy A. Long, W8YBL

ANOTHER “GLYPTAL” SOLVENT

As an old experienced “taker-aparter” of surplus gear, I was interested in the recent suggestion of the use of an insect repellent as a means of loosening screws and nuts that had been made fast with “Glyptal.”

Why wait as long as 12 hours for the stuff to work? After breaking a few screw heads and cursing in general about the solid way they put things together, I brushed ordinary paint remover over the “Glyptal” and let it stand for about 15 minutes. Apply the stuff with a small brush, and be careful not to get any of it on your skin. It works wonders, and will speed up the job of tearing surplus apart by many hours. — Cliff Erickson, W6DAE

HARMONIC REDUCTION WITH STUBS

Hams who are having trouble with harmonic radiation sometimes can make a substantial reduction in the amplitude of even-harmonic radiation by connecting the open end of a shortened quarter-wave stub to the antenna feeders or transmission line.
The function of such a stub is to present a short-circuit to all even-multiple harmonics of the transmitted frequency, while presenting a high impedance to the fundamental. Thus the stub causes no detuning or power loss, but eliminates the even-multiple harmonics.

The stub may be connected at any point along tuned or untuned transmission lines of either the parallel-wire or the coaxial type. A "T" connector will be necessary for tapping into coaxial lines.

If the transmission line is being used for more than one frequency band, the stub line may be made long enough for the lowest-frequency band used, and a shorting bar may be used to set the stub length to the proper position for each band. Continuous protection from lightning and static charges may be obtained by grounding the shorted end of the stub, and it will not be necessary to remove this ground during operation.

Roger T. Wilson, W3JHW

SOLDERING IN CRAMPED QUARTERS

Recently having a soldered connection come loose deep inside a milliammeter, and not wishing to take time or risk further damage to the instrument by taking it apart, I resorted to the stunt illustrated in Fig. 3. It is a method that will prove helpful whenever it is necessary to make a soldered connection in a space too small for the point of the iron to enter.

Fig. 3 — A handy "extension" for soldering in close quarters may be made of a short length of No. 14 copper wire, preferably pretinned.

A short length of No. 14 bare copper wire is wrapped about three turns around the tip of the iron, with an extension brought out as far as needed past the tip of the iron. The "extension" works best with pretinned copper wire, but any metal that will conduct the heat will do. Have the extension contact the tip of the iron along as much of its length as possible. — Jerry Morgan, W5ABQ

ADDING A NOISE LIMITER TO THE CAR RADIO

The circuit shown in Fig. 4 is a simple means of adding a noise limiter to the car radio, a "must" if it is to be used with a converter for mobile operation. The usual 6SQ7 detector-a.v.c.-first-audio tube is replaced by a 6S8-GT. This tube includes all of the elements required to perform the original functions of the 6SQ7, plus an extra diode that can be used for the noise-limiter circuits. Thus, it is possible to add the noise limiter without having to find room for another tube in an already-overcrowded cabinet.

Fig. 4 — Here's an easy way to install a noise limiter in your car radio. The 6S8-GT usually found in the set is replaced by a 6S8-GT, as shown.

C1 - 0.01 µfd.
R1, R2 - 0.27 megohm, 1/2 watt.
R3 - 0.82 megohm, 1/2 watt.
R4 - 1 megohm, 1/2 watt.
S1 - S.p.s.t. toggle switch.

No extensive wiring changes are involved, because the 6S8-GT has the same heater connections as the 6SQ7, and the few extra parts needed require very little space. In the diagram, only the added parts are marked. All others shown are already in the set.

The limiter does not seem to introduce any distortion when the set is used as a normal b.c. receiver, surpassing crystal diodes in this respect. Thus the switch is not actually needed unless one wants to demonstrate the effectiveness of the limiter. If the switch is used, the leads to it should be as short as possible. — Wayne W. Cooper, W3EWC

THE "MONITONE" AS A PHONE MONITOR

The "Monitone" keying monitor described recently in QST may also be used for phone monitoring with a simple addition to the original circuit. Thus the gadget becomes doubly useful, and is a good bet for the man who operates both c.w. and 'phone.

Solder a lead from the positive side of the 1N34 crystal diode to the ungrounded side of the 'phone jack through a s.p.s.t. switch. To use the unit as a 'phone monitor, turn the power switch off and close the added switch. For c.w. monitoring, open the new toggle switch and use as described in the original article. — Paul Hescock, W1PRE

Simulated Emergency Test. This October's AEC test of community plans was a humdinger, even better than last year's. New contacts with those served were established. Many hams got a new respect for those able to relay a message in good form with accuracy. Some received their first instruction on putting traffic together during the test! New station set-ups were tested in new places. Sets with handles, mobiles, portables and car installations were sent on urgent missions with time in the balance. By Sunday afternoon most tests had been completed and traffic for ARRL and Red Cross began to flow. It was no trickle but a river of traffic from scores of participating individuals and hundreds of alerted installations. It was a joy to hear it move, even under propagation conditions that were not the best.

Locally, amateurs vied with one another to get out the fullest roll call of potential emergency-ready operators in each of several bands. All who were in the test deserve our congratulations and a "well done." It will take some weeks to enumerate the communities heard from and see which SEC's teams chalked up the most-complete reports and radio coverage. The NEC will be looking for the strong reports to give credit where due, and for the weaknesses and lessons always learned from these tests, in order to suggest the revision of community plans and the adoption of added programs for utilizing amateur radio, as may seem necessary.

AEC Invitation. Each emergency coordinator will back us up, we feel sure, when we state that the test showed the importance to many amateurs of belonging to the ARRL Emergency Corps. Unless you had gotten lined up for a supporting or full membership in the Corps you didn't get any call to action in your community, and you missed not only the fun and practical values in radio testing your equipment under what was tantamount to emergency operating conditions—but, more important, you missed the chance to get a "dry-run" assignment that would develop your ability to serve in a communications status, come a real need for communications. "There's a place for every licensed amateur in the Emergency Corps."

Teletypewriter Technique. The story of the development of amateur radio teletype equipment and its utilization between amateurs in a 147.96-Mc. net, as told in October QST, is a fascinating one. This field is sure to attract numerous amateur experimenters in view of possible equipment modifications. Also, we'll be pleased to hear of the operating applications to fixed emergency amateur-radio facilities as well as to try to keep a complete directory of all amateur stations as they become TT-equipped. A postal card or radiogram to the ARRL Communications Department will assist us in noting your call and the date of your first operation by this method. Every pair (or more) of these machines in a com-
emergency coordinators, with operating frequencies, for advance planning as to possible use in local communications emergencies.

About TT Calling and Logging. FCC, of course, requires that amateur teletype stations identify their transmissions and the other amateur stations that are being called or worked at both the beginning and end of transmissions and once each 10 minutes, just as in the case of other systems of amateur work. To facilitate aural identification of their transmissions and the other amateur stations that are being called or worked at, some New York amateurs thought a "commercial was invading the band." So to appraise local groups that this new amateur system of communication is working, some comments identifying the system as one used for regular amateur contact for purposes of record keeping and convenience (not for secrecy) will be found desirable. Log keeping is best accomplished using the usual written-type log, and where a.f.s.k. is used noting that it is a form of A2 emission. It is true that if all the facts required (time, date, signature of licensed operator, names of others that talk or use the keyboard but don't throw the switch, the frequency band, the call of station called, and type of transmission, with any record traffic) are placed on the paper that comes off the machine, this can be the log. However, most fellows do not want to keep bales of back-and-forth comment — only the record traffic and legally necessary facts. So our recommendation concerning log keeping for TT is that a regular standard ARRL log form be used, and that the FCC requirements as to calls, times, etc., be recorded as concisely as possible therein as in other kinds of amateur communication.

TT Bands. Where a frequency-shift audio oscillator is used on an amplitude-modulated transmitter (A2) the amateur frequency bands 27.16-27.43, 50-54, and 144-148 Mc. and above, which provide for A2, may be used. However, when true f.s.k. is utilized involving carrier shift, 27.16-27.43, 29-29.7, 52.5-54, 144-148 Mc. and those higher-frequency bands specified for carrier shift in Sec. 12.111 as amended may be utilized.

Clear-Channel Operation. It is a waste of power and operating time to buck QRK when it can be so easily avoided. Never open up and inadvertently jam someone, or be jammed, without listening first. Rule 1: Listen before opening up on the air. Rule 2: If a frequency is busy, shift to a clearer spot or QRX until the channel is free.

The operation of nets and round tables aids in the efficient use of channels. The bunching-up of several stations to use one channel leaves more holes in the rest of the band. One way to insure relatively clear-channel operation is to operate in or as part of a regular net. In that way you get your turn, and the channel, kept in constant occupancy, is thus kept clear, either for relaying a message along or for delivering traffic. The other way to QRK-free work is to listen carefully and move to clear spots away from the published frequencies of the nets, or off groups of stations noted to be engaged in communication on a particular frequency. You always have to hear a station before you can work him, so why not always listen first?

All of the above applies both to voice and c.w. work. The interference headache belongs to everybody. A good VFO is the most flexible tool for dodging interference, but a few spare crystals will likewise permit you to do the trick. Working through QRK when copying traffic makes the best operators the world has seen. Dodging the QRK by ample listening and by application of operating savvy is an art similarly cultivated by necessity. Increasingly, we amateurs have the know-how and equipment. Consult the ARRL Net Directory, presented in these pages in November QST, and note the times and frequencies at which nets operate regularly. These nets ordinarily work for a half-hour or hour a day. In a few cases section nets may then become regional nets on the same frequency. This information, supplemented by monitoring, can help you pick a net best to handle the message you want to put into some particular place; or likewise, a little advance planning supplemented by monitoring will enable you to select the most advantageous spots to work, whether your interest is WAS, rag-chewing, experimentation or traffic. Pick a clear channel before opening up with a CQ. More answers are sure to result. — F. E. H.
A.R.R.L. - AFFILIATED CLUB
HONOR ROLL

It is a pleasure to present additional Honor Roll affiliated clubs in the following listing, supplementing that which appeared in June QST. These are the societies whose entire membership consists of members of the League. The listings of clubs with 100 per cent A.R.R.L. membership are in accord with the Board policy of such special recognition, which is determined from information supplied us in the affiliated-club questionnaire or Annual Information Survey conducted as required by the Board. In early 1949 a form will be sent to every active affiliate for filings on which the next Honor Roll will be based.

Allegan Area Radio Club, Allegan, Mich.
Associated Amateur Radio Operators of Denver, Denver, Colo.
Atlantic Radio Club, Inc., Atlantic City, N. J.
Central Kentucky Amateur Radio Club, Lexington, Ky.
Charlotte Amateur Radio Club, Charlotte, N. C.
Central Amateur Radio Club, Newport, Del.
East Bay Radio Club, El Cerrito, Calif.
Effingham Radio Club, Effingham, Ill.
Enid Amateur Radio Club, Enid, Okla.
Glendale Amateur Radio Club, Glendale, Calif.
Helix Amateur Radio Club, La Mesa, Calif.
Honolulu Amateur Radio Club, Honolulu, T. H.
Houston Amateur Radio Club, Houston, Tex.
Illinois Ham Club, Chicago, Ill.
Illinois Valley Amateur Radio Club, La Salle, Ill.
Inglewood Amateur Radio Club, Inglewood, Calif.
InterCity Radio Club, Ashland, Ohio
Joliet Amateur Radio Society, Joliet, Ill.
Kickapoo Radio Operators Club, Bloomington, Ill.
Kingsport Amateur Radio Club, Kingsport, Tenn.
Nashville Amateur Radio Club, Nashville, Tenn.
Necaho Valley Amateur Radio Club, Emporta, Kans.
North Radio Research Club, Maple Heights, Ohio
Parkway Radio Association, West Roxbury, Mass.
Radio Club of Tacoma, Inc., Tacoma, Wash.
San Francisco Naval Shipyard Amateur Radio Club, San Francisco, Calif.
Skaigd Amateur Radio Club, Mt. Vernon, Wash.
T-t Society, Ocean Grove, N. J.
Valley Radio Club, Eugene, Ore.
West Palm Beach Amateur Radio Club, West Palm Beach, Fla.

WITH THE A.E.C.

The Section Emergency Coordinator post is one of the most important appointments in the A.R.R.L. field organization. Acting as the assistant to the SCM in AEC matters, the SEC is responsible for the section-wide AEC organization, the recommendation for appointment and cancellation of Emergency Coordinators, the determination of the jurisdictions of the various ECs, and the promulgation of AEC membership drives, meetings, and activities at section levels. Activity on the air is not a requirement for the post — the SEC must be an executive. It is his responsibility to see that the AEC "works" in every community in his section. Is your SEC doing a good job? If you don't think so, write him a letter and find out what is wrong. If he is doing a swell job, tell him so — he's human, too! The following A.R.R.L. sections do not have an SEC appointed to help the SCM in this important field: Md.-Del.-D.C., S. N. J., Vt., Alaska, Idaho, Hawaii, Santa Clara Valley, Philippines, W. Va., Utah-Wyoming, Alberta, Yukon, Manitoba and Saskatchewan.

What's the matter, fellows, don't you think disaster can strike your section? Don't bet on it!

The gang along the Gulf coast of Mississippi and Louisiana, under the leadership of SECs W5JHS and W5KTE, were not caught napping on September 4th when a hurricane swept in from the Tropics. All nets were alerted in plenty of time, and the operation was carried off in top-notch fashion. The lesson of last year's big wind has not been forgotten.

The Radio Cadena de Aficionados de Nuevo Leon, a traffic-emergency net serving the Mexican state of Nuevo Leon and operating on 7100 kc., is now tied into the South Texas Emergency Net on Monday nights. The XEs are shooting for an emergency network covering all of Mexico.

Write W1BB for a copy of his single-sheet diagram of the AEC in Winthrop, Mass., if you would like to see how simple an emergency set-up can be and still be tops in efficiency.

The Puerto Rico Amateur Radio Club has published a detailed emergency manual, which is...
available to all amateurs of Puerto Rico and the Virgin Islands. Under the leadership of SCM KP4KD these fellows, who are directly in the path of many hurricanes, plan an AEC second to none in efficiency.

The Arkansas Emergency Net has been expanded into a five-day-per-week traffic net, and has been operating busily on 3695 kc. since September 1st.

The first storms of winter are almost upon us. Once again we can expect blizzards and ice storms which will sever communications lines, block rail and road traffic, and isolate communities. In past years the amateur service has demonstrated its ability to serve as a stand-by communications facility under such circumstances, and the agencies we serve have been loud in their acclaim of our work. Let us not feel that our past performances are a guarantee of the efficiency of our future efforts. Organization and advance planning are the best insurance we can obtain to protect our record. The AEC, under the leadership of the emergency coordinator in your community and that of the section emergency coordinator in your ARRL section, is presently preparing its master plan for public service during the wintry season. The AEC needs you. Join now!

HAM INTERCOM AT SPORTS-CAR RACES

New York amateurs were called upon to supply communications in connection with a road race sponsored by the Sports Car Club of America and held at Watkins Glen, N. Y., on October 6th. The Binghamton Amateur Radio Assn. was instrumental in arranging a radio communication plan for the event and was assisted in the operation by the Elmira Amateur Radio Association.

After advance testing of the communication situation with mobile units, the BARA group discovered that the rugged terrain over which the race was to be held presented difficult problems. It was decided to set up two networks, one battery-powered on the 75-meter band and the other on 144 Mc. using a.c.-powered surplus 522 units in fixed locations and walkie-talkies to cover specific points where the fixed stations were not practical. One mobile unit was employed which could be directed to points of trouble.

The plan was extremely successful. BARA members left Binghamton at 7:00 a.m. and arrived at Watkins Glen between 9 and 10 o’clock. Stations were immediately set up along the course and after some adjustment of antennas to obtain best communication, were “ready to go.” The networks developed into a smoothly-functioning communications pattern as the race progressed. Three accidents happened, one before the race and two during the race, which were promptly reported to race officials from the control station located at the finish line. No personal injuries were suffered, and this information, of course, was most reassuring, as the accidents occurred at points far from the finish line. In one case, a walkie-talkie was immediately on the job and communications were conducted right from the car.

It was a new experience to us and emphasized the need for higher-powered mobile equipment. We did gain experience in setting up stations quickly under situations approximating an emergency and will be able to do an even better job next time.

Those participating were: 2-meter fixed stations: W2s HJS RLS SFW FCG YLQ JOJ; 2-meter mobile: W2SNG; 2-meter walkie-talkies: W2s RFO SDA WZM; 75-meter nets: PWN PQH ARH WBU KJJ. The Elmira Amateur Radio Association was represented in the 75-meter net by W2KIJ and W2WBU.

J. E. Dayger, W2JOJ
President, BARA

MASSACHUSETTS RACING REGATTA

The 21st Annual Racing Regatta, held at Winthrop, Mass., on September 4th, 5th and 6th, was furnished with a radio net by W1QFI, headquarters station of Flotilla 412, U. S. Coast Guard Auxiliary, based at the Cottage Park Yacht Club in Winthrop.

W1QFI was used as base of operations with a 28-Mc. circuit to the Pleasant Park Yacht Club, where races were formed. A 144-Mc. circuit was used to contact the five mobile-marine units. At W1QFI a 50-watt 6L6-807 rig was used for 10 meters, and a similar unit was in operation at Pleasant Park.

A 522 was employed at W1QFI for 2 meters and the five boat units were TR-4s and transceivers, powered by storage batteries and vibrator supplies. The U. S. Coast Guard patrol boat, which was manned by Auxiliary men, was equipped with 2-meter gear also.

The following members of Flotilla 412 participated: Wls BHD HKG HXK KNA NBV QRR OCQ, and Ed Drake, Don MacFarland and Charlie Pyne. The following additional amateurs also participated: Wls LD LLY ORB RIP, and Art Pugeley.

NATIONAL EMERGENCY FREQUENCIES

<table>
<thead>
<tr>
<th>C.W.</th>
<th>'PHONE</th>
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<tbody>
<tr>
<td>7100 kc. (day)</td>
<td>3550 kc. (night)</td>
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</table>

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.
DX CENTURY CLUB AWARDS

DXCC Certificates based on postwar contacts with 100-or-more countries have been issued to the amateurs listed below. The countries-worked totals indicated have been certified by examination of written evidence under the award rules as published in March, 1947, QST.

RADIOTELEPHONE

W1F8H 207 W3KQF 146 P88GN 128 W9NRB 117 W3IXN 104
W6V6E 194 W5LCC 145 G2ZC 127 W7BD 116 W8WB 103
W8DI 192 W5LCM 145 W5W7H 112 G6DKY 110 W7DIQ 101
G2PL 188 W2N5Z 144 W3YD 127 W2TD 116 V2KD 101
W6HGW 187 W6BMM 144 G4CP 127 W2AGU 116 W2MZO 103
W4BDP 184 W5TYE 144 W2YJH 126 W8UDR 116 CM2SW 103
W2BKA 184 W9ZLO 144 W6M5H 115 W1BY 103
W8QAU 180 W9SAK 144 W2AFU 115 W2NTE 103
G2OZ 177 HB9CE 141 W8O3R 125 W6MZO 103
W1CH 176 W8NUC 141 W2RZH 1116 W8LYQ 102
W2HJF 176 W2EFPV 141 W2PA1 107 W6ZII 102
W2JNN 175 W6CKK 142 W4KNX 124 W2HHF 102
W1TW 174 W6AM 141 W6T1 124 VQ9HP 117 W3JLT 102
W6SAI 174 LAYT 140 W6BOB 124 W4WP 117 W4CP 102
W2AQW 173 W5KBI 140 W2FPA 124 W2AIW 117 G6TYQ 101
W6BG 172 W6GRS 140 W6G4Q 124 W8FD 117 W2W6A 101
W8RDZ 171 VE2QD 140 W6QR 124 W2IBI 117 W3JFG 101
W9ANT 170 W6KU 140 W8FIL 123 W3Z2Y 117 W8QI 101
W2GEW 169 W1ENE 139 W4OM 122 W7GBW 111 W1AH 101
W2FRA 167 LUCD 139 W6NDA 122 W2UAT 111 W2NAM 101
W3PQY 167 ONJW 139 HR 12 W2UGY 111 W8HRV 101
PA0UN 166 W2EWE 139 W6BP 122 W8MNO 111 W2KEE 101
W2AWG 162 W6QCY 139 G200 122 OK1CT 111 W8SC 101
W6UGD 162 W6MS 139 W2AIW 121 W2RI 111 W2QYK 101
W1LW 161 W6FSJ 138 W2QWP 121 W1BDS 111 W3LB 101
W7AMX 161 W6NTA 136 W6CP 121 W3QG 111 W2R2 101
W4CYU 160 W5BOF 136 W8GFE 121 Q81L 111 W9BO 101
W5KBJ 160 W6PS 136 W6PP 121 W4FP 111 W9GQ 101
W2QKS 160 OK1LM 134 W2WPS 121 W3VY 111 W6TM 101
W1ME 160 W2COK 134 W1LZ 121 W6TX 111 W6TH 101
W3RT 157 G8JLP 134 W1WJ 121 W2J6 111 W6TYC 101
W2GDN 157 W6GMX 134 W1WI 121 W2J6BP 111 W6T8 101
V27ZM 156 W6MX 134 W1WJ 121 W2J6BP 111 W6T8 101
W5ASQ 156 W3MEL 136 W2QWP 121 W1BDS 111 W3LB 101
W4JFT 159 I8KN 133 W6SKU 121 W1HR 111 W6TYC 101
W6CJN 158 H8BU 133 W6KJ 121 Z8AI 111 W6U 101
Z8X 158 OK1PF 132 W3KQ 121 W6UPZ 108 W6MJB 100
W6GJU 157 W6FNA 131 W6ANN 120 ON4QF 108 W1BUX 100
W6MKE 157 C83QG 131 W3DKT 120 W8ERA 107 W6DUC 100
W6TCL 156 W63Q 131 W8LG 120 W3QG 107 W6DUC 100
W6KC 155 W1DX 131 KP4KD 120 W3Z2N 107 W5NE 100
W6SN 155 W6BRQ 131 W3QCP 120 W5AD 107 W4RTT 100
W3CFV 155 W8FJN 131 V87HC 120 W4FPP 107 W6BY 100
W6DH 155 W2JHM 131 W6HJ 120 W6QH 107 W6DUC 100
W8JN 153 PA0JQ 130 W2UP 120 W4NN 106 W2BLS 100
W2GUM 153 W6LER 130 W3KDP 120 W2JB 106 W8WZ 100
W6QIJ 153 W3JTC 130 ZLQG 119 W4AY 105 W6T6 100
W3H2Y 152 W2JRR 130 W6DF 119 W6UX 105 G8FU 100
W1AXA 151 PT1AJ 130 W1AB 119 W4CS 105 G8FU 100
W1ADM 151 W2CZO 130 SVIRX 119 W9DUS 105 W6BM 100
W6TT 151 W6KUT 130 W1FJ 119 ON4MS 105 W2RDK 100
W9YXO 151 W8JW 130 W1LOP 118 W6RM 105 W4KCO 100
W8SFW 150 W5UP 130 W6LD 118 W6KRL 104 W1EQ 100
W8NBK 150 W4MR 139 W6B6P 118 G83J 104 G28Q 100
W7ZFA 148 W2QPH 129 W4FIF 117 W6QO 104 W3FUF 100
W6DI 148 W4XJM 128 G47Z 117 W1DF 104
W2RCQ 147 G2AJ 128 W8UAS 117 G2AZ 101

QST for
John Cann, W3IEI, keeps Baltimore, Md., on the traffic map from this neat low-power layout. Messages arrive on a BC-3411 receiver and leave via a doublet antenna and a 6L6-807 rig running 75 watts input. W3IEI is ORS, AEC, WAS, RCC, active on the Swing-Shift, Md.-Del.-D. C. and Virginia traffic nets. A skilled c.w. operator, John holds a 25-w.p.m. Code Proficiency Certificate, attained by copying with a pencil, and membership in the A-1 Operator Club.

TRAFFIC TOPICS

Stations in the more isolated locations frequently find traffic operation dull because they have few messages to handle. Thus, their interest lags. If you are in this position, originate traffic to friends in other parts of the country; some are bound to answer by radio and start the ball rolling. Originations help to build traffic activity for your net, and those nets through which they must pass, and will bring returns to help your deliveries. Let's try it!

W1QFI, the amateur station operating with Flotilla 412, U. S. Coast Guard Auxiliary, operates every Wednesday night on 3815, 3910 and 29,060 kc. Other amateur stations on the Atlantic Seaboard collaborating with the USCGA are requested to contact W1QFI for schedules.

The Vermont C.W. Net is in operation on 3740 kc., Monday through Friday, at 7:00 P.M. EST. Outlets include TLC, Eastern Mass. and Conn. Nets. Plans are under way to form a 'phone net on 3860 kc.

The Chattanooga Amateur Club operated W4DIJ/4 at the Chattanooga Inter-State Fair in September. Some 200 messages were originated and relayed during the four-day festivities. The transmitters were located in a trailer operating on 80 and 40 c.w., and 20-meter 'phone.

A recent issue of the Southern Border Net Bulletin contains a note worth repeating, and food for thought for all traffic men. "Let's not become complacent about our operating skill. All stations are urged to copy all traffic handled on the net and to listen in on other nets to increase speed and to become familiar with procedures. Copy five or six words to the line to facilitate check of word count. Originated traffic. Know the "Q " and "QN" signals and use them. An efficient net wastes no time in unnecessary transmissions."

The Lakeland Amateur Radio Assn. of New Jersey set up a booth at the Morris County Fair during September. The set-up included a transmitter on 80 and 40 c.w., and another on 2-meter 'phone. Over 250 messages were handled.

The Ozark Net in Arkansas is now operating on a Monday-through-Friday schedule on 3695 kc. The net meets at 7:00 P.M. CST with good coverage of the state.

Many new emergency nets are springing up to tie into the existing traffic networks. If your emergency net is not listed in the latest Directory of Active Nets, drop a line to Headquarters giving the frequency, times and days of operation.

The Traffic Outlet Bulletin has brought forth a good suggestion to eliminate the confusion between Washington State and Washington, D. C. "When you have traffic for the Nation's Capital, let's classify it as 'DC' and not as 'WASH.' Therein lies a source of confusion. In case you haven't heard, there is a state by that name way out yonder somewhere."

The Michigan QMN Net is operating on a three-speed schedule. At 5:00 P.M. EST the speed is 15 w.p.m. or less; at 6:00 P.M. EST, between 15 and 20 w.p.m.; at 7:00 P.M. EST, 20 w.p.m. or over. This gives opportunity for amateurs of all speeds to participate in their section-net activities. "QMN" meets Monday through Friday on 3663 kc.

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<th>Rel.</th>
<th>Extra Del.</th>
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<tr>
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<td>W8TRN</td>
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<td>50</td>
<td>423</td>
<td>44</td>
<td>522</td>
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</table>

The following make the BPL with over 100 "deliveries plus extra delivery credits":

W0YDR 248 W8OT 116 W6N 111
W0RAD 178 W2YNJ 114
W6CMN 183 W6DEE 111

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 listing is open to all operators who qualify for this monthly "honor roll."
TRAINING AIDS

Rules. The mimeographed "Rules for Use" of ARRL Training Aids were devised for the purpose of making more Training Aids available to more affiliated clubs on a planned basis. The rules were considered necessary in order that the material we have on hand could be used by as many affiliated clubs as possible. The rules were made to be read and observed by the clubs using Training Aids.

We never thought them very complicated. First there is a set of general rules, which applies in general to all Training Aids; and this is followed by separate sets of special rules for each type of Training Aid available. If you are using films, you will want to read the general rules, and then the special rules applying to films only. If it is a recorder or keyer you are interested in, you will want to read the rules that apply.

Most of the clubs who request Training Aids have a copy of the rules and Training Aids list beforehand, and make their requests on a regular request form supplied by us—which says, incidentally, that they "have thoroughly read, understand and agree to comply with all rules applicable to the Training Aids requested." And yet repeatedly, in at least one out of every three requests, the type and quantity of the material requested somehow indicates that the rules were not read, or if read, not understood.

What goes on, fellows? Do you actually read these rules, and understand them? Or do you simply glance over them and think that this qualifies you to sign a certification indicating that you have "thoroughly read and understand" them? When you make a request for Training Aids, we assume that you have read and understood the rules. If you do not understand them, write and ask us for a clarification; but we'll bet that if you read them thoroughly and carefully, you will have no questions.

Malpractice. While we are in a griping mood, let us get one more off our chest. A good many clubs, of late, have made proper requests for Training Aids, which were duly booked and shipped, only to be returned later with a letter which says that they were unfortunately unable to use them. In one classic case, six films were sent in succession over a period of many months, and all were returned without completed questionnaires. When we later requested the completion and return of the questionnaires, the club secretary informed us that they had not been able to use any of them, and that was the reason no questionnaires had been returned.

Please, fellows, make sure of your arrangements before you request Training Aids. You are causing us, yourselves, and other affiliated clubs waiting in line no end of inconvenience when you cause us to make a booking of material you cannot use.

MEET THE SCM

Ben H. Wendt, W0ICD, SCM Missouri, began his career as a licensed radio amateur in 1931 and has been consistently active on the air since that time. His first eight to ten years in the ham game were devoted to c.w. on 160, 75 and 40 meters. He got his start in Milwaukee, Wis., as W9ICD and later operated from Alma, Lexington, and Kansas City, Mo., before moving to his present location north of North Kansas City.

Ben is constantly experimenting with new and different ideas, the most recent being with 28-Mc. antennas. His rig seldom bears the same description for any length of time. At present the 'phone rig is a 6L6 oscillator driving a pair of 6L6s at 60 watts input, modulated by p.p. 6L6s, while for c.w. an 812 running at 150 watts input is added. Receiving equipment includes an S-20 with pre-selector, and a converted BC-454. On 27 and 28 Mc., W0ICD uses a three-element rotary beam; on all other bands a long wire is worked against ground. The 'phone portion of the transmitter is portable and there is an auxiliary folded-dipole antenna for 27- and 28-Mc. portable operation. Ben's favorite band is 28 Mc., although the transmitters actually cover 3.85- and 3.5-Mc. 'phone and c.w., 7-Mc. c.w., and 14-, 27-, and 28-Mc. 'phone and c.w. The rig is situated in the recreation room of the Wendt home overlooking Chau­mier Lake.

Holder of a 25-w.p.m. Code Proficiency Certificate and a Rag Chewers Certificate, SCM Wendt is a member of the Heart of America Radio Club and of the AEC and is a regular reporter on the AEC Net.

In addition to ham radio, Ben has such diversified interests as photography, philately, fishing, swimming, skating, horseshoe pitching, checkers, cards, and softball, and for two successive years captured a spot on the City Softball League all-star team.

Having completed an extension course in electricity and radio at the University of Wisconsin, Ben is now in the employ of the Berg-Gibson Mfg. Co. as an electrical engineer.
CODE PROFICIENCY PROGRAM

Have you received an ARRL Code Proficiency Certificate yet? Once each month special transmissions are made to enable you to qualify for the award. The next such qualifying run will be made on December 17th at 10:00 P.M. EST. Identical texts will be sent simultaneously by automatic transmitters from W1AW, W6OWP and W6CO. Frequencies of transmission from W1AW will be 3555, 7215, 14,150, 28,000, 52,000 and 146,000 kc., from W6OWP 7245 kc., from W6CO 3534 and 7053 kc. Send your copies of the qualifying run 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 10:00 P.M. EST. Take advantage of these transmissions to increase your code proficiency. References to texts used on several of the practice transmissions are given below. These make it possible to check your own copy. To get sending practice hook up your own key and buzzer and try to keep in step with W1AW.

Date Subject of Practice Text from October QST
Dec. 7th: The Story of Amateur Radio Teletype, p. 16
Dec. 9th: Simple Crystal Control on 144 Mc., p. 22
Dec. 15th: Further Advances in Electronic-Keyer Design, p. 27
Dec. 18th: A ''Flat Converter for 880 Mc., p. 31
Dec. 17th: Qualifying Run, 10:00 P.M. EST
Dec. 21st: Completing the Surplus-Parts Bandswitching Transmitter, p. 36
Dec. 23rd: Technical Topics, p. 45
Dec. 27th: The Why Have It, p. 50
Dec. 29th: The World Above 60 Mc., p. 52

BRIEFS

After using commercial station WSL as a regular source of code practice while studying for his license, OM Murphy of Fairmont, West Va., suspected the work of pixies when his ticket came through with the call WSWSL! His hours of listening to WSL are reflected in the melodious way he sends those letters!

The Tulane University Amateur Radio Club is sponsoring the International Federation of University Radio Clubs, an organization dedicated to the fostering of cooperation between university radio clubs. Initial aim of the Tulane group is to coordinate a list that will include: (a) colleges that have amateur radio clubs, (b) such clubs that have active amateur stations, (c) clubs that desire to work into a net with other schools. Clubs interested in joining the Federation are requested to get in touch with Phil Slipakoff, W5LDH, President, T.U.A.R.C., 3312 Louisiana Parkway, New Orleans, La.

ELECTION NOTICE

(To all ARRL Members residing in the Sections listed below):

You are hereby notified that an election for Section Communications Manager is about to be held in your respective Sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned, in good standing, are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been a licensed amateur for at least two years and similarly a full member of the League for at least one continuous year immediately prior to his nomination.

Petitions must be in West Hartford, Conn., on or before noon on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given here. The complete name, address, and station call of the candidate should be included with the petition. It is advisable that eight or ten full-member signatures be obtained, since on checking names against Headquarters files, there is no time to return invalid petitions for additions, a petition may be found invalid by reason of expiring memberships, individual signers uncertain or ignorant of their membership status, etc.

The following nomination form is suggested:

Communications Manager, ARRL [Place and date]

We, the undersigned full members of the [..... Section of the [..... Division, hereby nominate [..... as candidate for Section Communications Manager for this Section for the next two-year term of office.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided in our Constitution and By-Laws. The following officials, the term of office starting on the date given:

Section Closing Date SCM Present Term Ends
Mississippi Dec. 15, 1948 Harold Day Oct. 15, 1948
Southern Texas Feb. 1, 1949 Ted Cuslett Feb. 15, 1949
Maine Feb. 1, 1949 F. Norman Davis Feb. 17, 1949

In the Ohio Section of the Great Lakes Division, Mr. Roy B. Fuller, W1CJH, and Mr. John Titterington, W1E0F, were nominated. Mr. Fuller received 64 votes and Mr. Titterington received 53 votes. Mr. Fuller's term of office began October 1, 1948. In the Rhode Island Section of the New England Division, Mr. Ray T. Donahue, WA1QK, was nominated. Dr. Stricker received 352 votes. Dr. Stricker's term of office began October 1, 1948.

In the Ohio Section of the Great Lakes Division, Dr. Harold E. Stricker, WS6WZ, and Mr. J. R. Wildman, W8UJ, were nominated. Dr. Stricker received 362 votes and Mr. Wildman received 215 votes. Dr. Stricker's term of office began October 1, 1948.

December 1948 67
ATLANTIC DIVISION

EASTERN PENNSYLVANIA - SCM, Jerry Mathis, WB3BES - DX visited QEW while on vacation in the Poconos. The Springfield, Mass., and Trenton, N.J., Fall Field Day t.v. is coming up on Oct. 6; k.e.v. is looking forward to it. QEL has all kinds of antennas down on the farm. ELI finds 3.85-Mc. equipment to be readily available; too many amateurs and DXers are seeing him signing 3AEQ. NNV has given his antennas a good going over in preparation for winter and is arranging his shack for the most efficient operation. The Philadelphia Wireless Assn. met at the North Light Boys Club, Green and Silverstreet Sts., Manayunk, at 8:15 p.m. every Th. day. The call is 3AG and the club now is ARRL affiliated. OGU received his DXCC cards 7 months after getting his ticket. 30VV is K7's ten-year-old daughter, BBV will resume as 00, MEL, 101, and 02. K6V is the new DXCC manager. K7G is back on 144 Mc. rotary beam. LZN is back on 144 Mc. MZQ lost his sixteen-element beam in high wind. DQV has rebuilt his 502 outrigger. W3BEC is QRM on 144 Mc. QPG 21, WBT 12. EQK 8, JZY 7, JHVW 6, ARR 5, IEM 5, MYM 4.

SOUTHERN NEW JERSEY - SCM, G. (Bill) Tunnell, W20XX - Fall outings are very popular this year; the 3.58-Mc. Emergency Net plus the Cumberland and the South Jersey Clubs sponsored October affairs. Traffic honors go to SXK, who made BPL this month. RG has found a new place to station, not in sets, but in a pointed New Jersey Terminal Station for the National Trunk Line. BAY is spending a week aboard his 36-ft. boat and is hearing DX all the time. CCB is active on 7 Mc., and is heard occasionaly on 3.5-Mc. c.w. QIDI is up 28-Mc. Rotary Beam and is heard over the 14-Mc. band. NQQ, LIW, KQD, LJQ, KKA, UVD, and YDJ. Anyone interested in ORS contact NUG or your SCI for details. W2PGT - SEC: SJV, RM: FCO. The New York State Traffic Net is now in full swing, with a bigger and better season in prospect. This year we are running a slow speed net, known as the Straight Key Net, at 6:30 p.m. on 3720 kc. Anyone interested in starting traffic net is invited to join. JO1, W2M, HJS, SFW, RJS, YLO, FCG, SNQ, RFO, and SDA on 144 Mc., and PWN. W3SHQ is operaing portable at 8.88 Mc., operated portable at the Grand Prix Automobile Road Race at Watkins Glen over a 6-mile course. The primary purpose was to report accidents, secure ambulance, and wrecker if necessary, and stop rail traffic. The secondary purpose was to serve as check points. Hats off to this gang, who ran two complete circuits of the race course, and operated portable at three locations.
We are very fond of fresh-opened Cape Cod oysters served raw on the half shell together with a small cup of tomato sauce seasoned with horseradish and tabasco. If you are an oyster-lover, you will know what we mean. If you have never tasted oysters, you should visit the best seafood restaurant in town without delay and try an order. Don’t try just one and mouth it gingerly and decide that that’s enough. Eat the whole order. When you have finished, you will either call for another plateful or declare that you never want to taste the awful things again as long as you live.

Perhaps radio receivers and oysters do not have much in common, but the point we are trying to make is that if you are a ham or an SWL and have never had a National receiver in your shack, you may be missing just the type of receiver performance that you have always wished for. Thousands of satisfied owners swear by their National receivers. Of course, a few swear at them, too, when failure of some component puts a crimp in the excellent performance they have come to expect.

All this tub-thumping is, we realize, quite out of line with the non-commercial type of article we usually present on this page, but we have always tried to give you helpful information here and our confidence in our product is such that we believe urging you to try a National receiver is asking you to do yourself a favor. Of course, if you do, it will not do us any harm either!

Changing the subject, we wonder if you fellows who bought NC-173 receivers when they first appeared on the market have noticed that this model as currently produced has ventilation openings in the rear of the cabinet. This ventilation is not the only change; a bi-metallic temperature compensating element is used in the H. F. Oscillator section of the tuning condenser with marked improvement in temperature/frequency characteristics. This arrangement was worked out during development of the more recent NC-183 and we felt it well worth incorporating in the NC-173.

When making this change, we realized that many owners of the earlier NC-173 would like to avail themselves of its advantages. We have, therefore, made available a modification kit carrying the designation VMK-173. The price is $6.75 and your National distributor can order it for you if he does not have it in stock.

Seth Gard, W1DRO
a new 3.5-Mc. half-wave antenna. His latest DX on 14 Mc. was on 144 Mc. and was heard by KWL. Ed is looking for a 14-Mc. station set up in the District to be some W6. KXU is using ICF at a minimum and that LFMI has returned to school in Miami. NBV/NGW has made the "supermarine wonder" by 设置 a new 14-Mc. beam. NUG has a new appointment as a Traffic Manager. YDJ has applied for OCS appointment. QVW has left Pittsburgh way, AER reports that HAT is experimenting with a new beam. HGP reports the "state of the art" during recent hurricane emergency. HPG reports the "state of the art" during recent hurricane emergency. HPG reports the "state of the art" during recent hurricane emergency.
Happy Christmas

BILL PETERSEN, WØJRY

PETERSEN RADIO COMPANY, Inc.
2800 W. BROADWAY, COUNCIL BLUFFS, IOWA
DIVISION LA.

ARKANSAS -- SCM, Marshall Riggs, W6JlC -- Well, boys, some of you have been complaining about the absence of news from Arkansas. Just to plain, I am not a newspaper editor and do not enjoy making sense coming out of nowhere. QRS is on 28 Mc. with 807 and is getting close to WAX. OJ has announced for 3.5 Mc. as has the rest of the County Club, and are on 3.5 Mc. We have lost JXC to the zero district. Sure will miss you, Doc. MRR is in the midst of completing 2010 rig. He has his 400 watt set, FB, Onslow, JJC, and JKC have a nice good luck with BC-654 on 3.85 Mc.

Mobile, the Ozark Net has been made a traffic net and member to PVB, and TQP are working hard in their VFOs. BAQ showed up on 4 Mc. with a good traffic connection. DIY and HOJ are hunting hugs.

RPE is trying out 2300 Mc. cavities and 10,000 Mc. tubes, BPE, and FBZ are turning in nice reports. FBZ and BPE tried throughs. NNC is back at Georgia Tech. CDA gets about one phone after an interval of several months devoted to operating. BFL, and KKG are working hard in their VFOs, and LAX, Stone County EC, and JXO, AEC, have announced the completion of an emergency plan for the guidance of Boone County. Our nets have been built up for the very near future. Regular drills are held each Wednesday at 5:30 A.M. LUX, Stone County EC, and JXO, AEC, have announced the completion of an emergency plan for the guidance of Boone County. Our nets have been built up for the very near future. Regular drills are held each Wednesday at 5:30 A.M.

LOUISIANA -- SCM, W. J. Wilkinson, jr., W5VT -- The PAM, SEC, and I are ready and willing to try and keep you informed. You fellows and girls posted on the doings around the section. Our still is holding down the PAM job, and our old reliable, KTE, is doing the honors as SEC. The RM post is still on the market. Won't some good old traffic man step forward and take this post. Be fair to us traffic men, and we will be fair to you.

It's a pleasant task and the experience will aid in the emergency set-up. BUR was a visitor during the month and a nice visit he made. LAX has called the attention of the fair in Germany, OXF is a new-comer in Shreveport. GRY is the new call of LYP. The Shreveport Club is planning a Charlotte to discus the future of the band. KRX is active and will QSP, BSF, your director, is interested in the fact and wants to hear from you. KRY is active on 7, 14, and 28 Mc. 50-Mc. stuff. FY5 is on 14-Mc. c.w. AEN is a new-comer to the DX 75, and EM soon will be fixed up for all the ham band operators. 14 to 3.5 Mc. VT is gradually getting the summer's accumulation of cobwebs from the rig, and will be pounding away in the very near future. If everyone would not send a little dope this time will do so next month we will have a very nice report for you. Traffic: W5KYK 2, VT 2, JPB 2, JKG 2.

OHIO -- SCM, Dr. Harold E. Stricker, W8WSW -- SEC: FCC, PAM: KAIH, RM: FCCU. The Chattanooga Amateur Radio Club provided amateur communications for the Ohio River Queen during the week of Sept. 19th. Operation was on 14-Mc. phone using the call DJ3A 4 and on 3.5-Mc. c.w. with the call JH4, 4, with independent installations, housed in a trailer. The Columbus Club's contest interest was shown by Fair visitors and a very good traffic report was received. Traffic: W8601G 3, PVB 3, JUP 3, UPR 3.
Take advantage of the small size and light weight of Pyranol® d-c capacitors for those applications in freezing temperatures and below. No need to penalize your designs with oversize capacitors resulting from the use of other dielectrics.

Pyranol capacitors, as improved in recent years, are not only suitable for operation at temperatures up to 85°C, but can also be operated at temperatures down to -40°C. Throughout this wide temperature range, the capacitance remains within plus or minus 5% of its 25°C value.

Here are some of the advantages you'll secure by using Pyranol capacitors—styles 50 through 69 like those pictured above—built to commercial standards:

- Size is smaller.
- Most commercial standard ratings can be shipped from stock.
- Pyranol is non-flammable.
- Like other G-E small capacitors, Pyranol commercial-standard capacitors are hermetically sealed in drawn cases—hot tinned for resistance to corrosion. They use the new silicone-gasketed bushing as insurance against leaks. They are all individually tested.

For specifications and details, ask for GEA-2621. Apparatus Department, General Electric Company, Schenectady 5, N. Y.
Now that mobile phone can be used on all amateur bands (except 40 meters) the TBS-50 & TBS-50A become more adaptable than ever before because it is ideal for use in automobiles, trucks, boats, camps, etc.

50 WATTS 8 BANDS
PHONE OR CW
(Class B. Modulation)
NO PLUG-IN COILS
80, 40, 20, 15, 11, 10, 6 and 2 METERS
(Completely wired and tested - not a kit)

Crystal controlled on all bands, yet requires no oscillator or multiplier tuning. Operates from AC pack or Dynamotor Supply for mobile work. New, beautiful black crackle finish.

TBS-50. Complete with tubes only $99.50

THE NEW TBS-50A
Incorporates a small three tube preamplifier with sufficient gain so that any high impedance microphones having an output level of approximately -50 db can be used.

TBS-50A, complete with tubes only $121.25

Send for catalogue describing Harvey-Wells Transmitters, Power Supply, Preamplifiers and Rack Panels

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For BOTH MOBILE & FIXED STATION USE.
With an E-V microphone, you assure accurate reproduction of your own speaking voice. The shading and warmth of your speech arrive at the other end of the QSO undistorted and undiminished.

Your carrier is modulated with your exact speech...the individuality of your voice is clearly retained...your personality is on your carrier.

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Crystal users appreciate the complete service James Knights Co. offers. If you have a special crystal problem, James Knights Co. is equipped to build crystals to your exact specifications—no matter what they may be. Because of a special production line for short runs, the price is right—whether you need one, ten, or several thousand crystals!

In addition, James Knights Co. fabricates a complete line of "Stabilized" crystals to meet every ordinary need—precision built by the most modern methods and equipment.

Fast service is yours, too. Two company planes save hours when speed is important. Your inquiries—and crystal problems—are invited.

... Send For New James Knights Co. Catalog

A large AIRCRAFT RADIO MANUFACTURER needed extremely small and light weight 3105 kc crystals. We designed and built one that weighed less than two ounces, now our Type H-17W.

The JAMES KNIGHTS Co.
SANDWICH, ILLINOIS

... 8:30 p.m. at Red Cross Headquarters, 644 Salmon Ave., Elizabeth. All ORS and prospective ORS are invited to attend. ZT schedules $235 twice daily, at noon and midnight. Transmitters: W0EJX 299, W0EJS 195, NED 195, JBA 80, MIV 38, OXL 25, BZJ 22, NXY 15, CQB 15, GJX 12, PHH 11, KMK 10, BRC 9, ZRA 7, WZDR 6, MJC 4, CFB 3.

MIDWEST DIVISION

IOWA—SCM, William G. Davis, W8BPP—The Tall Corn Net will be off to a flying start Sept. 19th. The Net has 25 active members and needs outlets at Iowa City, Clinton, Dubuque, and Ottumwa. Contact them on 3350 kc. at 0:15 p.m. through P.3. The Iowa 53 Net, Man, through P.3. The Iowa 25 Net, built

... The wonderful cooperation of Kansas amateurs during the past eight years will not be quickly forgotten. An earnest effort will be made to continue contact with all via signals from AWP. We regret to have to report the sudden death on Oct. 7th of Father Romuald Fox, ESL. He was a member of the University of Kansas and Notre Dame, and served the Ambrose community and received code practice while doing it.

The University of Missouri Radio Club has organized and selected GXT as station manager. CLT will be heard with a KH6 call and he hopes to make it permanent. QXO has a new 600 watt, Millen exciter driving a pair of HK2As, operating all bands from 3.6 to 26 Mc. The University of Missouri Radio Club has been organized with JHH as president, JIR as vice-president, SQA as secretary, and GKT as treasurer. The Club has a BC-501 at its disposal. The National Convention in Milwaukee was attended by DEA, OEP, SFA, ZAX, JHH, RMF, IZG, ZVK, and XKT. The Missouri Amateur Radio Club staged a successful ham picnic. Many out-of-town guests were present to help put the get-together over. NIIH is rebuilding a 28 Mc. rig and WAP is constructing a Clapp oscillator circuit for his 3.5-Mc. rig. GKT has a portable rig consisting of a 20-watt r.f. section and an 800-watt power section. He has an ASO operating at 7.15 kc, has a 48R and an NC-57, QMF is constructing mobile gear for 3.5 Mc. ARH is using 110 watts on n.f. Transmitters: W0CQB 138, SFA 54, WATR 54, WAPR 54, KEP 16, DEA 4, ICD 4, ORG 4, ARH 2, INK 2, EEE 1, QMF 1.

NEBRASKA—SCM, William T. Green—The Nebraska C.W. Net opened up on 3745 kc. at 7 p.m. CST with FQB, HYR, KJP, CON, LJO, OZC, PDH, BAL, and JDP netting a large number of new net members. TQI renewed ORS appointment. PREPARE FOR EMERGENCIES, JOIN the EC. Inquire at MLI, Kearney. We spent the summer rebuilding, PAM spent the summer rebuilding, FAM spent the summer rebuilding, PLUS VFO TA 40 buffer, and two "old ORS in push-pull," LFH, ZSC, ZED, LJO, and HRY started a mobile 3.85-Mc. (Continued on page 78)
Consider the advantages . . . and Eimac Variable Vacuum Capacitors become the essential component in modern circuitry.

- Extremely compact size reduces equipment bulk. Type VVC 60-20 is less than one-sixth the size of air-dielectric capacitors with similar ratings.

- Structural rigidity eliminates electro-mechanical vibration.

- Low-torque tuning mechanism.

- Unaffected by dusty or humid atmospheres. Ideal for industrial application.

- Capacitance variation is linear with shaft rotation.

- Low temperature coefficient. Negligible change in capacitance due to temperature variance. (0.004 mmfd. per degree cent.)

Eimac variable vacuum capacitors are immediately available. In addition to the type VVC 60-20 illustrated here, there are types VVC2 60-20 and VVC4 60-20.

**GENERAL CHARACTERISTICS**

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<thead>
<tr>
<th>Capacity</th>
<th>B.F Peak Voltage</th>
<th>Maximum RMS Current</th>
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<tr>
<td>VVC 60-20</td>
<td>10-60 mmf.</td>
<td>20 KV</td>
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<td>VVC2-60-20</td>
<td>Parallel 20-120 mmf.</td>
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<td>Split-stator 5-30 mmf.</td>
<td>40 KV</td>
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<tr>
<td>VVC4-60-20</td>
<td>Parallel 40-240 mmf.</td>
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<td>40 KV</td>
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caravan at Wahoo, with destination the Ak-Sar-Ben Radio Club picnic on the Storm farm, Omaha. LLS, LLY, and LJO represented the Hastings area. The ARC new members on the fourth day of the month. FOB conducts a weekend "log" class on 27 MC. Monday, Wednesday, and Friday. BVR is attending a meeting here with 28-MC rig. LLY is on 14 MC. BC-457. BRO is using 5-watt VFO on 7 MC. LZO has his WAB and WC companion. JZB and WVE operated 3.5-MC.

irc-tailgate at the State Fair. VJBP and VBO are at CAMF. CMBF is using the VHF radio, and VBO and VCB are at CAMF. Morales support while VXM recorded it on tape. JPI has new three-eleven 28-MC. He is using the "ring"-the tedious filing, tinkering with shaft inserts, accurately the first time. Just insert shaft, calibrate, and you avoid all that bother. The overall operation takes just a few moments.

IRC CONTROLS with DOUBLE-FLATTED, TAP-IN SHAFTS

Remember the last control you installed in your rig—the tedious filing, tinkering with shaft inserts, tiresome "build-up"? With IRC double-flatted tap-in control shafts you avoid all that bother. With the double-flatted shaft you can position for either set screw or push-on type knobs—match knob pointers with dial scale—quickly, easily, accurately the first time. Just insert shaft, calibrate, cut to proper length, and install knob. The whole operation takes just a few moments.

IRC INTERNATIONAL RESISTANCE COMPANY

401 N. Broad Street, Phila. 8, Pa.

IN CANADA: INTERNATIONAL RESISTANCE COMPANY LTD., TORONTO, LICENSEE

(Continued on page 80)
Smooth VOLTAGE CONTROL

WITH a load rating of 1.725 kva, the Type V-10 VARIAC will handle the complete voltage-control requirements of the average amateur station. Connected to a nominal 115-volt line, the VARIAC will deliver 115 volts output even if the line voltage drops to 95! Output voltages with the VARIAC are continuously adjustable from ZERO to 17% ABOVE line voltage.

As are all VARIACS, the Type V-10 is equipped with a dial direct-reading in output voltage in terms of 115-volt input. It provides absolutely smooth and uninterrupted control of a-c voltages; unlike the rheostat-type of control the output voltage of the VARIAC is independent of load.

The Type V-10 (illustrated) has a rated current of 10 amperes, a maximum current of 15 amperes and a no-load loss of only 17 watts. It is efficient, economical, long-lasting, remarkably smooth in operation, and moderately priced.

TYPE V-10 VARIAC . . . . . . $33.00

WRITE FOR "VARIAC BULLETIN"
Radio's newest, multi-purpose instrument consisting of a grid-dip oscillator connected to its power supply by a flexible cord.

**Check these applications:**
- For determining the resonant frequency of tuned circuits, antennas, transmission lines, by-pass condensers, choke coils.
- For measuring capacitance, inductance, and mutual inductance.
- For preliminary tracking and alignment of receivers.
- As an auxiliary signal generator; modulated or unmodulated.
- As antenna tuning and transmitter neutralizing power off.
- For locating parasitic circuits and spurious resonances.
- As a low sensitivity receiver for signal tracing.

**SPECIFICATIONS:**
- Power Unit: 5/4"; wide; 65/4" high; 7/5" deep.
- Oscillator Unit: 33/4" diameter; 2" deep.

**FREQUENCY:**
- 2.2 mc. to 400 mc; seven plug-in coils.

**MODULATION:**
- CW or 120 cycles; or external.

**POWER SUPPLY:**
- 110-120 volts; 50-60 cycles; 20 watts.

**MANUFACTURERS OF:**
- Standard Signal Generators
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- Phase Sequence Indicators
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**50 MC. TO 400 MC.**

**80**

grew VTO. BB, Wintrop EC, is a member of the National Emergency Net. Quite a few from this section attended the 11th Annual N. H. State ARRL Convention and Hamfest at Concord, N. H. The T-9 Radio Club held a meeting at HBQ's QTH in Derry, N. H. The Nashua Amateur Radio Club and the Brockton Amateur Radio Club held their first meetings. At the Eastern Mass. Amateur Radio Assn.'s first meeting, GW gave an account of the National Convention at Milwaukee and AEP, NLU, HIL, and SS, candidates for New England Director, spoke. "IA, in Fairhaven, has applied for ORS appointment. WU is on ESN and SSF when home and will have a new 1-kw. rig. AF has been on 3.85 Mc. phone with SCR-284A and voiced Mission for his 29th state. AVX, in New Bedford, is on most of our bands with a 1500, HQ-126X receiver, and VHF-152 converter. HB7 has moved to Tucson, Ariz. EY8 has a 2400-grid oscillator. 582A final on 144 and 220 Mc. EIT is on 141 and 14 Mc. Look for FL/VO2P1 on 14 and 28 Mc. AY6 is on 144 Mc. Q8B is playing chess with 2ULV and 2VUS. AY6 has two operating positions. BB has a windlass and keeps emergency batteries charged at all times. KTO is on 144 Mc. with 632 and "J" antenna. WS has moved to New Hampshire. AY6 has moved to Los Angeles. BW is living in Duxbury. DWO has now antenna for 7 Mc. RBK is keeping schedules. New officers of N Ray Radio Club are: PAW, pres.; BOD, vice-pres.; LNX, secy.; IRS, treas.; NXY, act. mgr.; JSM, chief eng. "CE is putting up three-element beam for 28 Mc. PAW has a BC-654 for emergency work. KNI reports a net on 50 mc. on Thurs. at 7:30 p.m. EURY is on 50 Mc. QNJ and QJ0 have EC link on 224 mc. The Newton Bridge League would like the gang to watch out on the last Sunday of each month from 5 to 6 p.m. with a little less QRM on 144 Mc. Give them a break, gang. 8R is new Dedham EC. QIE is working DX with Hammamulidi 4-20 on all bands. OLC's XTL, has the call ROL and QOP visited VE2FL in Edmonton and K7BL in Pullman, OMI, with AQG at the key, is on the ESN. JLY reports into the ESN. BHD is quite active in the U. S. Coast Guard Auxiliary and has a rig on under the call QPI. Traffic: (Aug.) W1EMG 19, AAL 10, (Sept.) W1QPIQ 91, TY 84, EMG 60, WU 57, QBP 40, AAL 30, LM 28, DWO 22, QOE 15, QES 12, LMU 10, RBK 7, BB 6, MJU 4, OMU 4, LOQ 3.

**WESTERN MASSACHUSETTS—SCM, Prentiss M. Biddle, W1CFF—RE. RYAN, W1XV—UD. PAM: NY.** BVR attended the ARRL Building Committee meeting and the National Convention in Milwaukee. NY spent two solid weeks of loading at ports on the Cape. EGG has a new Clapp oscillator and complete handswitching with broad-tuned double stages. JTY is full-dedged member of SNN. CCE has a new beam 60 foot in the air. The Haverhill County Radio Club became affiliated with ARRL. JYH handled traffic from Japan along with getting a few new countries. New officers of the Worcester County Radio Club are: EJD, pres.; QLP, vice-pres.; RIQ, secy.; LSL, treas.; MUN, act. mgr.; and JYH, publicity. PVF is a new member of WCRC. KP4DU visited the club. OZ vacationed in Pennsylvania. AMH has schedules with N. M. and Ohio. HAY is busy with school and football. In between times he is experimenting with a Clapp oscillator. GSS, now 2TFP, now is on 28 Mc. IH3 is active on both the e.w. and 144 Mc. JE is still using the Swing Shift Net. BVR is on with plenty of traffic. The Wachusetts Amateur Radio Club meets Monday, Wednesday, and Friday weekly! They have 55 active members—25 with tickets. BB has moved to new QTH. COI momentarily spurs radio for golf. He has a Harvey UHX-10 for sale. QJG has moved to Hatfield. BB has gone remote Recently he is on again with the coming of cool WX. BMT soon will be ORS. JLT will soon be in his new home. The Pittsfield Radio Club has purchased several necessary articles for emergency communications. HAZ is active on 28 Mc. and ties in with the Western Massachusetts HF Net. Traffic: W1E 189, BVL 20, NY 26, AMI 23, HLT 4, GJQ 12, IBZ 9, BDV 6, AZW 5, UT8 5, JYH 3, RDB 1.

**NEW HAMPSHIRE—SCM, Gilman K. Crowell, W1AQO—Our eleventh hamfest and convention proved to be one of the best ever, with an attendance of over 375 and 11 states represented. The outstanders of the day was the 144-Mc. treasure hunt run by CNX. After the dust had settled the four-element beam proved too much for the boys with the whip antennas. The code contest offered an excellent chance for those who wished to exhibit their skill. The set-up for this contest was very fine, thanks to IJB. JYH 3, RDB 1.**
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1. New design anode tabs cannot break from vibration.
2. Ample air space retained for gas expansion at elevated temperatures.
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6. Lower tab to terminal contact resistance for sensitive circuits.
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10. Increased FP anode ratio of 12 to 1 at 450V and 15 to 1 at 150V provides better design factors.

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I wish to thank the boys in this section for their election as SCM. I shall try to do the job as well as our former SCM, Clayton C. Gordon, JR, has done for the past thirteen years. That means some activity during the September section contest. With the ARRL section contest over, ARK set up a 522 atop the Journal Building and was in contact with WP2B. The NAARO was ready with emergency power and rig for the Red Cross Armory.

VERMONT—SCM, Burlis W. Dean, W7JHNO—RHQ, is Dick Black of West Pawlet. ROJ is John Wallace of Alburg, brother of PDR. RPR is Paul Laun of Burlington. PFX, FYT, and PZK have Class A tickets. FYO has the task of phone license. CAG is chief engineer at WILW. Your SCM won a VIE-P-16A at the New Hampshire Hamfest in Concord Sept. 10th. FRO has joined the last two. ROJ has just completed a 24-Mc. phone with HT-18, Atom-X and three-element beam. ORO visited MIO-L-WP2K, LFP, ZQD, PDR, PPM, PPM, and THQ. PZK has joined the Navy Reserve. GKA has joined Air National Guard as radar technician. The V4 Net operates on 3740 kc. Mon. through Sat. at 7 P.M. GKA and PSD take turns as NCS. It is a slow speed net and it would be nice if you fellows could call in one night a week. The 3.85-Mc. phone gang is forming a Sunday morning net. Traffic: W1P3D 24, EWF 2.

NORTHEASTERN DIVISION

ALASKA—SCM, August G. Hiebert, KL7PQ — The first annual meeting of the Norton Sound Radio Club was held in DJ's hamshack at Shaktokill. NL and QL arrived on the scene in a Cub Super Cruiser. Also present was JS, BD, of Moses Point, was contacted by 3.85-Mc. phone during the meet. The Norton Sound Net operates nightly at 9:00 Bering time on 3860 kc. and is always ready to handle emergency traffic. This net is interested in co-operating with the newly-organized Aleaskan Civil Air Patrol network. QL has had previous experience in that line, being the former Kansas wing communications officer of CAP. The Norton Sound meet was climax when the little Cub was flown by LN and QL over the Tundra a mile and a half from the end of the runway when taking off. It took the rest of the week and plenty of pine-needle work to float the plane on two 13-ft. boats lashed together and bring it back to the landing strip.

IDAHO—SCM, Alan K. Ross, W7IWO—Twin Falls. JMX has a wide-spaced 28-Mc. beam. LNO has working DX on 28 Mc. using an LM13 frequency meter for transverter. JMX is rebuilding the 10A. Radio is a VSWR 2.15. 14-Mc. cw. with input of 15 watts. MHI and MEJ are attending college. MMO is new station on 28 and 7 Mc. MEK is building new path-coupled VFO. The club entered the Northwest Division FCC manager at JMX's. Kendrick: MGI and MHR have new 100-watt VFO rig on 7 Mc. KIDV is on with new 350-watt all-band rig. Nampa: New ham is MTFP on 7 Mc. C7T is back on 28-Mc. phone and wants to contact old friends 2B6U, 8ANO, and 2FPC. Boise: New VLF ham is MTP at St. Teresa's. IWU eliminated car QRM on 3.9-Mc. Mobile job by using separate battery. LNC, of Moscow, paid me a visit. Drop in to see him. W7MOZ 27, LNC 14, WM 58, and always glad to meet you. Traffic: W7M2Z 61, EMT 27, LQ 17, IWU 12, JM1 7.

MONTANA—SCM, Fred B. Thimtinger, W7BGN — The Southern Montana Amateur Radio Assn. has resumed meetings and elected the following officers: MQI, pres.; LIV, vice-pres.; FIN, assy.; Emmett Oster, treas.; MKS, sgt. at arms. The club paper, FTV ts VFO, 14 and 28 Mc. FIN is edited by KGJ. New calls in Billings are KUH, MSU, MKY, MEB, MEG, MEN, LDN, MQI, and MKS. CT and KGJ are ORE and operate on L. "A" PTW is VPO 14 and 28 Mc. TIN has worked four VKs on 27 Mc. From Livingston, FGB says the FASR Net has returned to winter schedules and Larry takes the Montana traffic. The Old Faithful Radio Club has resumed meetings and plans an emergency program in conjunction with Western Union and Northern Pacific Ry. The N. P. Ry. has emergency power plants available. From the Hi-Line we learn that CBV has good results with new 28-Mc. dipoles. DZ6F is building 28-Mc. rigs and GLT is working 14-Mc. DX. CAL has been working out FB from mountain top around Lewistown, using SCR-274N transmitter and receiver, plus a put-put to drive a reheated dynamotor for filament and plate supply. HBM still is improving ART-13. JRM left for school in Billings. BXL visited FTO, PZK, and C1. PTW has acquired two new hams in Fuyallup Valley. The gang at the Valley radio club, at Fuyallup, are already working on plans to get a booth at the Fuyallup Fair for next year. MKG is now operator at Elma. CZY, our RM, is hard at work trying to line (Continued on page 84)
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The Webster-Chicago Model 78 Wire Recorder is a real asset in ham radio operation. It takes input from microphone, phono pickup or direct from your receiver. Outputs for external amplifier or speaker. Push button control makes Model 78 easy to operate while you are on the air, and provides all desirable recording, playback, and erasing combinations.

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up traffic outlets in Eastern Washington for WSNET, JC has ordered a 10-Mc. folded dipole. With this he intends to complete his 3.5-Mc. WAC. CKT still is high man in these parts as far as traffic goes. He must never sleep. ZU took two weeks off to visit his mother in the East. AF is getting ready for the winter traffic season. DRA has a big wallop on 3.5 Mc. and collects traffic for Tacoma on WSNET. HIC is back on 3.5 Mc. and 7 Mc. after a long vacation. "Cut" is remembered as an old-time Tacoma spark man. BG reports an FB time visiting old friends at the National Hamfest in Milwaukee. CWN is busy painting his house and moving into a new shack. FLY is back on the air after a long stay in the hospital and is busy getting ready to start publishing his WSNET Model News again. MFI is a man-prominent on the scene of the latest conversion he did at KKRO, FWD reports the war surplus pile has increased by CDM, MMK, TKV, KJQ, LVS, SXD, and JU. Stakes on 50 and 144 Mc. OPP directed the operations, MJ has his Collins 231B overhauled and operating. The SNARC's new officers are: MBQ, pres.; TFE, vice-pres.; Jim Ingraham, sec-y.; LBE, treas.; SXM, reg., and LUV, corr. sec-y. KJG has a 522 and 454 converted for 3.5 Mc. OPP is in charge of KTRAN. BVZ has an SC-4 in the going over to the BC-840. LBD and CDL are now on 28 Mc. SXD and HMO are on 7-Mc. c.w. JO runs a full kw. on 7 Mc. WVZ has new 129-X receiver and 4-11 rig. TJJ runs his schedules on 50 Mc. KLR has his 14-kw. station completed. Traffic: W7WZV 10S, TJY 21, HV 1.

PACIFIC DIVISION

NEVADA — SCM, N. Arthur Sowle, W7CX - Asst. SCM, Carroll Short, jr., 7BVZ; SEC: JU; EC: JLV, TJY, QYK, KZW, OPP, JWV, and KSR. DJV is back in Las Vegas. The Boulder City Emergency Corps is working for the communication with the Third Annual Lake Mead Sweepstakes on 50 and 144 Mc. OPP directed the operations, assisted by LDM, MMK, TEF, EJQ, LVB, SXD, and HMO. TJY had his Collins 251B reburbled and operating. The SNARC's new officers are: MBQ, pres.; TFE, vice-pres.; Jim Ingraham, sec-y.; LBE, treas.; SXM, reg., and LUV, corr. sec-y. KJG has a 522 and 454 converted for 3.5 Mc. OPP is in charge of KTRAN. BVZ has an SC-4 in the going over to the BC-840. LBD and CDL are now on 28 Mc. SXD and HMO are on 7-Mc. c.w. JO runs a full kw. on 7 Mc. WVZ has new 129-X receiver and 4-11 rig. TJY runs his schedules on 50 Mc. KLR has his 14-kw. station completed. Traffic: W7WZV 10S, TJY 21, HV 1.

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT - Asst. SCM, Geoffrey Almy, 6TBK; RM: CIS; EC: TEF, JLV. The SCCAR.A. held its first dinner meeting of the fall season include some very interesting meetings and social gatherings. The PARIA held its social get-together at Palo Alto. The club plans many FB meetings this fall under the guidance of JSB, the new president. ZJ has returned from his vacation in the East. Miles attended the national ARRL Convention and reports a very good time. JSB, now in Class A, is active on the Mission Trail Net. 3KNT, located at Sunnyvale, is new in the section at will be on 28-Mc. mobile for about a month while waiting for his equipment to arrive from the East. ISQ is working n.l.m. on 28 Mc. but reports that a poor antenna and a lack of contacts. The Monterey Bay Club spent Labor Day on Mt. Madonna, working portable rigs. WMJ reports that several of the Santa Cruz gang have worked out on BC-659s with good results. CIS enjoyed his vacation painting the house. Ken made an enjoyable trip to Vancouver, B. C., and met several VE7s. He now has his DXCC Certificate. WN1 has mobile rig on 3.85 Mc. ZID is working 28 Mc. with new beam. EC is knocking off DX on 14 Mc. FMM is working 28-Mc. c.w. YQN still is tuning his 26-Mc. beam. JRN now is working 28 as well as 144 Mc. ZUJ has been transferred to Chico. Look for Bob from that QTH soon. Traffic: W6WJM 82, CRS 2, ISQ 2.

EAST BAY — SCM, Horace R. Greer, W6TI - Asst. SCM, C. P. Henry, 6EJA; SEC: OBJ, EC: ARK, NNS, TIT, IDY, QDE, ZB, and WGN. Asst. EC u.f.: OJU; RM: ZM and FB. The following East Bay section hams were seen at the Southwestern Division Convention in Los Angeles on October 2nd & 3rd: TT, DUB, PB, MEK, EY, NZ, T1, RRR, EKB, and BF. New ORS and OBS is W6 of Richmond. News from the North Bay Amateur Radio Association shows that this club has plenty on the ball under the leadership of RRG, president. The East Bay Radio Club's paper is outstanding. For an organization that has been active for only a short time it truly is showing results. BF reports his HRS 7's are getting out very well. UT, the Oakland Radio Club station, is very active on the air and an FB job. DFR has not been feeling very well of late and might have to change his QTH. SJF reports conditions are very poor with a high noise level this month. MIL is program-promoting the Mission Trail Net still is looking for more c.w. stations. 2390 p.m. FDST, 3894 ke. QM now is knocking off traffic in EB style after a long summer layout. WIT is getting ready (Continued on page 86)
There’s a short but potent sentence in the Communications Act of 1934, as amended, which reads:

> The [Federal Communications] Commission, if public interest, convenience or necessity will be served thereby, subject to the limitations of this Act, shall grant to any applicant therefor a station license provided for by this Act.

Thus the fate of an application for a new broadcast station, for example, may depend entirely upon the applicant’s ability to demonstrate that his proposed station will operate in the "public interest, convenience or necessity." The phrase is so often used in Washington that it is sometimes shortened to "picon."

There is no space on the application form for an amateur station license, you may have noticed, requiring your proof of "picon."

Why not? For a very good reason:

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The “GONSET” 100%-R is a modulation indicator of the “peak flash” type which flashes a warning light whenever the peak modulation percentage exceeds a predetermined value even though the peak may be of very short duration.

Unlike modulation indicators using a meter, the “GONSET” 100%-R is actuated by and only by the peak modulation percentage regardless of how short the duration and regardless of the peak factor or form factor of the modulating wave.

The “GONSET” 100%-R does not require the undivided attention of the operator, such as with a cathode ray tube modulation indicator. It either flashes or it doesn’t.

The importance of these considerations is shown by the fact that modulation monitors for AM broadcast service must be provided with a “peak indicating light or similar device” in order to obtain F.C.C. approval.

A selector switch giving the option of 85% or 100% permits you not only to tell when overmodulation occurs, but also tells if the average speech level is up high enough.

The “GONSET” 100%-R is a must for adjusting a rig using a low level speech clipper. With it you can set the clipper threshold accurately in a matter of seconds. SEE YOUR DEALER

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for some winter traffic. OJW operates on all bands. At the Northern California Division Convention 21 was presented with a 9B wrist watch by the Los Angeles gang for his efforts as QSL Manager. UPF is just about through rebuilding. FXX still is the man about town and still is single. OSA hopes to become active soon. OJZ is looking for those interested in emergency work. The San Leandro, the Hayward, and the Richmond Radio Clubs are still in business.

The Mt. Diablo Radio Club and the SARO have not been reporting lately. No news has been received from the Mission Trail Net. AED is active again. HFQ is keeping schedules. "DON'T SHOOT TROUBLE ON YOUR TRANSMITTER WHEN TIRED OR SLEEPY." Death is a rare event of DX. If no one wants to work December 25, there are no QSLs from that faraway land. EW spent an FB vacation in Texas. EE is on 14-Mc. phone. MGK has new QTH in Walnut Creek. OLL is on 144-Mc. phone. ZF wishes to extend its best wishes to A. L. Bolding and wish him all the success in the world on his new job. Traffic: W6FDR 234, OT 102, QXN 50, YD1 84, SF 10, WI 10, J2X, J2A.

SAN FRANCISCO - SCM, Samuel C. Van Lier, W6NL - Phone JU 7-6457, SEC: DOT, CEC: BYS, WHL has returned from vacation in Nebraska and again is to be found pounding brass on 7 Mc. JWZ has been working hard to get 3.85-Mc. mobile rig going. MBQ has installed a TCS receiver and transmitter in his car and can boast of a 400-mile contact already on an experimental whip antenna. Many of the gang have been trying out 3.85-Mc. mobile gear and it proves to be very reliable for mobile work. From the Eureka area OZU has been trying a whip antenna for receiving with fine results while BOT has been concentrating on beam antennas construction. NAO took a vacation from hamming during the summer days. SLX is using surplus equipment. 0FIV is visiting in San Francisco. Another new-comer here is DQY, ex-3AE, 363WJ, 2CPZ. Norman was at one time SCM of Southern New Jersey. He is present with 18 states to date from his present location in Fairfax. He expects to be working schedules with the Eastern States on the lower frequencies this fall. From the Marin area, two new calls have been reported. EAX will be found on 28-Mc. phone. IQX, ex-21XQ, is chief engineer for KPOF/CO, on Mt. Beacon, Marin County. UPF has been back in Marin County this past month. LUM spent his vacation in Northern California this but was on hand for the Dipsea Race. He also spent the 15th, 16th, 17th, 18th, 19th, 20th, 21st, and 22nd in the Olympic Mountains. OZU is busy moving to a new location. ZXD now has a new call in San Leandro. DXV worked CPS, K17, KH6, and 16 states in three days on 7-Mc. cw. and now has the DX fever. KZU has been practicing with the "bug" lately and is thinking of going to c.w. again. MQQ is busy building a new home. GBW warmed up the rig again for the Dipsea Race. From the Hamilton Field gang: EOE, the Hamilton Field Club station, has been getting fine reports from its new four-element beam on 28-Me. phone. The club members report 80-Mc. signals are very scarce these days. They expect to have a 152A ready this month. KBO is ready for 3.85-Me. cw. and was used in the Dipsea race. FJJL is getting out well with his new beam. T6L is building 144- and 28-Mc. beams. EOE is building a new battery to give KD a little QRM. BCC spent a thirty-day vacation in C. D. DXL is using a BC-459 VFO, and says he is more helped by working DX than anything else. On 14-Mc. VPI, VP79, OZ5, and PB9 on 14-Mc. cw. He still needs Europe for WAC on 7 Mc. Stand by for traffic on 28-Mc. field soon. OEI has been showing there already are two different kinds of 220-Mc. mobiles, each with assorted prizes. The San Francisco Radio Club held its monthly meeting Sept. 24th. The speaker of the evening was Mr. Oliver Wright, A.T. & T. Engineer, who spoke on "antennas." He also gave a demonstration of the effects of varying antenna length, matching impedances, and standing waves on a feed line. The picnic held at Flood Park, Sept. 1st by the Electronics Division of the Hunters Point Naval Shipyard was sponsored by the San Francisco Radio Club. The Marin Radio Club meeting was held Oct. 8th at the College of Marin, Room 30, Engineering Bldg. The speaker of the evening was Mr. G. G. Villard, jr., Stanford Engineering Dept. His topic was "New Developments in Single Sideband Transmission and Reception." Traffic: W6FDR 143, JWP 59, GQ 10, W6S 90, W6L 11.

SACRAMENTO VALLEY - Acting SCM, Ronald G. Martin, W6Z6L, asst. SCM, SCM, Ray Jensen, 6Z82B, SECs: Heath, KME and K, RM: RER, OBR: IPV, Our first story for this month is RER with 2443 messeges handled. IPV handled lots of California fair traffic and experimented with fast phase modulation on 144-Mc. ABB moved from the East Bay to Sacramento Valley section. 1Y has moved from Dixon to 1V2 Collister St. WCH, FA, shortly will leave for K56 Land. WRD is new president of SACR. ARK reports the Mt. Shasta Hamfest, held at Mt. Shasta City in mid-September, was a big success. MR now is in new QTH at Red Bluff. J2L 76 is building an exciter unit but gets on at BCI's station occasionally. M1W has gone back to 144 Mc. BHY helped handle California fair traffic on 28 Mc. JDN is new QSO for 144 Mc. and KB7 at Dunsmuir, and (Continued on page 88)
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HiVolt Supplies are self-contained in hermetically sealed metal containers. They are designed to transform low voltage AC to high voltage—low current DC.

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**Amateurs! Here's your opportunity to own a high quality Signal Shifter at a real saving!**

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The new MEISSNER FMX PHASE MODULATOR is designed for quick conversion of the Signal Shifter to NBFM phone. The deviation control allows a swing of 5 to 10 KC at 28 mc. Input for high impedance crystal or dynamic mike is provided. Any Class C amplifier that the Signal Shifter is capable of driving becomes a remotely located unit. Plate and filament voltages for the FMX are secured from the SIGNAL SHIFTER power supply. Tubes required: 6SJ7, 6SL7 and VR-150.

**Model FMX PHASE MODULATOR, complete, less tubes, Amateur Net... $12.00.**

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**SIGNAL SHIFTER KIT, Part No. 10-1207... $49.75.**

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Greatest Advance in V.O.M. History

**TRIPLETT Model 630**

$3750

Dealer Net

Adapter Prod For TV High Voltage Tests Extra

**TECH DATA**

<table>
<thead>
<tr>
<th>D.C. VOLTS: 0-12-60-300-1200-6000, at 20,000 Ohms Volt</th>
<th>A.C. VOLTS: 0-12-60-300-1200-6000, at 5,000 Ohms Volt</th>
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<tbody>
<tr>
<td>D.C. MICROAMPERES: 0-60 at 250 Millivolts</td>
<td>D.C. MILLIAMPERES: 0-1.2-120, at 250 Millivolts</td>
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<tr>
<td>D.C. AMPERES: 0.12, at 250 Millivolts</td>
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<tr>
<td>OHMS: 0-1000-10,000, 44 Ohms at center scale on 1000  Ohms scale, 44 Ohms center scale on 20,000 range</td>
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<tr>
<td>MEGOHMS: 0.1100 (4400-440,000 at center scale)</td>
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<tr>
<td>DECIBELS: +20 to +44, +46, +50, +56, +70</td>
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<tr>
<td>OUTPUT Condenser in series with A C Volt ranges</td>
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A completely new Volt Ohm Mill-Ammeter that does more... has proved components... and will give a lifetime of satisfaction.

**NOTE THESE SENSATIONAL IMPROVEMENTS**

★ Beautiful Streamlined Instrument.

★ Large 5½ Inch Meter In Special Molded Case Under Panel.

★ Resistance Scale Markings from .2 Ohms To 100 Megohms— Zero Ohms Control Flush With Panel.

★ Only One Switch—Has Extra Large Knob 2½” Long—Easy To Turn—Flush With Panel Surface.

★ New Molded Selector Switch—Contacts Are Fully Enclosed.

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For complete information and technical data write

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**BLUFFTON, OHIO**

In Canada: Triplett Instruments of Canada, Georgetown, Ontario
work on the emergency set-up for the section and the emergency net on 3525 kc. You are asked to cooperate in this work. You should become a part of this group. Would like to say thanks to the Charleston Club for a steady hamfest and a good time at the Alans on Sept. 5th. Traffic: W4ANK 69.

VIRGINIA — SCM, Victor C. Clark, W4KFC — Activity in the two Virginia nets is reported excellent by IPC, FV, JCV, JAR, JDB, JFU, JMX, JOS, KJT, KAO, KRV, KVM, KVE, LPP, LRO, MIZ, MML, MXX, NIK, NNI, NPG, NPO, NXP, and SU and on the phone nets, 3580 kc. CLD. SH, SU, JBG, JIZ, JOQ, IPO, JPS, IWA, IYK, JAD, JAC, JAF, JCA, JDB, JFU, JIV, JMX, JOS, KAA, KAO, KRO, KVS, KVM, LPP, LRE, LSJ, MAR, and LRF. Drop around and identify yourself on either net and qualify to receive the FB Section Net Bulletin being put out by Assistant SCM KJD. The c.w. nets meet at 2000 IST Mon. through Fri., the phone nets at 7:30 P.M. same days plus a rag-chew session starting at 2:00 P.M. Sun. New officers for PVPO are: VE1, pres.; 2FTC, vice-pres.; 3WU, secy.; 4Y4, treas. and NNN, asst. mgr. The Fulls Church Amateur Radio Club hold an FB hamfest Oct. 16, including demonstrations of the usefulness of ham radio for the benefit of non-bias guests and participation in the National Emergency Tests. SEC EDY calls for more EC volunteers and lists the following as current active ECs: AJA, FV, AKX, IQQ, LPP, KAO, KAV, and KYW. New appointees: FF And EM, both ORS, KVM in Virginia merged with IKA as JRK. Joe lives at KJD's house, CLD will record your signal and play it back to you! VE and DHZ sent in cards for DXCC. The Ocean View Amateur Radio Club, reports that SCR-299 was obtained by the club on a loan basis from the Navy for emergency work. IQQ is a student at VPI. JQ moved and PCAR is now comfortably reaccommodated in his new net old Point Comfort. HJC has worked 117 locals and 154 miles in Norfolk. GEJ is redecorating his shack. MQM has his new 14-Mc antenna about concludes the task of moving up.

WEST VIRGINIA — SCM, Donald B. Morris, WSJM — The MARA elected the following officers: KW, pres.; GGE, vice-pres.; FMU, secy.; Mathews, treas.; JM, asst. mgr. GGF, GSP, and OXO are doing a bang-up job as NCS for W. Va. 3770 Net. Our sympathies to DCO on the loss of his wife after a very short illness. The Clarksburg amateurs have organized a radio club and have HUG as the outlet on the West Virginia Net. OJH has new mobile 26-Mc. rig. EBG has moved to Ohio and BSQ has settled in Clarksburg. PZT has 1-kw. e.w. rig going on 3770 kc. After a long absence BOK is rebuilding for 3.5-Mc. c.w. operation. Northern West Virginia amateurs held their annual freeze-out party high in the Preston County Mountains with an SCR-299 being used as the transmitter on 3.6 and 7 Mc. The PAC post is opened to any interested active for $1.00 per year. The amateur was interested in an excellent newspaper report on their coverage of Army Air Forces training hills were used for broadcast over WPDX, R.C. station. BTO reports work is interfering with ham radio. New amateurs are: Morgan White—5RV, FV, 12. VE 10, OLD 4, KJT 1.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, M. W. Mitchell, W6IGZ — This being my first report as your SCM, I wish to take this opportunity to thank all those who supported me in the election. I wish to specially thank WD6BD, QYT, your former SCM. who so willingly gave considerable time to acquaint me with the many duties of the SCM business. I would like to use this opportunity to thank all Colorado amateurs who have made reports in early order that they may arrive before the seventh of the month. The more cards the better. If you need report cards, drop me a line and I promise to shoot them out immediately. I need the reports, follow, and your help will be greatly appreciated. OEV says he has quit building his new beam because of the high prices of materials. WO developed a three-band antenna that is pretty hot on 14, 28, and 52 Mc. EDF have 14-Mc rig on 27 Mc. and will try to get FM on 27 Mc. with 11 Watts input to a pair of ECs. AVD is rebuilding to higher power with an 810 in the final. He plans working 14 and 28 Mc. EFP has a 14-Mc rig going on 27 Mc. from the air. Having recovered from his recent marriage, A. Very Merry Christmas to you all! Traffic: W4CC 29, KFC 23, FY9 19, VE 16, GD 4, KJT 1.
When the "heart" of the tube is a Speer Graphite Anode, you are sure of these advantages:

• 200-300% higher power rating over most metallic anodes.
• Greater tube stability — Speer anodes keep their original characteristics; will not warp, even over the 200 megacycle range.
• Because they operate at lower temperatures, graphite anodes outlast metallic anodes, even when usage is severe and continual.

Graphite anode tubes are widely used for diathermy, ultra-high frequency, short wave and FM transmitters; for motor control, electrostatic precipitation, resistance welding, electronic heating, counting and sorting. When you buy tubes, ask for the one with the graphite "heart."
Newark All Channel TV Antenna

Save on your TV installation by using Newark's new sturdy, high quality 13-Channel TV Antenna.

High frequency unit mounted above low frequency. Both use "Hairpin" type dipole - with reflector for high gain.

Complete with 6 foot aluminum mast, hardware and instructions. Shpg. Wgt. 10 lbs.

Cat. No. A-30400

Special

$3.83

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RCA 630TS CHASSIS—Heavy steel, plated chassis, completely punched and formed for RCA 630TS 10" TV receiver, with 4 brackets. Fits all RCA components. Overall 19 x 16 x 4" H. Shpg. Wgt. 10 lbs.

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Power Transformer — Equivalent to RCA 20176 as used in 630TS 10" receiver. (Reg. $27.00). Shpg. Wt. 18 lbs.

No. 5-836

Very Special

$14.95

Vertical Blocking Transformer — Completely shielded. Very efficient at 60 cycles. No. 5-827

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Horizontal Blocking Osc. Transformer — Sturdy. Channel mix efficiency is highest at 15,750 cycles — the repetition of horizontal sweep. No. 5-764

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Terrific Television Buy! Tech-Master 630TK 10" Kit

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Complete with 30 RCA Tubes including 10SP4

This is exact copy of famous RCA 630TS Television set. Contains efficient RCA front and 13-channel tuner — completely factory wired and aligned. Can substitute 12" or 15" tube for 10SP4 if desired. Dual controls for picture and FM sound, and for horizon, and vert. control. Kit supplied complete with 30 RCA matched tubes, and RCA schematic and service manual, but less wire, solder, and mtg. screws. Shpg. Wt. 85 lbs.

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Your Cost $198.50 $39.70 down, 12 months at $14.03

Hand Rubbed Walnut Cabinet No. A-19753

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Newark made a fortunate purchase from a world-famous manufacturer of test equipment! Now you can afford the scope you've always wanted. This oscilloscope has many outstanding features not found in run-of-the-mill instruments — such as: built-in light shield and removable graph screen, sweep frequency 10 cps to 60 kc. Sine wave response of vertical amplifiers ±10% from 10 cps to 60 kc.

High Voltage, High Current PLATE TRANSFORMER

Rugged unit is ideal for medium power phone and CW transmitter. Designed to deliver 1345 volts AC, each side, CT of 500 Ma., from 110 V, 60 cycle source. Will operate for many hours without "cooking." Primary tapped for 105, 115, 125 V, 6.6 W x 9.5" L. Screw terminals on bakelite board. Inverted type mtg. Wgt. 67 lbs.

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Multi-Filament Xformer

Perfect filament transformer for most medium power rigs. Used with plate xformer (above) provides basis for swell power supply. Tapped primary: 105/125 volts, 60 cycles, 6 separate secondaries: 3 windings 6.4 V @ 8 Amps., 2 windings 2.6 V @ 2.5 Amps., 1 winding 2.6 V @ 10 Amps. Will easily handle pair of 866 rectifiers plus all other tubes in Audio and RF sections of rig. Inverted flange mtg. 4 1/2 x 5 x 5/4" H. Wgt. 14 lbs.

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6.3 V Filament Xformer

Channel Mtg. 2 1/2" between centers. 6.3 V @ 1.2 Amps. Used with regulated power supplies. Pri: 110 V — 60 cycles. Wgt. 2 lbs.

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68c

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Famous Make 3" SCOPE
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Save $30.50

Newark made a fortunate purchase from a world-famous manufacturer of test equipment! Now you can afford the scope you've always wanted. This oscilloscope has many outstanding features not found in run-of-the-mill instruments — such as: built-in light shield and removable graph screen, sweep frequency 10 cps to 60 kc. Sine wave response of vertical amplifier ±10% from 10 cps to 40 kc. Gray cradle cabinet 14 1/4" D, 8" W, 14 1/4" H. Ships wt. 30 lb. Cat. No. A-2. $16.00 Down — 12 Months at $5.97

BY-LINES... by
Bob Gunderson

W2JIO
CONVERSION OF BC606A, 40MA, 40MA, 457A. Remove the 50,000 ohm cathode resistor from the 1939's and replace it with a 200 ohm, 10 watts. The screens and plates are brought out to separate B+ terminals. Ideal, all relays are removed and a 12 volt dc relay keeps the oscillator B+ live. All terminals are brought to be a 6-612 socket. No 612. Antenna circuit is modified as follows: the rectifying section is essentially a 6AG7 tuned amplifier. Output of this is applied to a 6SL7GT, power speech amplifier. 11 watts audio output, High impedance, mike input, 6SK7, 5U4G, 6C5, 2-7C5LT. RCA. Will Play or record on either 33 1/2 or 16 2/3 r.p.m.. RCA. $43.00

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with NO LOSS of
AUDIO RESPONSE


- 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.

ONLY $275.00

(Price subject to change without notice)

For complete information on the single sideband selector write: General Electric Company, Electronics Park, Syracuse, N.Y.
HOW TO ELIMINATE HIGH GAIN AMPLIFIER NOISE

Perhaps you have worked one of those Hams who turned the gain “wide open” on his speech amplifier and then wandered around the shack while in QSO. Perhaps you also noticed a high hiss level on his carrier.

This high hiss level was probably caused by a noisy carbon resistor in the plate circuit of the first speech amplifier tube. Turning up the gain on the speech amplifier to boost the very low output of the microphone made this hiss noise noticeable. Replacing the plate load resistor with an Ohmite 84 Series “Riteohm” wire-wound resistance unit equal in value to the carbon unit will eliminate this source of noise.

CHANGING ANTENNA TUNER COIL INDUCTANCE

If you have the problem of changing the inductance of the coil in your antenna tuner, Ohmite has the answer. The Ohmite Band Switch T-503 has been especially designed for high-frequency and high-voltage applications. Each switch has three contacts so three bands may be covered. Two or more switches may be ganged for “single-knob control.” For radio frequency application, the switches should be mounted on insulated supports to reduce stray capacity to ground. Shown is a Pi-section tuner using the T-503 Switch.

HAVING TROUBLE WITH NOISY POTENTIOMETERS?

How many times have you replaced the volume control on your communications receiver or the XYL’s Kitchen B. C. Set in the last three years? If you want a permanent cure for this trouble, Ohmite has a composition potentiometer in which the noise level becomes less with use. These units have a molded composition element that will provide years of life and smooth operation. The potentiometers are rated at 2 watts and carried in stock in all popular resistance values with a linear taper. Clockwise and counter-clockwise log tapers are also available. See your Ohmite distributor for this rugged potentiometer, Ohmite Type AB.
Sensational Value!

NEW ALLIANCE

"Tenna-Rotor"

BEAM ROTATOR

- 360° Rotation at 1 RPM
- Remote Control
- Supports up to 25 lbs.
- Starts, Stops or Reverses at any point

Here's a perfect Beam Rotator for Amateur or Television Antenna. Priced amazingly low! Never before so many desirable features at such low cost! The "Tenna-Roto" is remotely controlled from a compact, single-knob control box. Turns a full 360° at 1 rpm and supports up to 25 lbs. Instantaneously starts, stops or reverses direction at any point—automatic stop after complete revolution indicated by light on control box. Has heavy duty motor and gear train in sturdy, light weight, water proof housing. H主播 most of his time at Pt. Mugu. YTH is busy with his 28-Mc. mobile rig. DXR, CFQ, DN, and DAS have made some contacts. RG has some time on 3.85-Mc. 'phone. HBE is 'phone, 3865 kc. The 3515-kc. Net meets at 8 P.M., 3552 kc. Net at 7 P.M. Merry Christmas and Happy New Year everyone. Traffic: W7LPA 65.

ARIZONA — SCM, Gladden C. Elliott, W7MII — MOA is operating portable on 28 Mc. at Kankakee, Ill. GYK has his Class A license and is on 3.85 Mc. PEY has a new 3.85-Mc. rig and 28 Mc. W7MII ran his DX up to 7 countries. New ECA: Tucson, LLO; Phoenix, JMS; and Casa Grande, RJN. The following attended the Southwestern Division Convention: W7RE, W7GJ, W7GK, W7MII, W7AM, W7IO, W7OA, GYK, KM, WA, and W7DK. They brought home 7 prizes. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc. e.w. and reports FB results. UOG spent his vacation with a 28-Mc. mobile rig in California. MIB is a new Tucson call. Present now, seven hams: KQ7, W7A, W7AM, W7OA, GYK, KM, and WA. LF8 has a full twp on 14-Mc.
How Much Competition Have You ... For Your Present Job—For a Better Job?

Again employers can afford to be "selective", particularly when there are thousands of new, ambitious, young men who have entered the radio industry since the war. This means you must improve your technical knowledge not only to qualify for the better job you want, but to hold the job you now occupy.

Your own success in radio depends upon the effort you make now to fortify yourself with modern technical training. You may have "gotten by" up to this point. But, if you are like some radiomen, many wartime and postwar technical advances of the industry have passed you by. If you want to progress with the industry ... if you want an important, good-paying position and future security — you must acquire up-to-date technical training.

We invite you to investigate the CREI proved program for professional self-improvement for which thousands of radiomen have enrolled since 1927. CREI can help you by providing down-to-earth, practical technical training that should equip you to advance to the better-paying radio jobs that offer security and happiness. CREI home study courses can equip you to step ahead of competition.

CREI courses are still available at pre-inflation prices, and today give you more thorough instruction service per dollar than ever before — on convenient terms. The facts about CREI and what it can do for you are interestingly described in our 24-page booklet. Send for it today.

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Mail me your FREE 24 page booklet.
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☐ PRACTICAL RADIO-ELECTRONICS ☐ TELEVISION
☐ BROADCASTING ☐ RECEIVER SERVICING
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Street ........................................
City .................................. Zone ... State ............
☐ I am entitled to training under the G. I. Bill.
make HENRY your HALLICRAFTERS TELEVISION HEADQUARTERS

We stock all Hallicrafters receivers and transmitters and allow the greatest liberal trade-in allowances. That's the best proof of why we are the world's largest distributors of short wave receivers.

Hallicrafters TV 7 in. You can afford this low-cost high performance set. 18 tubes, plus picture tube and 4 rectifiers, push-button tuning, covers all 12 TV channels.

- Model T-54. Functional "airrodized" silver gray steel cabinet, only .......... $189.50
- Model T-505. In hand-rubbed blond or mahogany finished wood cabinet, only .................................................. $199.50

Hallicrafters TV 10 in. Amazingly new and low cost. Sharp pictures sparkling with contrast. 19 high efficiency tubes, 3 rectifiers. Push-button tuning on all 12 channels.

- Model T-61. Smart ebony plastic table model cabinet, only .................. $289.95
- Model T-67. Hand-rubbed rich mahogany finish cabinet, only ............. $295.95

Hallicrafters TV Projection. New Hallicrafters projection gives you huge 16" x 12" picture. You couldn't want finer TV performance or engineering. 12 channel push-button tuning.

- Model T-68. Period style hand-rubbed mahogany finish console .......... $695.00
- Model T-60. Less cabinet—for your custom-built installations ........... $595.00

Dear Bob, Please send me
- Hallicrafters TV Model __________ today.
- Enclosed is my $10.00 deposit balance C.O.D.
- More information on Hallicrafters TV.
- Catalog of Hallicrafters amateur receivers and transmitters.

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City: __________________ Zone: ______ State: ___________ Call letters: __________

Butler, Missouri

HENRY RADIO STORES
"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

11240 Olympic Blvd.
LOS ANGELES 25
CALIF.

100
BOB HENRY HAS IT IN STOCK AND OFFERS YOU A BETTER DEAL!

Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of amateur, FM, Television, Short Wave, Communications, Recording, and other radio equipment. I promise you lowest prices, complete stocks, quick delivery, easy terms, generous trade-ins. I promise that you will be satisfied on every detail. Write, wire, phone or visit either store today.

A FEW OF THE ITEMS I STOCK ARE:

- Collins 75A $375.00
- Collins 32V 475.00
- Collins 3108-1 190.00
- Collins 3108-3 215.00
- Collins 30K-1 1450.00
- National NC-57 89.50
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- National HFS 142.00
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- Hallicrafters 1118 189.50
- Hallicrafters 1119 110.00
- RME HF-10-20 77.00
- RME VHF-152A 86.60
- RME DB22A 71.00
- Hammarlund HQ129X 177.30
- Gon-Set 10-11 converter 39.95
- Stancor ST-203-A 44.70
- Hunter Cyclomaster 169.50

Millen, Sonar, Bud, Gon-set, Silver, Premax, Workshop, Amphenol-Mims; Jensen, Meissner, Browning; I have everything.

Some prices slightly higher on the west coast.

LOW PRICES
I guarantee to sell to you as cheap as you can buy anywhere.

COMPLETE STOCKS
Hallicrafters, National, Hammarlund, Collins, Millen, RME, Meissner, Meck, Gordon, Amphenol-Mims, RCA, Vibroplex, Sonar, all other amateur receivers, transmitters, beams, parts, etc. If it is amateur or communications equipment—I can supply it.

QUICK DELIVERY
Mail, phone, or wire your order. Shipment at once.

EASY TERMS
I have the world's best time sale plan because I finance the terms myself. I save you time and money. I cooperate with you. Write for details.

LIBERAL TRADE-IN ALLOWANCE
Other jobbers say I allow too much. Tell me what you have to trade and what you want.

TEN DAY FREE TRIAL
Try any receiver ten days, return it for full refund if not satisfied.

FREE NINETY DAY SERVICE
I service everything I sell free for 90 days. At a reasonable price after 90 days.

FREE TECHNICAL ADVICE
and personal attention and help on your inquiries and problems.

HENRY RADIO STORES
11240 Olympic Blvd.
LOS ANGELES 25 CALIF.
Trapezoid or Wave form patterns.
Compact-3" x
AC power supply, 60-cycle sweep.
Relay terminals for stand-by blanking.

- $10 HENRY 300 MA. CHOKE
A terrific bargain. Audio Development Co. high-quality 10 Henry 300 MA. filter choke. All black-crackle finish, new. 100 ohms DC resistance, very compact, 4¾" x 3½" x 4¾", 10 lbs. only. $3.50

- LAMBDA 2" SCOPE
Sensational new Modulation Monitoring scope with calibrated percentage scale.
Trapzezoid or Wave form patterns.
Relay terminals for stand-by blanking. Compact-3" x 5" x 10", uses 902, 6C4, built-in 110-volt AC power supply, 60-cycle sweep. COMPLETE WITH TUBES, INSTRUCTION BOOK $24.95

NEW MEXICO — SCM, Lawrence D. Walsh, WSSMA - SEC: ZM, RM; NXX: PAM; FAG. The LARAG held a Field Emergency Test the week end of Sept. 25-26. Stations in the field were NXX, MQG, GXU, ZM, and OMR. Stations participating from home QTH were SMA, OXC, AFU, and UFA. The 80-meter C.W. Net on 3075 kc. was activated and NXX was elected RM. The 75-Meter Phone Net is presiding FR. Stations calling FR were SMA, OXC, ZU, HF, BIW, OXC, GXU, and SMA. RP+473/8 has rig on 7- and 14-Mc. phone and c.w. from Fort Stanton. FAG reports that the Albuquerque ARC gang continues to hold schedules on Wednesday and Thursday evenings, trying to work El Paso on 144 Mc. Frequency is 145.8 Mc. EL will be on on 50 and 144 Mc. with sixteen-element beam. KL's active on 28-Mc. DX. HSO has a new beam. LGB has 112 counties now. LYQ is encasing his rig to protect it from the rain. KBD may be seen on 3.5 through 435 Mc. OXQ is doing better on 3.5 through 435 Mc. GL has active on 28-Mc. DX. HSO has a new beam. LGS has active on 28-Mc. DX. HSO has a new beam...
NATIONAL NC-57

- 540KC — 55MC continuous tuning in five bands
- Direct calibration on main and electrical bandspread dials
- Self-contained power supply and loudspeaker

Famous NATIONAL performance features... at a reasonable price... make this an outstanding all-purpose receiver value. Extreme stability, high selectivity, automatic noise limiter, BFO, RF trimmer, and bandspread tuning provide satisfying amateur operation, yet the basic simplicity of control makes this an ideal receiver for general household use. And its smooth, clean lines please the eye wherever this modern receiver is installed. Price, including a full set of nine tubes, $89.50

On our "play as you pay" terms, $17.90 puts the NC-57 in your ham shack.

A RARE BUY in VHF GEAR

SCR-522 XMTR-RCVR

The ideal set for 100-156 mc work... receiver is 10-tube superhet with 3-microvolt sensitivity... 7-tube, 15-watt xmr. Used, but very clean. With full set of tubes. Price only $33.95. Conversion and schematic instructions included. Available separately 25c per set.

Spare 832's for SCR-522... $2.65 each

AMAZING TRANSFORMER VALUES

Going fast... but limited quantities still available. ORDER NOW!

A. Power Transformer — Pri. 110 v., 60c. Sec. 420 — 360 — 80 v., 250 mils. Fil. 6.3-5.25 v. All C.T. $3.69

B. Bias transformer Type U3883 — pri. 115 v., 60 cycles; sec. 215 v. CT 300 ma, 5 v. CT 6 amp. Size 5½ x 6 x 4. Weight 9½ lbs. $13.99

C. Bias transformer Type UX912A — pri. 115 v., 60 cycles; sec. 280 v. CT 1.2 amp. Size 4½ x 5½ x 6½. Wt. 15½ lbs. $13.99

D. Dual Section Choke Type WXS148 — each section 1.75 Hy., 250 ma, d-c res. 42 ohms. Size 6¼ x 3½ x 3½. Wt. 7½ lbs. 10/32 holes for mounting. 89c

AMAZING TRANSFORMER VALUES

Going fast — but limited quantities still available. ORDER NOW!

A. Power Transformer — Pri. 110 v., 60c. Sec. 420 — 360 — 80 v., 250 mils. Fil. 6.3-5.25 v. All C.T. $3.69

B. Bias transformer Type U3883 — pri. 115 v., 60 cycles; sec. 215 v. CT 300 ma, 5 v. CT 6 amp. Size 5½ x 6 x 4. Weight 9½ lbs. $13.99

C. Bias transformer Type UX912A — pri. 115 v., 60 cycles; sec. 280 v. CT 1.2 amp. Size 4½ x 5½ x 6½. Wt. 15½ lbs. $13.99

D. Dual Section Choke Type WXS148 — each section 1.75 Hy., 250 ma, d-c res. 42 ohms. Size 6¼ x 3½ x 3½. Wt. 7½ lbs. 10/32 holes for mounting. 89c

BC-929-A OSCILLOSCOPE

Priced for quick clearance $9.95

This 3-inch radar-type scope is readily modified to use as a modulation indicator or a panadapter. You can run it on 60 cycles by hooking a 150-watt lamp in series with the input to the 400-cycle power supply. Handy size — 8 x 9 x 14 inches. Complete with SCP-1 CR-tube, 2 — 6DEGT, 2 — 6SN7GT, and 1 each 666G, 6X6GT, and 2X2. Good used condition.
Quebec Division

Quebec — SCM, Gordon A. Lyon, VE2GL — QSO has been appointed SEC and is looking for EC appointees in Three Rivers district and Quebec City. TM now is OBS, BB is back on BBN, ESN, and TLS after vacation in VE2 Land. Getting his hands into the farm fields. NR has rig now operating but still is chasing few bugs although he is sending code practice. TR, AJM, and ACD newly equipped with a splendid BC-457 and BC-458. EBC reports daily schedules continue with RM, EV, AEH, AHN, OD, and AJB. While his XYL is overseas, LO is too busy watching it. For braided fishing, but he sends W1LW, VE3GM, and VE2BB regularly. AGG keeps pounding away on 7 Mc. from Drummondville and is planning QSY to 14 Mc. To see what's doing there. Efforts are being made to form a South Shore v.h.f. radio club. All v.h.f. and would-be v.h.f. hams are invited to contact LP or EC for contact. LP made first reported QSO between Montreal and Ottawa on 50 Mc. Activity on 50 Mc. Continues but reports are scarce. Since then in, please. GN reports that 144 Mc. Is extremely quiet. He suggests that instead of just listening that the boys do lots of calling. If everyone listens only there is nothing to hear. Contact him at PL 9211, local 217 or AT 4973 with news and to arrange schedules. Out-of-town stations should write him for schedules. MG has WC with 10 watts on 28 Mc. ACP is on 28 Mc. with 30 watts and two-element beam. Get those reports coming again. Traffic: VE2EC 23, LO 14, GL 6, BB 3, KG 2.

VANALTA DIVISION

Alberta — SCM, Sydney T. Jones, VE6MJ — Newly-elected officers of the NARC are: PV, pres.; VJ, secy.; EE, FB, LG, and KF, executive committee. HW works out well very well and is building his band 10 meter bands. The 10-meter band is in the outer edge of the dial. We have the complete kit in stock it's easy to install. Instructions furnished. Quantity is limited so order now. Available only from SREPCO.

STOCK NO. C-909A
BC-459 Calibrated Dial Kit
Add 20c for postage

$450 net

STOCK NO. C-909X
BC-457/458 Dial Kit
Add 20c for postage

$450 net

SCR-274N Components

TRANSMITTERS

BC-458 — 5.3 to 7 Mc. Brand New. Used. $5.95 ea.
BC-457 — 4 to 5 Mc. Used. $4.95 ea.

ALL the above transmitters are in excellent condition and covered with VE4RP taking over on 14 Mc. Brand is covered by F in MB. HA, a new one at The Pas, reports 35 contacts, including a VK4, his first month on. HB, another new ham, made his first contact using a BC-457. BB has an average of 30 contacts a month and thanks for reporting. LO is one up on RO - STMPHI. EA has his ICCI Certificate, GI and DP raised the power and have new beam working in Dauphin. AF is sending code practice. The power company for street lighting, XP blew modulation transformer and is on c.w. AW is on 3.85 Mc. occasionally, with 28-Mc. power on. SAO now is signing IW on 3.85 Mc. IX is working portable from McArthur Falls, Winnipeg District EC, an important call in the field. The boys do lots of calling. If everyone listens only there is nothing to hear. Contact him at PL 9211, local 217 or AT 4973 with news and to arrange schedules. Out-of-town stations should write him for schedules. MG has WC with 10 watts on 28 Mc. ACP is on 28 Mc. with 30 watts and two-element beam. Get those reports coming again. Traffic: VE2EC 23, LO 14, GL 6, BB 3, KG 2.

PRARI DIVISION

Manitoba — SCM, A. W. Morley, VE4AM — Winnipog now has OBS on all bands with VE4RP taking over on 14 Mc. Brand is covered by PF on 14 Mc. HA, a new one at The Pas, reports 35 contacts, including a VK4, his first month on. HB, another new ham, made his first contact using a BC-457. BB has an average of 30 contacts a month and thanks for reporting. LO is one up on RO - STMPHI. EA has his ICCI Certificate, GI and DP raised the power and have new beam working in Dauphin. AF is sending code practice. The power company for street lighting, XP blew modulation transformer and is on c.w. AW is on 3.85 Mc. occasionally, with 28-Mc. power on. SAO now is signing IW on 3.85 Mc. IX is working portable from McArthur Falls, Winnipeg District EC, an important call in the field. The boys do lots of calling. If everyone listens only there is nothing to hear. Contact him at PL 9211, local 217 or AT 4973 with news and to arrange schedules. Out-of-town stations should write him for schedules. MG has WC with 10 watts on 28 Mc. ACP is on 28 Mc. with 30 watts and two-element beam. Get those reports coming again. Traffic: VE2EC 23, LO 14, GL 6, BB 3, KG 2.

Strays

What's in a name? Vol 2, No 2

W0MSW and W0BCT are both named Coil. W0BB lives on Shields Ave. W0HCK lives on Hammond Ave. W0QI is appropriately named "W0QI". A toy "arrow" (wooden dowel with rubber suction cup at one end) is a handy gadget for replacing metal tubes in hard-to-get-at sockets. Newberry's has them at three for a dime. W0IRQ
BEAM ROTATORS

These sturdy, dependable units, manufactured at a cost of several hundred dollars each, to control the pitch of propeller blades, make an excellent beam rotator! Brand new, complete with detailed conversion and installation instructions. ($Mail orders add 90¢ each for packing)

- COUPLING UNIT: Thick walled dural tube 2½" OD x 8", precision machined. Top end threaded to take standard pipe fittings (or mast pipe up to 2½ OD can be inserted and pinned). Beam with coupling unit can be slipped into place after rotator has been mounted, and locked with a screwdriver. No machinery or welding required!
- Complete with special steel torque and locking pin, load bearing thrust pin, bolts and detailed instructions. $7.50
- STEPDOWN TRANSFORMER $5.95
- DIRECTION INDICATOR KIT (with special gear) $14.75
- SPECIAL OFFER — Rotator, with transformer and Direction Indicator Kit. $32.95
- Complete outfit - ready to install - rotator (fully modified) coupling unit, transformer, direction indicator (assembled and wired) less only cable. (7 conductor required) $47.50

SMASHING MULTI-METER BARGAIN!

5,000 Ohms-Per-Volt DC

Save over $13.00 on this fine instrument!

- OHMMETER: 0-5,000-50,000-100 Megohms (Reads ONE Ohm)
- DC VOLTS: 0-5-50-250-1,000
- AC VOLTS: 0-10-100-250-1,000
- OUTPUT METER: 0-10-100-250-1,000
- DC MILLIAMPS: 0-5-100-1,000
- DEGREES: Four ranges 3° to +5° DB
- ACCURACY: 1% of full scale

Plus these desirable features:
- Large 4½" x 2½" case
- X-Rayed tubes plus new rectifiers
- Special glass cover avoiding fogging
- Natural finish oak carrying case - 9½" x 7½" x 6½"
- FULLY GUARANTEED

HARRISON'S SPECIAL PRICE $17.95

Because of this sensational price slash, the manufacturer (who values this instrument at $31.50) has asked us not to mention their name but you’ll recognize the high quality.

HARRISON HAS IT!

MERRY CHRISTMAS
73, BIL, W2AVA
AND THE HARRISON GANG.
CRAZY LOW PRICES ON TOP QUALITY CONDENSERS

1) Hammarlund Type "HFD" Micro. Double spaced, 1500 volts, .030" spacing. Screwdriver slot for tuning, with shorting jack. Solid brass plate, gilded plated. Aluminum end plate mounted on isolating base. Has isolating center shield. Silver plated for contacts can be shifted to 3 positions for shortest possible leads. Made by Johnson. Type HFD15X, 16 max.-5 min., mmfd., 11 plates per section. Stock No. 144661, size 1 1/16 x 1 1/8 x 3". SPECIAL EACH..........$1.99

2) Hammarlund Type HFD30X, 25 max.-5 min., mmfd., 30 plates per section. Stock No. 144661, size 1 1/4 x 1 1/16 x 3 3/4". SPECIAL EACH.............$1.19

3) Johnson Type 207 Mmfd. Type 200FD20. 0.045" spacing, 2000 volts, 207 mmfd. max.-13 min. per section. No. 18A510, size 2 1/4 x 2 1/4 x 8". $10.00 List Value. SPECIAL EACH..............$1.95


5) Cardwell "Midway", 74 Mmfd., 19 plates air gap. 3000 volts. 12 plates. $5.00. No. 13A823, size 2 1/4 x 2 1/4 x 2 1/4". SPECIAL EACH............$1.45

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VFO Unit

(Continued from page 16)

mounted in the rear edge of the chassis. The output may be either capacitively coupled or link coupled to a following stage. The two power switches and the key jack are set in the front edge of the chassis.

Adjustment

The adjustment of the unit is very simple. The VR resistor, $R_a$, should first be set so that the VR tubes stay ignited with the key closed. VR-75s or VR-90s may be used, the higher voltage giving somewhat greater output from the unit. Then, the tuning condenser $C_1$ should be set at maximum capacitance. Listening on a receiver tuned to about 3400 kc., the oscillator padde, $C_b$, should be adjusted until the oscillator signal is heard at that frequency. The oscillator tuning should then cover the range up to a frequency slightly higher than 4000 kc.

The amplifier padder is adjusted by tuning the oscillator to the approximate center of the band and adjusting $C_4$ for maximum grid current to the following stage. If the coil dimensions have been followed carefully, the output should then be substantially constant over the entire band. The 1750-kc. output coil should be used in feeding a crystal stage normally using 3.5-Mc. crystals, while the 3.5-Mc. output coil should be used in cases where 7-Mc. crystals are normally employed.

The output from the unit as described was found to be sufficient to drive a pair of 807s directly as straight amplifiers at maximum rating at 3.5 Mc. Keying, even with appreciable lag in the keying circuit, is virtually inaudible when listening at 28 Mc., and frequency drift, even from a cold start, is negligible. The adjustment of output loading will have some effect upon frequency. Shorting the output terminals causes a change of about 500 cycles at 28 Mc. When the output stage is doubling frequency and somewhat more with 1750-kc. output. The tuning of output circuit of a following crystal stage changes the oscillator frequency a matter of a few cycles at 28 Mc.

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Life for Old Receivers

(Continued from page 10)

short length of coaxial line ungrounded and to use something other than a coaxial fitting for connecting the antenna. If your antenna uses 600-ohm line or tuned feeders, the best bet is a small antenna-tuning unit link-coupled through a length of RG-59/U to the converter input.

There is nothing sacred about the crystal frequencies used, other than to be sure that they have no harmonics falling within the signal-frequency range. For the crystals suggested in the coil table, the receiver tunes from 4 to 3.6 to cover 14 to 14.4 Mc. (yes, it tunes backward!), 3.375 to 3.825 for 21 to 21.45 Mc., and 3.5 to 5.2 for 28 to 29.7 Mc. The 27-Mc. band is also covered by the 10-meter converter, by tuning your receiver below 3.5 Mc. How you build the converter and what first i.f. (tuning range of your receiver) you will use will depend on the crystals you can dig up and the range your present receiver tunes. Using the second or third harmonic of the crystal should be satisfactory in practically every case. By careful selection of crystal frequencies, you can arrange things so that the band edges start at some even 100-kc. mark on your receiver, thus giving you frequency-calibrated reception (with the necessary mental correction factor).

Once you have enjoyed the advantages of stable high-frequency reception, it is unlikely that you will ever want to go back to the old-fashioned technique of drift-and-follow. You will also find out rather quickly which of your friends have the drifting signals and which ones are rock-steady. And knowing that your receiving system is about as sensitive as they come will remove some of those doubts that may have always been present. From there on, you can concentrate on the real secrets of DX reception: antennas and real estate.

V.H.F. Man’s VFO

(Continued from page 86)

be regarded as merely an approximation, and not relied upon for band-edge work, the calibration process may be carried out with the aid of any receiver having a reasonably-accurate dial. The 50-Mc. range, requiring the least padder capacitance, should be calibrated first. The trimmers $C_9$ and $C_{10}$ (mounted on the tuning condenser, $C_1$) should be set near maximum capacitance to provide the proper bandspread, approximately 55 divisions near the middle of the tuning range of $C_1$. The 144-, 28- and 27-Mc. ranges should then be set up, by means of their padders which are under the chassis.

Operation of the amplifier may be checked with a dummy load made up of two 250-ma. pilot lamps connected in parallel. With 300 volts on the 6AG7s the lamps will light to approximately full brilliance with the stages properly tuned. Once the proper settings for $C_9$ and $C_{10}$ are found, it is

(Continued on page 110)
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suggested that these points for each band be marked on the panel, so that they can be reset correctly at will. As the amplifier is somewhat overdriven, the settings will not be critical, and it will ordinarily be possible to shift frequency over an entire band without resetting these adjustments, if they are set up originally near the middle of the band in question.

Operation of the reactance modulator may be checked readily by monitoring the signal from the VFO unit in a receiver operating on the band in which the transmitter is to be used. Unlike amplitude modulation, which must be checked with the high-powered stages running at full input, n.f.m. may be monitored accurately in one's own station. There is really no excuse for poor-sounding n.f.m. — your own receiver will tell you how it is going to sound on the air, without any on-the-air or dummy-load testing. Start with the crystal filter in its broadest "on" position, and set the deviation up to the point where normal speech comes through cleanly, without roughness, as you tune down either slope. That is a good starting point for putting the rig on the air. It may be necessary to change the deviation slightly one way or another to satisfy different receiver bandpass characteristics, but you can't go far wrong with the above method. At least you will not be guilty of emitting the hash that is all too prevalent in n.f.m. operation as it is practised by some users.

If the reactance-modulator portion is not to be used, the r.f. section may be operated at voltages as low as 200 or less, and still provide enough output for most purposes. The speech gain drops rapidly at supply voltages under 300, but the r.f. output is adequate for use of the unit as a crystal substitute at much lower voltages. It was designed for use with rigs that normally operate on 11, 10, 6 or 2 meters, to serve as an f.m. exciter for the first stages of a rig for those bands, but, since its output frequency is 6.75 to 9 Mc., it may also be used for a.m. or c.w. work on 40 or 20, and for the new 21-Mc. band when that assignment is released for amateur use.

I.A.R.U. News

(Continued from page 81)

SWEDEN

The Sveriges Sandare Amatorer reports that its membership has more than tripled from its pre-war total, S.S.A. now having well above 1500 members, of which more than 1000 are licensed amateurs. The president of the society is Gösta Siljeholm, SM5SJ; the honorary secretary and editor of SSA's official journal, QTC, is Hans Eliason, SM5WL; and Ake Alseus, SM5OK, is QSL manager.

Postwar regulations for amateurs in Sweden, patterned after the United States FCC regulations, provide for three classes of radio amateurs: Class C, issued to qualified beginners between 16 and 18 years of age. Applicants are required to pass a simple test of their knowledge of the

(Continued on page 118)
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TVI Elimination
(Continued from page 55)

By adopting the measures listed above we have so completely cleaned up our 20-meter 'phone rig that we can look at any channel while the transmitter is on the air with 700 watts, despite the fact that the television beam aims right at the 20-meter beam. In fact, all our ham antennas, as well as the transmitter itself, are between the TV antenna and New York City, where all of the TV stations are located. This is the worst possible condition. The only difference between the 20- and 75-meter finals, aside from using a pair of 813s on 20, is the use of harmonic plate traps tuned to 57 Mc. The vacuum condensers not only helped a great deal in giving the traps a chance to do a good job, but made their adjustment much less critical.

Incidentally, to get a rough idea of how much harmonic output was necessary to disrupt a television program we built a low-power battery-operated oscillator using a 957 acorn, with everything except the coil enclosed in an aluminum box. The plate power input was measured at 0.2 watt. When tuned to 56 Mc. the oscillator completely blocked the program on Channel 2 at a distance of 20 feet. When tuned to 28 Mc. the second harmonic of the 0.2-watt oscillator will take out the picture at 10 feet. On 24 Mc. it will jam the picture if amplifier. Further tests along this line were made by building up a miniature "diathermy" oscillator using a 6J5 with 12 volts a.c. on the plate. The plate current was 0.5 ma., an input of 0.006 watt. This "diathermy" oscillator puts a black bar in the picture at 50 feet. The above shows how completely a ham rig must be "deloused" in order to prevent TVI.

Happenings
(Continued from page 35)

Sioux Falls, S. D.: Mar. 9, June 8.
Spokane: Apr. 27.
Syracuse, N. Y.: Jan. 6, Apr. 6-7.
Tampa, 410 Main P.O. Bldg.: By appointment.
Tucson, Ariz.: Some time in April.
Tulsa: Jan. 24-26, Apr. 21-22.
Washington, D. C., 2005 Temporary L Bldg.: Monday through Friday, 8:30 A.M. to 5 P.M.
Wichita: Mar. 10.
Williamsport, Pa.: Mar. 8, June 7.
Wilmington, N. C.: June 4.

HAMFEST CALENDAR

The next dinner meeting of the Quarter Century Wireless Asn. will be held on Friday, December 3rd, at historic Fraunces Tavern, Broad and Pearl Streets, New York City. John DiBlasi, W2FX, is president of the association, which now has more than one hundred members and is rapidly becoming world-wide in scope. Among the hams recently joining are the Honorable George B. Sterling, W3DF, of FCC, J. E. McDonald, VE3YV, Alfonso Pereyra, OA4P, B. J. Kroeger, XE1KE, and Ulises Maria, KP4AJ. Membership in this newly-formed social club is open only to present holders of amateur license who were active hams not less than 25 years ago. The dues, one dollar, are used only to defray mailing expenses.

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(Continued from page 48)

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HRO-7R .............. $192.50

S-38, AC-DC ........... $49.95
S-32-AC-DC-SW .......... $110.00
S-59, FM-AM chassis $49.50
S-55, FM-AM rec. .......... $129.50
SX-43, FM-AM-SW .......... $189.50
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Part of Sun Radio’s 1000 Sq. Ft. Sound-TV Studio, showing Table-Model Television Section.
ARRL Week
(Continued from page 49)

QSL reports from both parties to a QSO will be expected and must be received at ARRL by March 31st to be considered for this letter recognition! Mark “ARRL Week” on these or on project reports for Presidential examination.

GPR

The Governors-to-President Relay will be the first held in 12 years! You will enjoy hearing the relay in progress, and perhaps you can participate in handling one of the 48 messages! SCMs will designate “starting stations” in each city having a state capitol. Message filings for the President, to be delivered on the day of the inaugural, will be released for radio handling at 5 p.m. EST on January 19th on the frequencies deemed most appropriate. The Washington Radio Club advises by amateur radio that it will coordinate the effort of numerous amateurs and associated club groups to look for incoming messages in the receiving area. Messages bound for D.C. can be relayed to any of the stations on the job for this purpose. A listing of stations and frequencies will be given in the next QST.

The ARRL Member Contest

The week-end radio activity is a family QSO party for all licensed League members. It is held Saturday P.M. and Sunday, during the hours indicated in these rules. To get voice contacts one calls, “ARRL, this is . . ., over,” and, for c.w., “ARRL DE ... K.” Each member contact is credited by points and as new field-organization sections are worked each adds one to the multiplier. Members may be worked, wherever located, and they give name of country instead of section if outside the field organization—but only one section multiplier may be claimed for any or all member stations worked outside the field-organization sections that are named on page 6, QST. Within each field-organization section, to recognize competitive effort, there will be a call-pin award. Any amateur-assigned frequencies may be used, with results partly accomplished on voice, or part on c.w., or all one mode. Convenient forms will be furnished on request, but advance entry is not required.

An ARRL membership- and call-letter pin (gold border and lettering, with black-enamel background) will be awarded in each section with call of the winner engraved thereon.

Starting Time: Saturday, January 22nd, 3 p.m. PST, 4 p.m. MST, 5 p.m. CST, 6 p.m. EST or the equivalent time at any point.

Ending Time: Monday, January 25th, 12:01 A.M. PST, 1:01 A.M. MST, 2:01 A.M. CST, 3:01 A.M. EST, or equivalent.

Operate any 20 hours of the 33-hour party. State contest hours you did not operate if your score is over 20,000.

Contest Plan

Exchanges: In radiotelephone contacts the sec-
(Continued on page 120)
Our 26th Year

GREENLEE PUNCHES
Attention all Hams. Here is a Punch you've been looking for. It will cut a .020" Hole, perfect for the mounting of Meters. This Punch will cut up to .040" Thick Steel. $12.95
We also carry a complete line of Radio Chassis Punches in stock.

ISOLATION TRANSFORMERS
All 117 Volts to 117 Volts 60 Cy.
P-96, 40 watts. $3.60 P-98, 100 watts. $9.30
P-97, 80 watts. $3.10 P-99, 250 watts. $17.70

SELSEY MOTORS
15 volt AC 60 cycles. Transmitters only. Can be used to turn small beam antennas or as indicators only .3/8" diameter x .3/4" high. Shipping weight 10 lbs, Per Pair, Special. Per Pair...

WIRE WOUND POTENTIALMETER
100,000 ohm, precision made. G. r. t. p.
25 watt, 6" diameter.
Brand New...

$5.95

BIAS TRANSFORMER TYPE KS8779
Completely shielded, Insulator Terminals
Primary 115 Volts 60 cycle at 500 Ma.
Secondary 180 V. @ 20 Ma.
300 V. @ 20 Ma.
15 V. @ 1.2 amps. Special
5 V. @ 8 7 amps. C.T.
$1.95

ITEMS YOU MAY BE LOOKING FOR
Multiple Contact Telephone Type Relay
No. 882-2 windings 12,500 ohms. 49c
No. 881—Single winding 12,500 ohms. 49c
Heinemann 5 amp. circuit breaker........ 73c
Crystal Mike and Stand
No. P-97
P-96
Heinemann
$2.95

POWER STAT VARIABLE TRANSFORMERS
Type 20 115 V. Input, 0-135 V. Output @ 3.0 amps. 0.4 KVA...
$12.30
Type 116s mounted; 115 V. Input, 0-135 V. Output @ 77.5 amperes 1.0 KVA...
$23.00
Type 116U unmounted; 115 V. Input, 0-135 V. Output @ 7.5 amperes 1.0 KVA...
$19.00
Type 1126t 115 V. Input, 0-135 V. Output @ 15.0 amps. 2.0 KVA...
$44.00
Type 1226t 220 V. Input, tapped at 115 V, 0-270 V. Output @ 9.0 amperes 2.4 KVA...
$46.00
Type 115R 12 volt, 4.5 amp. output @ 50.0 amperes 61 KVA...
$118.00

RELAYS CS DIFFERENTIAL
Dual coil with armature pivoted normally open. Operates 220-250 volts, 8000 ohms each coil, contacts S.P.D.T. Controls rated 2 amperes at 110 VAC. Ideally suited for balanced or bridge type circuits where limited control over power is available...

88c

OHMITE LITTLE DEVIL ASSORTMENT
In all-plastic cabinet. Inductors 125 selected ½ watt Resistors in 40 different values (10 ohms to 10 megohms). Cabinet is 9½" long x 4½" high x 5¼" deep. These boxes can be stacked...

$10.00

PLATE TRANSFORMERS
American Heavy Duty 1350-0-1500 Volts. Tapped at 1350-1250 Volts at 1.5 amps. Pri 110, 220 V, 60 cy, 10 x 10 x 7. Wt. 100 lbs...

$49.95

Primary 115/230 Volt, 25-60 cycle. Secondary 820 volts center tapped at 775 Ma. Hardly any voltage drop at 950 Ma. Completely shielded. Dimensions 4½ x 9 x 3½. Weight 36 lbs...

$7.95

FILAMENT TRANSFORMERS
Primary 115-230 volt 60 cycle. Secondary 5 volts at 15 amperes. 3000 volt insulation. Swell for 35T, 75T, 100TH, 250TH, HK-54, etc. Completely shielded dimensions 4½ x 9 x 3½. Weight 10 lbs...

$3.95

METERS
100 amp.—6 volt D.C., 3 inch scale.
4½" square
Grey finish, supplied with 100 amp. shunt. Brand New...

Each as illustrated...

$2.95

1-0-100 Amp. 2" Rd. McClinton...
$1.95

0-9 amp. R.F. 2" Round...
$2.45

5-0-5 amp. ch. & dis. 2" Rd. ...
$1.95

METERS
100 amp.—6 volt D.C., 3 inch scale. 4½" square. Grey finish, supplied with 100 amp. shunt, Brand New...

$2.95

0-100 Amp. 2" Rd. McClinton...
$1.95

0-9 amp. R.F. 2" Round...
$2.45

5-0-5 amp. ch. & dis. 2" Rd. ...
$1.95

TUBES
SBP1 5" Cathode Ray Tubes...
$1.29

39B1 3" Cathode Ray Tubes...
$1.95

3C24 Triode...
$1.95

Each 39c; 10 for $3.50

$0.69

2 x 2 879 Rectifier 2.5 volts 1.5 amp...

49c

TUBES
Dual Primary 110 V. A.C. Each.
Secondary 0-35, 34½ Volt at 3 amperes.
Extra 0-7, 75 Volt at 3 amperes. Special...

$1.95

This transformer is completely shielded.

If not rated 25% with order, balance C.O.D. All prices F.O.B. our warehouse New York, No order under $2.00.

We ship to any part of the globe.

STEP DOWN TRANSFORMERS
Input 220-250 Volts 60 cy.

Output 110-125 Volts 60 cy...

Primary card and plug, Secondary...

Receptical...

80 watts, P-61...
$4.80

150 watts, P-62...
$6.45

250 watts, P-63...
$8.25

500 watts, P-64...
$10.65

1000 watts, P-65 ...
$20.25

OIL FILLED CONDENSERS
4 Mfd 600 Volt D.C. Sprague...
$4.95

8 Mfd 1000 Volt D.C. Tobe ...
$1.69

7.5 Mfd 330 Volt A.C. G.E...
$9.85

2 Mfd 1000 Volt A.C. Sprague...
$13.05

1 Mfd 750 Volt Sprague...
$25.00

Dual .1 Mfd 600 V. CD Type DRY each...
$9.00 per 100...

49c

VARIEABLE CONDENSER
6 Gang; 1 section of .00025 Mfd. 4 sections .000025 Mfd, 1 section .00005 Mfd, with 5 air trimmers of 15 to 25 Mfd capacity. Silver Plated. Each only...

$95c

88c

SELECTION TRANSFORMERS
SPECIAL OFFER—Add $1 to any order you send and get 10 boxes of R.C.A.

PARIS.

LEEDS RADIO CO.

73 Vesey Street

Cortlandt 7-2612

New York City 7
Don't Lose those Good QSO's While Turning Your Beam by Hand

MUNGER

Electro-Beam ROTATOR

Hold those rare DX contacts right through QRM by peaking up your own and received signals in a few seconds. Ruggedly built, powerful reversible motor, 115V-60 cycles. Swings your beam at 1 r.p.m.

• Price Includes Reversible Electro-Beam Rotator and Accurate Direction Indicator.
• Foolproof Potentiometer and Meter Circuit. Calibrations in both Degrees and Directions.

Free Inspection Offer!
Order today, if not satisfied, return rotator within 10 days for refund. (Control-power cable supplied at 10c per ft. in 50' or 100' lengths.)

MANUFACTURED AND SOLD EXCLUSIVELY BY
REX L. MUNGER COMPANY
4701 Sheridan Road, Chicago 40, Ill.

Priced
Complete
Illustrated Bulletin on Request
Time Payment Plan

$69.50

"DASHBOARD" MOBILE

EVERYTHING AT YOUR FINGERTIPS... with this completely new, compact, efficiently designed, 30 watt transmitter, small enough to mount in most glove compartments or under any dash. For complete details write or see the full page ad in August QST.

PHOTO... ONLY $79.95

SUBURBAN RADIO COMPANY
82 Herman Street - East Rutherford, New Jersey

50 Mc.

(Continued from page 58)

Bennington, Vt. — This town is not the sort of place you'd pick out as a spot where h.f. signals could be heard from any direction, situated as it is in a deep valley, with hills in all directions, but W1MFP is able to make contacts on both 50 and 144 Mc. Daily skeds are kept on 144 Mc. with W2ACY in Schenectady, about 40 miles away, and signals are consistently good. Chet's beam has to be aimed northeast for maximum signal, while Schenectady is almost due west from Bennington.

(Continued on page 182)
CLOSEOUT
OF FAMOUS
BENDIX TA12
TRANSMITTERS
These can be easily converted to 20-40-80 meters. Crystal re­
quired for 10 meters. Each electronic coupled oscillator dial has
3000 divisions enabling quick precision shifting. This transmitter
was constructed of the highest quality of precision parts, with labor­
atory precision. Four separate output tanks: one 4-position selector
channel switch having seven sections which changes the ECO, IPA
and output tanks simultaneously.— BRAND NEW, complete with tubes.
NEW...$39.95
USED...$29.95

VKF TRANSMITTER
Here is one of the greatest offerings in war sur­
plus ! Hundreds sold at $20 and now closed out
at an amazingly low price. Brand new, Battery
operated (67½ v Band 1½ v A.C., Frequency 80
at an amazingly low price. Brand new, Battery
plus! Hundreds sold at $20 and now closed out
of its holders alone.

ATTENTION! CLOSEOUT SPECIALS
PART KITS!
KIT 1 Assd Micro Condensers—Unmarked. 100 for..........................$1.50
KIT 2 Assd Resistors 5W-1W. 100 for..........................................1.00
KIT 3 Assd Condensers—Tubular Bypass. 25 for...........................1.00
KIT 4 Assd Condensers—Electrolytic. 25 for.................................2.00
KIT 5 Assd Potentiometers—with or without switch. 10 for.............1.00
KIT 6 Assd Ballast Tubes—Line Ballasts. 10 for............................1.00
KIT 7 Octal Sockets—Waf er. 25 for.............................................1.00
KIT 8 Octal Sockets—Plastic with Flange. 20 for............................1.00
SPECIAL! All 8 Kits for $8.00

FM TRANSMITTER BC-684
These units are BRAND NEW, provid­
ing 35-watt output, 10 channel push button control employing NON­
LINEAR MODULATING COIL. This unit
comes complete with tubes, less power
supply, covering and crystals. Excellent
15 meter FM transmitter for "Ham" or Police use. ...$24.95
WHY struggle with unsightly "plumbing?" Install a neat, sturdy, professional-looking tower that is a credit to your rig and your hobby. Tower illustrated is a TRYLON standard 5-ft. spread utility base, 10-ft. high. It's self-supporting and additional straight 10-ft. sections with guys may be added at any time. Approx. Shipping Wt. 100 lbs.

Write to Tower and Antenna Div., Wind Turbine Co., West Chester, Pa. for Complete Details.

CUTS ANY SIZE LARGER SQUARE OR ANGULAR HOLE

For Transformers, I.F.'s, Plugs, Binding Post Strips, Sockets, Etc.

Bonished forever is hand hack sawing or filing of holes for hard to mount parts. Sizes to meet every need.

Simple Hand Wrench Screw Action

Square

| Size | 7/8 | 3/4 | 5/8 | 1/2 | 3/4 | 1
<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Net</td>
<td>$2.95</td>
<td>$3.50</td>
<td>$1.95</td>
<td>$2.15</td>
<td>$2.30</td>
<td>$2.65</td>
</tr>
</tbody>
</table>

Buy It At Your Favorite Distributor

Tests with W2WEB, also of Schenectady, show maximum signals with the beams aimed directly at one another. In the case of W2ACY, it would appear that signals are reflected from Bald Mountain, which rises more than 2000 feet above W1MEP's elevation, on the northeast side.

2-Meter Standings

<table>
<thead>
<tr>
<th>Call</th>
<th>States</th>
<th>Areas</th>
<th>Call</th>
<th>States</th>
<th>Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>W8UKS</td>
<td>14</td>
<td>7</td>
<td>W8WRN</td>
<td>8</td>
<td>5</td>
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<tr>
<td>W8WJC</td>
<td>14</td>
<td>6</td>
<td>W8WHQ</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>W8SWXY</td>
<td>13</td>
<td>-</td>
<td>W8QX</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>W8SCYEB</td>
<td>12</td>
<td>6</td>
<td>W8HB</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>W8KUX</td>
<td>12</td>
<td>5</td>
<td>W8WZG</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>W8RUE</td>
<td>11</td>
<td>5</td>
<td>W8RZG</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>W8WLS</td>
<td>10</td>
<td>4</td>
<td>W8GOK</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>W8NFM</td>
<td>9</td>
<td>6</td>
<td>W8RZG</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>W8IFB</td>
<td>9</td>
<td>6</td>
<td>W8RZG</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>W8BLF</td>
<td>9</td>
<td>5</td>
<td>VE3AIB</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>W9AR</td>
<td>9</td>
<td>-</td>
<td>W8HXY</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>W8FBJ</td>
<td>9</td>
<td>5</td>
<td>W8JHS</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>W1HDQ</td>
<td>9</td>
<td>3</td>
<td>W8KFPQ</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Shepherdsville, Ky. — Tennessee contacts on 144 Mc. were provided for 10 stations in Kentucky, Indiana, Illinois and Ohio as the result of an expedition conducted by W4FBJ and W4BPE. Band conditions were just normal, and all the stations worked were ones which are consistent at the home location of W4FBJ, so he feels that only some resident activity is needed in the right spots in Tennessee to make that state workable over quite a bit of the Middle West. The site, chosen with the aid of W8ZUR/4, was a location of average height near Haysville. The rig ran 100 watts to an 829 final, with a 16-element horizontal array.

Charleston, W. Va. — More West Virginia work on 144 Mc. is in prospect, with the advent on the band of WSLYG, WSYIF and WSBIIT. The first contacts were made with WSWRN, Columbus, and W8CYE, Miamisburg, Ohio, on the morning of October 7th. W8WRN has nightly skeds with WSEP, Terra Alta, W. Va., and WSBIIT, at 8:00 and 8:30 respectively. WSBIIT is also worked each Thursday morning at 7:15.

Champlain, Minn. — Regular schedules with W8WGZ and W8NFM (Grinnell and Solon, Iowa) are being kept by W8JHS. Contact is made only under good conditions, and then usually on c.w. The distances are between 250 and 300 miles. W8HSX in St. Cloud, Minn., has worked both W8WGZ and heard W8NFM, and W8SV has been heard by W8NFM. The rig at W8JHS now runs 100 watts to 24Gs, feeding a 12-element array. This beam is similar to one section of the W2NLY 24-element job described in QST recently, but in a horizontal position.

Jacksonville, Fla. — A receiver for the high f.m. band is a handy means of checking tropospheric propagation conditions, according to W4ELD. In daily observations during September, Miles found the 144-Mc. band and the f.m. band both better in the early morning hours than at other times. W4LAW and W4HAD in Tampa,

(Continued on page 141)
MAGNETIC SHUNT as used by Burlington insures uniform damping characteristics. All ranges AC and DC available in 2½", 3½", 4½" rectangular or round case styles and are fully guaranteed for one year against defects in workmanship or material. Refer inquiries to Dept. J128.

**Burlington INSTRUMENT COMPANY**
BURLINGTON, IOWA

Plus Performance at Low Cost

**TURNER CHALLENGERS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Level</th>
<th>Response</th>
<th>List</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>BX CRYSTAL</td>
<td>For recording, public address, sound systems and amateur work. Brown enamel finish.</td>
<td>-52 db</td>
<td>50-6000 c.p.s.</td>
<td>$10.85</td>
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<tr>
<td></td>
<td>With 7 ft. attached cable.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CX CRYSTAL</td>
<td>Rich satin chrome finish with 7 ft. removable cable set. Moisture sealed crystal circuit.</td>
<td>-52 db</td>
<td>50-7000 c.p.s.</td>
<td>$16.25</td>
<td></td>
</tr>
<tr>
<td>BD DYNAMIC</td>
<td>Same style and finish as BX. Level: -52 db. Response: 50-6000 c.p.s. Available in 50, 200, 500 ohms or high impedance. 7 ft. attached cable.</td>
<td>-52 db</td>
<td>50-7000 c.p.s.</td>
<td>$15.75</td>
<td></td>
</tr>
<tr>
<td>CD DYNAMIC</td>
<td>Same style and finish as CX with removable 7 ft. cable set. Dynamic circuit in 50, 200, 500 ohms or high impedance. Level: -52 db. Response: 50-7000 c.p.s.</td>
<td>-52 db</td>
<td>50-7000 c.p.s.</td>
<td>$19.50</td>
<td></td>
</tr>
</tbody>
</table>

Write for Literature

THE TURNER COMPANY
917 17th STREET, N. E. • • • CEDAR RAPIDS, IOWA


123
With the new JOHNSON "Instant Crystal Selecto" you can QSY with the speed of an ECO and still enjoy all the advantages of xtal control! Unit accommodates all crystals with 1/8" spacing. With adaptors you can also use up to six of your upright 3/8" spaced crystals, plus four with 1/2" spacing. Extra position on switch for ECO.

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

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

COMMERCIAL RADIO INSTITUTE
A RADIO TRAINING CENTER FOR 28 YEARS

Literature upon request. Veteran training
Dept. B., 31 West Biddle Street, Baltimore 1, Maryland

XYL's! Here is an inexpensive "extra" gift for the OM . . . A gift he can use and will appreciate. No more "losing" of his notes on schedules when you clean up the "shack".

KEEP YOUR HAM SHACK
"Up-to-Date"
New! 1949 Radio Amateur's SCHEDULE CALENDAR
No "missed" schedules with this New Calendar designed for the Radio Amateur's use. Space for every detail of your schedules: Time, Station, Frequency, Name, QTH, and Beam Direction. Hang it on the wall, stand it on your receiver, or lay it on the table.

Postpaid ONLY 75¢
If Your Radio Dealer Cannot Supply You . . . Write to
SHEAFFER STATIONERY SHOP
"Gordy" W0DKE
BALATON, MINNESOTA

175 miles, were worked on several occasions, and W4AQ has been heard. The signals of W4EID have been heard by W4BYR at Lake Placid, more than 200 miles to the south, and W4QN, Orlando, has been worked.

RECORDS
Two-Way Work
50 Mc.: CEIAH — J9AO
10,500 Miles — October 17, 1947
144 Mc.: W3CV — W6WAZ
660 Miles — September 18, 1947
285 Mc.: W1CTW — W2HWX
210 Miles — October 12, 1947
420 Mc.: W6VIX/6 — W6ZRN/6
186 Miles — July 27, 1947
1215 Mc.: W3MLN/3 — W3HFW/3
12.5 Miles — September 24, 1947
2300 Mc.: W6IFE/6 — W6ET/3
150 Miles — April 25, 1948
3300 Mc.: W6IFE/6 — W6ET/3
150 Miles — October 5, 1947
5250 Mc.: W2LF/3 — W7FOF/2
31 Miles — December 2, 1945
10,000 Mc.: W4HPI/3 — W6ZSF/3
7.65 Miles — July 11, 1946
21,000 Mc.: W4WTV/6 — W0SAD/2
800 Feet — May 18, 1946

Pensacola, Fla. — The possibilities of 50 Mc. for a Gulf Coast emergency net look good to W4MS. The small antennas and relative freedom from QRN would make a reliable net on this band a boon for hurricane work, if only more stations could be lined up in the right locations. It can be demonstrated that a reliable working radius of 60 miles or more is possible, even with low power, in flat terrain, so the principal cities of the Gulf Coast could be linked readily and reliably by a 50-Mc. net. Pensacola 50-Mc. stations include W4s LRC, CNK, EQR, HIZ and MS. They are working on the Mobile gang in the hope of developing some 6-meter converts.

A Two-Bit Two-Minute Ground-Plane for 420 Mc.
W7KWO, who is doing a lot of 420-Mc. promoting in the region around Phoenix, Arizona, says that a ground-plane is unquestionably not the world's best antenna for 420 Mc., but it can be the quickest and possibly the cheapest, if made as shown in the photograph on page 51. Tom takes an Amphenol coaxial fitting, Type 83-1R, solders a 6½-inch piece of stiff wire (No. 12 will do, or welding rod may be used, if handy) into the center conductor. Four more pieces are soldered to the flange of the fitting for the ground plane. If these are soldered in the position shown, the holes in the flange are left to be used for mounting the completed antenna.

Activity on 420 Mc. is being maintained in and around Phoenix by W7KWO, W7MIV and W7KTJ. Long-range plans are now being made for an expedition to the San Francisco Peaks (nearly 13,000 feet elevation) next July. The boys would like to hear from interested parties (Continued on page 132)
Here is a high quality basic oscilloscope, slightly larger than a standard multimeter, that provides a continuous, visual, on-the-air check of your phone transmitter. The MM-2 permits adjustment of your transmitter for maximum efficiency and helps you keep it there. Check these top-flight features: Weighs only 4 1/2 lbs. Full set of controls including centering and horizontal gain. Built-in AC supply. Built-in 60 cycle sweep with automatic return trace blanking. Calibrated modulation percentage scale. Beam switch for cutting off trace during standby periods. Reversible front panel for vertical or horizontal mounting. 2" screen with fine stable green trace. Table-top or rack mounting. Standard 19" punched rack panels available for permanent installation with rack mounting equipment. (See Oct. Ad for complete details.)

THE F.C.C. SAYS

12.123. Purity and stability of emissions. In the case of A-3 emission, the amateur transmitter shall not be modulated to the extent that interfering spurious radiation occurs, and in no case shall the emitted carrier wave be amplitude-modulated. More shall be emitted in excess of 100 per cent. Means shall be employed to insure that the transmitter is not modulated in excess of its modulation capability for proper technical operation.

MM-2

MODULATION MONITOR

LAMBDA ELECTRONICS CORP.

BOX No. 53 DEPT. Q12 CORONA, N.Y.

125
Micro-Match tells you at a glance what your actual RF power output is in watts. Also tells you SWR of antenna system. MM 1 for open wire lines, price complete $29.50. MM 2 (shown) for coaxial lines, price complete $37.45. Contact your distributor.

Other Micro-Match models for operation at 500 KCS to 400 MCS, and power levels of 2 to 50,000 watts.

M. C. JONES ELECTRONICS COMPANY
P. O. Box 1519, BRISTOL, CONNECTICUT

Correspondence

(Continued from page 57)

The Polarization Question on 420 Mc.

Numerous letters have been received asking that a standard be set for polarization on 420 Mc., and that everyone agree to use that polarization. The same request is made in connection with 144 Mc., but the difficulty of attaining an agreement, even for 420 Mc., shows us something of what might be expected on 144! Some months ago this department carried the suggestion that, since there seemed to be almost no basis for argument, one way or the other, that anyone starting up on 420 Mc. use horizontal polarization. But so far, most of the reports indicate that 420-Mc. workers are using vertical. So what say, gang — which will it be?

OK, FB, BUT . . . !

2101 California St., Columbus, Indiana

Editor, QST:

... Some of our fraternity are using R incorrectly. I always thought that it meant that the last transmission was copied 100%, but a fellow I was talking with the other day came back with "R.R.R OK FB BUT MISSED THE QTH ES THE NAME." Well, someone's wrong here. Maybe I ought to look up my table of abbreviations again.

— Robert Lay, WD8MK

VALUES

1028 Geddes, Ann Arbor, Mich.

Editor, QST:

The argument for changing 'phone frequency assignments seems to be that 'phone men should be given space commensurate with their numbers. I can think of a much better argument: they should be given space commensurate with their value to amateur radio and the public welfare.

— Kenneth K. Bay, W6GJS
The final test of product quality and performance is the acceptance of users. Small wonder that Astatic takes extreme pride in the preference among amateurs for Astatic Crystal, Dynamic and Ceramic Microphones. The Astatic Corporation guards this acceptance zealously, spares no effort to produce superior products that will warrant your continued approval. Illustrated are the most popular models, new and old. If you would like more information, write us.

Astatic Crystal Devices manufactured under Brush Development Co. patents

THE ASTATIC CORPORATION
CONNEAUT, OHIO

2 ELEMEHT 10-11
2 ELEMENT 20
AS PICTURED $74.95 WITH 2 T MATCHES

AVAILABE NOW!

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>3E6</td>
<td>3 El., 6 Meter</td>
<td>$27.60</td>
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<tr>
<td>4E6</td>
<td>4 El., 6 Meter</td>
<td>$33.35</td>
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<td>4E6 Jr</td>
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<td>4 El., 10 Meter</td>
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<td>3 El., 10 Meter</td>
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<td>3E10T</td>
<td>3 El., 20 Meter incl. T Match</td>
<td>$47.95</td>
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<td>3E10-20T</td>
<td>3 Element 10 and 2 Element 20 Meter Stacked with 3 T Matches</td>
<td>$74.95</td>
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<td>4E10-20T</td>
<td>4 Element 10 and 2 Element 20 Meter Stacked with 4 T Matches</td>
<td>$94.95</td>
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<td>Array with 2 T Matches</td>
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<td>3E10S</td>
<td>3 El., 10 Meter spaced</td>
<td>$49.95</td>
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<td>3E10-2E20T</td>
<td>3 Element 10 and 2 Element 20 Meter Stacked with 2 T Matches</td>
<td>$84.90</td>
</tr>
<tr>
<td>Folded dipole for 6 and 10 meter beams</td>
<td>$56.00 extra</td>
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</tbody>
</table>

All above beams are close spaced (.1 Director—.5 Reflector) wide spaced beams (.15 Director—.2 Reflector) $1.50 extra. Available on 5 element 6 and 10 Meter beams only. All 3 element 20 mtr. beams come in .075 and .1 spacing.

Write to Dept. Q128 for details
The Navy and the Amateur (Continued from page 80)
novations and communications share a common heritage — the communication assistant. In the early days of radio, the amateur's role was primarily to assist in the development and demonstration of new technologies. Over time, this role evolved to include the provision of communications services during peacetime and in times of crisis. Today, the amateur radio operator is a valuable asset to military communication systems, providing critical services that cannot be replaced by other means.

Amateur radio operators are well-trained and capable of operating in a variety of environments and conditions. They are adept at using a wide range of technologies, from simple Morse code to advanced digital communication systems. Their skills are highly valued by military leaders, who recognize the importance of effective communication in times of conflict.

In addition to their technical expertise, amateur radio operators bring a unique cultural perspective to military communications. They are well-versed in the history of radio and its contributions to society, and they are committed to preserving this heritage.

Amateur radio operators are also known for their community spirit and willingness to help others. They often volunteer to support disaster relief efforts and other humanitarian causes, and they are always ready to lend a hand when needed.

In short, the Navy and the Amateur are a perfect match. The Navy benefits from the expertise and dedication of its amateur radio operators, while the amateurs enjoy the challenge of working in a military environment. Together, they create a powerful force for good, both on and off the battlefield.
As advertised Oct. QST, pega 129. We are swamped with orders. Get your name on our list now.

COMPLETE RADIO TRAINING!

Prepare now to accept a responsible position in Commercial Radio. New developments will demand technicians with thorough basic training, plus a knowledge of new techniques discovered during the war. Training open to high school graduates, or those with high school equivalency. Courses 6 to 18 months’ duration in RADIO AND ELECTRONICS. Approved Veteran training in Radio. Write for particulars.

J. V. LOVE & COMPANY
E. Joel (WSAPP) Owner
2219 Mechanic Street
GALVESTON, TEXAS

Hams everywhere specify KENYON “T” Line Transformers! Manufactured under rigid standards, all KENYON transformers are constructed of the finest grades of material plus the skill and long experience of a highly trained competent operating staff.

All KENYON transformers are checked progressively in the course of manufacture and are laboratory-tested upon completion to insure satisfaction. Yes, KENYON “T” Line Transformers meet the most exacting requirements of critical purchasers. For skilful engineering, progressive design and sound construction — Specify KENYON for top performance in your rig!
own communications, which is essential for the effective exercise of military command.

At times we are called upon to serve other Government departments and agencies. It was but a short time ago that the Navy was requested by the State Department to install and operate a radio station in Jerusalem, with very little warning or time to accomplish. We were able to fly the equipment and personnel in and have the circuit operative by the time our services were required. Yes — there was an amateur in the small group we sent to Jerusalem in May — and like his associates on that hazardous assignment — he is doing his job well.

Like all other military officers, I earnestly hope that there will not be another war. But if there should be a war, men who know communications and electronics as do you amateurs will be invaluable in service to our country, especially in this age when our national security is daily becoming more and more dependent upon rapid communications and upon electronics.

It is with great pleasure that I speak for the Navy in saluting you — the members of the American Radio Relay League. You have a truly enviable record of accomplishment. You have been responsible for so many of the greatest strides which have been made in the development of electronics and communications. Your performance of duty, both in peacetime emergencies and in war, has been of the highest order. I know that individually and collectively you will always support and maintain the splendid record which you have built — established as patriotic American amateurs. I bring you the Navy's highest praise: and so with my personal “73” and my sincerest thanks, I say to you, “Well done!”

The 1948 Midwest Division Convention

With an advance ticket sale of over 300 and a final registration close to 400, attendance was no problem at the 1948 ARRL Midwest Division Convention. And neither was the entertainment of the conventioners — the hard-working committee from the Wichita Amateur Radio Club had anticipated everything, and there were no dull moments.

The program opened officially on Saturday afternoon with a welcoming address by City Treasurer John Pierce, followed by an ARRL business meeting conducted by Director Len Collet. After eulogies of “Pop” Kerr, W0GP, and K. B. Warner, W1EIH, by Director Collet, By-Goodman of Hq., the Old-Timers Round Table was the next order of business. The Director reported on Division happenings and plans, followed by a technical session on recent advances in the Industry.

The Saturday-night activities included an hour-long floor show by professional talent, followed by dancing and a c.w. “phone, v.h.f. and emergency round table. A Woot-Hong initiation was held at the traditional hour, midnight.

Everyone with 10-meter gear in his car was up early Sunday morning to participate in the Portable-Mobile Sweepstakes. This was a QSO contest limited to convention delegates, and good DX conditions on the band added excitement. The first day station contributed the latest thoughts on avoiding FCC QSLs. Technical sessions then took over, with Vince Dawson, W0JJF, telling what was being accomplished by the v.h.f. gang, a demonstration by W6ESV of the Southwestern Bell Telephone Company's portable-mobile radio telephone, and a movie shown by Lt. Phillips of the USAAF on “Ground-Controlled Approach by Radar.”

Then everyone took a short breather before pitching in to an excellent buffet supper.

The Saturday-evening activities included an hour-long floor show by professional talent, followed by dancing and c.w., “phone, v.h.f. and emergency round table. A Woot-Hong initiation was held at the traditional hour, midnight.

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Then everyone took a short breather before pitching in to an excellent buffet supper.
Amateurs—the new Alliance Tenna-Rotor will rotate most antennas from 50 m. c. upwards. Tenna-Rotor is a "beaming" device to give you positive control of rotation—select the exact spot for "peaked" reception! Operates in any weather—is quick and easy to install—consists of a fully enclosed, electrically driven rotor, connected to plastic control box which plugs into any 110 volt, 60-cycle house circuit. A simple two-way selector switch rotates your antenna clockwise or counter-clockwise through 365° and stops it at any desired point on the compass! Rotor unit resists corrosion.

Ask your dealer for Tenna-Rotor!

Model ATR
Fits most types of antenna
Size of rotor unit 7¾ x 5¼ x 8½
Size of control box 5½ x 5½
Approx. weight 12 lbs.
Special 4 conductor interconnecting cable available at 5½¢ per ft. list price.

Have skill, accuracy
Send and receive code this easy—faster way! The CANDLER SYSTEM has developed expert Amateur and Commercial Operators, and Code Speed Champions. In a few weeks you can pass the code examination for license. You can send and receive with amazing skill and speed, without tension. Long hours of practice unnecessary to acquire proficiency. The way to do it is ALL IMPORTANT. By simple progressive lessons Candler teaches you at home to send and receive as easily as you talk or read—fast, accurately.

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CANDLER SYSTEM CO.
Dept. 4-Q, P. O. Box 928, Denver 1, Colo., U. S. A.
and at 121 Kingsway, London, W. C. 2, England

LEARN CODE!
SPEED UP Your RECEIVING with G-C Automatic Sender Type $24.00 Postpaid in U. S. A.
Housed in Aluminum Case, Black Instrument Finished, Small—Compact—Quiet Induction type motor, 110 Volts—60 Cycle A.C.
Adjustable speed control, maintains constant speed at any setting. Complete with ten rolls of double perforated tape. A wide variety of other practice tapes available at 30¢ per roll.

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STRATFORD • NEW JERSEY
THE MILLEN No. 90711
Variable Frequency Oscillator

The 90711 is a complete transmitter control unit with 6SK7 temperature-compensated, electron coupled oscillator of exceptional stability and low drift, a 6SK7 broad-band buffer or frequency doubler, a 6A67 tuned amplifier which tracks with the oscillator tuning, and a regulated power supply. Output sufficient to drive an 807 is available on 160, 80, and 40 meters and reduced output is available on 20 meters. Net price, f.o.b. Oakland $89.75

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101 West 63rd St., New York 23, New York
TEACHING RADIO SINCE 1925

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Each year an increasing number of individuals find QST to be the ideal gift. A subscription present is unique, too. It serves as a monthly reminder of your thoughtfulness. A yearly subscription, including League membership, is but $4.00 in U.S.A. and Possessions, $4.50 in Canada and $5.00 elsewhere, little enough for the ones you have in mind. And ... we'll send an appropriate gift-card conveying your Christmas Greetings at the proper time.

A Monthly Reminder of Your Thoughtfulness and Good Judgment

QST

38 LaSalle Rd., West Hartford, Conn., U.S.A.
10 over 20 Stacked Array with Rotator and Indicator

This combination is the last word in amateur antenna equipment:

- High Gain
- Light Weight
- Rugged Construction
- Aluminum Alloy Elements
- New Model Rotator with Solenoid Brake
- Matches Directly to 72 Ohm Line

WORKSHOP ASSOCIATES, Inc.
Specialists in High-Frequency Antennas
63 NEEDHAM ST., NEWTON HIGHLANDS 61, MASSACHUSETTS

WANTED ...

Box 135 - QST

Amazing NEW 1948 VIBROPLEX

"PRESENTATION" MODEL
WITH SUPER-SPEED CONTROL MAINSPRING

POLISHED CHROMIUM PARTS 24-K GOLDFLATED BASE TOP
PATENTED JEWEL MOVEMENT

You'll be surprised how easy it is to send with this New Super-Deluxe Vibroplex key. You'll be able to send better, faster, easier. No strain. No special skill required. Suits any hand or any style of sending. Speed range from 10 wpm to 40 wpm and beyond. Polished chromium parts mounted on 24-K gold-plated base top. Colorful red switch knob, finger and thumb piece. Die-Cut contacts and main spring. Extra large contacts. Non-slip rubber feet. Cord and wedge. $25.00. Immediate delivery. Money order or registered mail. FREE catalog.

THE VIBROPLEX CO., Inc.
833 Broadway, New York 3, N. Y.

A REMARKABLE NEW LINE!
High QUALITY—High POWER Custom-Built AM-FM Chassis

You need no longer hesitate to replace your outmoded radio receiver with a modern, low priced, powerful ESPEY replacement chassis. The Model 511 (illustrated) is typical of the complete ESPEY line, and features 12 tubes, plus Rectifier and Tuning indicator. This high quality AM-FM receiver, drift compensated, is supplied complete with 25-watt speaker, both antennas, and all necessary hardware. It's your best bet! Consult your nearest radio service-dealer for full details, or write to Dept. B-11 today.

ESPEY MFG. CO., INC.
528 East 72nd Street, New York 21, N. Y.
ESTABLISHED 1928
Merry Christmas to All!

We're playing SANTA to AMATEURS!

The following partial list of unexcelled values will make many a Ham happy this Xmas and for months and years to come. Each instrument thoroughly checked and guaranteed to meet manufacturer's original specifications. Equipment available in quantities shown at time this publication goes to press.

Order Now for Immediate Delivery — indicating 1st, 2nd and 3rd choice.

All the big-name brands of new Communication equipment in stock ... ready for shipment the day you phone, wire or write.

"COMMUNICATION EQUIPMENT HEADQUARTERS SINCE 1922"

Phone CHEstnut 1125

FREE!


Convenient TIME PAYMENT Plan on New Equipment Purchases.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Make and Model</th>
<th>Prices</th>
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<td></td>
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<td>Regular</td>
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<tr>
<td>1</td>
<td>Ham Vertical OI-21 with coils</td>
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<tr>
<td>2</td>
<td>Hallicrafter HT-9 Xmitter with tubes and 3 sets coils</td>
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<td>3</td>
<td>Hallicrafter SX-16 &amp; spkr</td>
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<td>4</td>
<td>Millen HR, 120 with tube and coil</td>
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<td>Millen 90700 Veri-Arm</td>
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<td>Millen 90800 Electra with tubes and coil</td>
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<td>7</td>
<td>Melsser 41 Sig Shifter</td>
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<td>8</td>
<td>Melssers 41 Sig Shifter (Postwar)</td>
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<tr>
<td>9</td>
<td>National 1-10 coupling with power supply, spkr &amp; coils</td>
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<td>10</td>
<td>National NC-200 with spkr</td>
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<td>11</td>
<td>Piercen RP-81 &amp; spkr</td>
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<td>RAE-15 &amp; spkr</td>
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<td>17</td>
<td>Sonar VFX-600 FM Exciter</td>
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<tr>
<td>18</td>
<td>Sonar XE-10 FM Adapter</td>
<td>$49.50</td>
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<tr>
<td>19</td>
<td>Transistor 905 Xmitter tester</td>
<td>$10.50</td>
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</table>

"SURPRISE" Trade-in Allowances on your used, factory-built Communication Equipment. In the coupon provided tell us what you have to trade. Indicate your preference in new Equipment. We'll come right back with a money-saving offer that's sure to please. Mail the coupon right now!
HAM-ADS

(1) Advertising shall pertain to radio and shall be of
nature of interest to radio amateurs or experimenters
in the field, and will be limited to announcements of
items for sale.
(2) No display of any character will be accepted, nor
shall it be necessary to place in display any heading,
except a short and plain capital letter that would be used
in a personal advertisement.
(3) The Ham-Ad rate is 36c per word, except as noted
in paragraph (4) below. Interlineations shall be in full
must accompany copy. No cash or discount or agency
commission will be allowed.
(5) Closing date for Ham-Ads is the 25th of the second
month preceding the publication date.
(6) A special rate of 74c per word will apply to advertising
in the classified columns. A special rate of 12c per
word will apply to advertising by private agreement for
special equipment by a member of the American
Radio Relay League, and is placed and signed by a member of
the American Radio Relay League. This advertising of bona
fide apparatus or offered for exchange or advertising in the
interest of experimenters by a member of the American
Radio Relay League takes the rate 75c an item. An attempt to
deal in apparatus in quantity for profit even if by an individual,
is not allowed unless there is obvious non-commercial
interest or for the grade of character of the products or services
advertised.

TRADE or sell: Collins 25-A1 receiver for $325.00 prepaid or best offer in 16 mm, movie camera and sound projector. W4AIS, Box 11, Greenville, S.C., R.D. Receiver. Ends 1st month.

TUBULAR condensers, 0.1uMfd., plus or minus 10%. Normal working voltage 100 DC, $8.00 per M. $75.00 per 100. Young & Underwood, 2504 Sansome St., San Francisco, Cal.

NEW YORK City Ham SELL: TR4 and tubes, $15.00; Elec. Lab. 6 and 110V input power supply, $15.00; Millen Variaram, $300.00; Hammarlund R-138 and 2200 and Variaram, $350.00; W2K34 tubes, $10.00 pair unusual Elmahe 4-125A tubes and sockets, $25.00. W2AMC. 21 Poer Ave. East, N. Y. $15.00. 1 year reduced to 1.5 pounds; reconvertible motor, control unit indicator. Griffin, W5-visna, 227-158FMD with R-148T. $50.00. $62.00.

SOLD: VIXEN 400mm ref. camera. $500.00. W2GWY, 36-34th Ave., Jackson Heights, L. I., N. Y.

SELL Class B 809 modulator multi-match input and output trans
sis, 1000 and 3000 volt power supply, $200.00; 350-2000 oscilloscope with two 913 tubes, $15.00. WBBQR, 8642 Eauclaire, Milwaukee, Wis.

AUTOMATIC new revolutionary time indicator, giving compar
ative times every time over the whole of the globe, with modern colored map chart. Special equipment for your own time stamps. Make your own stamps. W2BLK, Box 118, Beloit, Wis.

FOR SALE: Model ET-436B RCA transmitter including table mounting speaker amplifier and line transmitter 115 to 230 volts AC or battery output of transmitter is 600 watts C.W. 400 watts phone. First $250.00 takes this rig, complete, Shipped F.o.b., Mobile, Alabama.

SALE: Well maintained Hallicrafters receiver with complete acces
ories. W6LNA, Warren, 1865 Cardinal Drive East, Mobile, Alabama.

SALE: Miller signal shifter, Jefferson-Javis xmttr-cwr 50-50-50-50-50-100 to 714 m, $350.00. W5RVR. Transmitter with W4AM one watt 10 meter, one watt 75 meter and 140 meter transmitter and receiver. RCA 10-meter mobile transmitter. BC555A, PE103A dynamotor, valve base, etc. 10 to 20 price. Precision matched 350$ oscilloscope, CTC & Kencydix transformers and tubes and mechanicals, complete list of bargains. Send for list of good all-wave receiver for 6 volt operation ham bands or converter to run in car, etc. W2PL, 401-15th Ave., West Springfield, Va.

SELL: Collins T/C5, used. Includes receiver, transmitter, shock
mounted; antenna tuner, remote unit with speaker, cables, A.C. power supply. $250.00, $200.00, $150.00, $100.00, $75.00, $50.00, for $125.00. Nat. Radio Sales, 1042-17 Farmers Boulevard, Hollis, L. I., N. Y.

6S1P-AMPS, DIALS, PINS, we make to order. Gilpin, Box 6384R, Mt. Clemens, Michigan.

CHANGE: New, $16.00.

FAN ELS, dials made to order. Griffen, W2GUF, 1709 Midwood, Columbus, 2 Ohio.


10-METER Beams, $19.50. Send card for free information. Riverside Jobber, "C" Tel. 6-3800, Nashville, Tennessee.

TRADE or sell: Collins 75-A-1 receiver for $325.-.00 prepaid or best offer in 16 mm, movie camera and sound projector. W4AIS, Box 11, Greenville, S.C., R.D. Receiver. Ends 1st month.
SELL new SX-42 Hallcrafters receiver and R-42 speaker in perfect condition. Quitting the ham game. Submit your best offer. Write 222 SALES or trade: McMurdo Silver Model 706, slightly used, AN/AFT-24th Street Drive. Cedar Rapids, Iowa.

For Sale: BC-348-Q receiver with power supply. Coble, 434 Pammel, Des Moines, Iowa.

SOLD: Hallcrafters 11GR-148 receiver, 100 ble, no power supply, all original, $200. Burton signal search, 1020 W. 13th St., Minneapolis, Minn.


WANTED: Small transmitters 10 to 100 watts, unfinished or completed. Give full particulars. Jack Watt, W8HYQ, Onslow, Ontario, Canada.

CRAIG 66: New and used transmitters, receivers, parts, new and used. Write for list. (

BARGAINS: New and used transmitters, receivers, parts, new and used. Write for list. That's Quality! (

WANTED: Small transmitters 10 to 100 watts, unfinished or completed. Give full particulars. Jack Watt, W8HYQ, Onslow, Ontario, Canada.

SOLD: 1924, most valuable.

OVERBOUGHT Radlart Model 45S 6-volt vibrator supplies, out in 2-ton Ave., Westwood, N.J.

SWAP: Graflex folding series B. J.J. x 4¼". lens. #32; Kodak Sky Traveller, $50.00. SP44 Panadaptor rack mounted, $30.00. Stereo 522 115 V AC, calibrated 80-40-20, noise limiter, S-meter, RF-AF and dbratora. Want reasonable offer. Electronic Associates, Inc. 4-125 push-button control; HRO 5TA1 receiver; Meissner deflection receiver. Also: ewap pitch motor for beam completely converted with 2 month, $180.00. Perfect, $150.00. Want: communications transformer, 10v. J00kva $35.00 for both, F.o.b. Annapolis. For the electronics, first served. J.C. Paulsen, W4WAL, c/o Milwaukee Road, Avon, So. Dakota.

COMPLETE Ham station for sale. 1-kilowatt transmitter; PP mon-kev, electronic fully automatic key, practically new, $20.00. N. Pomeranz, W2WK, 5 Koelbel Court, Baldwin, N.Y.

FOR Sale: VX101 deluxe in perfect condition. Wt VG. E.W. Carr, USNA Radio Club, Annapolis, Md.

FOR Sale: New and near-new power transformers, chokes and condensers. Quotations by return mail. Highland Metal Products Box 578, Highland, Indiana.

HALF kilowatt Westinghouse CW rig used for airwave communications, relay shifted four bands. BC456 added for VFO. Provision for 400 watts, good condition. $150.00. For: First served. Trautwein, W2PLS, 40-25 17th Ave., Laurelton, L.I., N.Y.


FOR Sale: One new HQ-129X complete with speaker and manual, $125; one new NC-420-D complete with speaker and manual, $95.95; one NC-46 complete with speaker and manual, slightly used, $99.50. Ward Lantis, W4LEB, 2207 Millye Street, Westwood Hills Add., Kingston, Penn.

BEST offer takes 160-watt fone rig, complete all bands. D-104 mike, etc. J. L. Paulsen, W4KAL, c/o Milwaukee Road, Ave. So., Dakota.

FOR Sale: New and near-new power transformers, chokes and condensers. Quotations by return mail. Highland Metal Products Box 578, Highland, Indiana.

TWIN City radio hams: I offer the three big c.w. transmitters at face value. They are 800 watts, 500 watts, 150 watts output. All are in excellent condition. I also have for sale: in 2-ton Ave., Westwood, N.J.


ALUMINUM tubing in 12 foot lengths, most sizes, send for list. Yourcallcastinauminum \$1.75

W8GFK

ALUMINUM
CALL PLATES

Your call cast in aluminum - hand polished - with 14" letters. Plate size 2½ by 14½". Styles: P for panel mounting, L for car license and D for desk use. $1.75 each postpaid.
P & H SALES CO. 619 Jasper St. Kalamazoo 31, Michigan

Ham Post!

QSL - CARDS SWL
SAMPLES TEN CENT - NO CHEAP TRASH
VHF-152A DB 22A
HF-10-20 RME-45 FOLDERS FREE
HAM PRINT SHOP
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Ham Post!

Hollander's Fm. 135-C Standard $14.25
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