FIRST TO FIT ANY MIKE WITH ¾"-27 STAND COUPLER

Never before such ease, such versatility! Ideal for communications, paging, dispatching. Specially designed lever-type switch for relay operation or microphone "On-Off."

Combines handsomely with E-V microphone, as shown, to give you complete, ready-to-use "BREAK-IN" operation or available separately for use with your present mike. Action is quick, finger-tip. Self-contained switch removes easily from round die-cast base. Single-pole, double throw. Satin Chromium finish; gray plastic switch lever.

Model 428. "BREAK-IN" Touch-to-Talk Stand with Switch. List Price .... $12.50

Model 328. Touch-to-Talk Switch only. SPDT. List Price........ $9.50

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

Model 629. Complete with E-V 606-8 Hi-Z patented Differential Dynamic Mike, 8 ft. cable. List Price ............ $49.00

(Double Pole, Double Throw available on special order at $1.00 list extra.)
Top 30 mc in ham discussions, and

Type GL-2E26 takes a bow. This mod­
ernly engineered addition to the ham's tube
list is ideal for work in 2- and 6-meter rigs.
There's a reassuring record of hard com­
mmercial service in FM. And the price of the
tube is low: three GL-2E26's, one for driver
and a pair for push-pull final, cost less than
one standard "50-watter!"

Even a single GL-2E26 as final will han­
dle an input of approximately 27 watts
phone, which often is all you need on 2 or
6 meters. Powerwise the tube pulls its
weight.

Shielding—frequently a problem at the
higher frequencies—is handled neatly by a
short metal sleeve, which surrounds the in­
put of the tube so completely that no ex­
ternal shield is required.

Get further design facts and the low price
from your G-E tube distributor. Or write
Electronics Department, General Electric
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Series 3 in a listing, by areas, of tube
distributors who can supply you with
Ham News, G.E.'s bi-monthly magazine:

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Supply Corp.; Radio Electric Service Co.
Altoona, Pa.: Hollenbeck's Radio Supply.
Baltimore, Md.: General Electric Supply Corp.;
Wholesale Radio Parts Co.
Bethlehem, Pa.: Bell Electric Supply Co.
Kingston, Pa.: Stull Brothers.
Norfolk, Va.: Ashman Dist. Co.
Philadelphia, Pa.: A. G. Radio Parts Co.; Almo Radio
Co.; Consolidated Radio Corp.; Penn Electronics
Parts Co.; Radio Electric Service Co.
Pittsburgh, Pa.: Cameradio, Inc.; M. V. Mansfield Co.;
Tydings Co.
Roanoke, Va.: Leonard Electronics.
Salisbury, Md.: Standard Electronic Supply Co.
Scranton, Pa.: Mr. Fred B. Purcell; Scranton Radio and
Television Supply.
Washington, D. C.: Electronic Wholesalers; General
Electric Supply Corp.; Kenyon Radio Supply Co.
Wilmington, Del.: Radio Electric Service Co.
York, Pa.: Mr. C. R. Minnich.

(List as of Feb. 25, 1949)
Thanks, W6OKQ, for proving the point

- When H. P. Westler, W6OKQ, bought his 30K-1 he was dubious. Read what he says in a recent letter:

> "Ever since Eimac tubes have been available I have been running fairly high power—never less than 650 watts. A few months ago, when I made my decision to purchase a Collins 30K-1 with a phone input power of 375 watts, I was quite concerned in my own mind as to whether I would ever be happy and whether I would get results comparable to those I had been accomplishing. As you know, I am strictly a phone man and I think the following results which have been accomplished during the last few months since I purchased this new Collins transmitter speak for themselves. These contacts have all been made on 20-meter phone:

<table>
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<tr>
<th>Call</th>
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<tr>
<td>J9ACB</td>
<td>5-8</td>
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<tr>
<td>I1RC</td>
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<tr>
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<tr>
<td>VU2ET</td>
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> "I thought perhaps others might have had the same idea I had and that possibly you could use my past experience in proving the point that a well designed piece of equipment, such as this Collins 30K-1, does and will compete with the kilowatt rigs. Of course I have had many, many more contacts and lots of duplications of the same, but to receive reports like the above in the crowded 20-meter phone band shows that your equipment definitely can compete."

* * *

- Footnote to amateurs who are also professionals: You can expect the same high performance from Collins broadcast equipment and Collins airborne and ground station communication and navigation gear.

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SWITCH FROM ONE TO THE OTHER AT THE FLIP OF A SWITCH

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For complete enjoyment of circular-picture television, you need both the circular picture and the rectangular picture. The larger picture is truly a joy to behold, but—it clips off the sides of the normal picture. It works like a telescope; it concentrates on a smaller area and magnifies it. You see less, but what you do see appears bigger and closer. However, if reading material is flashed on the screen, the circular view may not cover the full width of the lines. Then, of course, with Hallicrafters, you merely flip the switch back to the rectangular picture.

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Takes 10 or 12 in. tube. Slight extra cost for 12 in. bracket.

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Pick PR Precision CRYSTALS at your jobber's for your favorite spots. Go PR... and KNOW WHERE YOU ARE! — Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Iowa. (Telephone 2760)
Section Communications Managers of the ARRL Emergency Corps

Reports Invited. All amateurs, especially Leamance members, are invited to report station activities on the first of each month (or preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio Club reports are also desired by SCSRs for inclusion in QST. All ARRL Field Organization appointments are now available to Leamance members. These include ORS, OBS, OPS, OS, and OBS. Also, where vacancies exist SCSRs desire appointments for SEC, EC, RSM, and PAM. In addition, the selection and leadership appointments for Members, all amateurs, are invited to join the ARRL Emergency Corps (ask for Form 7).

<table>
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<th>Division</th>
<th>State</th>
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<td>ATLANTIC DIVISION</td>
<td>Delaware</td>
<td>Jerry Mathis</td>
<td>623 Crescent Ave.</td>
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<td>Maryland</td>
<td>Elga W. Darre</td>
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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 fraternization and a high standard of conduct.
It is an incorporated association without capital stock, chartered
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The Officers are elected or appointed by the Directors. The League
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"It Seems to Us..."

Power

Spring is here and our thoughts this month ought to be all sweetness and light. But they aren't going to be. We'll wager a blown 30-amp. fuse that a few of the gang won't like us for airing some of ham radio's dirty linen on this page, but it seems to us about time we in American amateur radio took a long, critical look at our complacency in tolerating in our ranks those who violate all the standards of good sportsmanship in our game and who flaunt, more or less openly, intentional disregard of our amateur regulations.

We're talking about power. Not 250 watts or 500 watts or even a "full gallon," but the 2, 3 and 5 kilowatts that some stations are using today here and there around the country, to a very large extent with the knowledge of their fellows in the law-abiding category. We all used to make facetious reference, before the war, to the "California kilowatt" that a very few stations were pretty generally known to operate. There was a little grumbling in the background about these super-power stations, but the feeling seemed to be that they had simply elected themselves into another league that few decent hams would want to sign up with even if the opportunity offered.

Well, the postwar surplus market has changed all that. It seems that in a number of cases we were guilty of mistaking lack of opportunity for sportsmanship and a respect for the laws of the land. Surplus gear has put a lot of fellows on the air who might never have had a chance otherwise, and we're all for that. But surplus has also made it temptingly easy to put stations on the air with more power than the law allows, and the way some of the unscrupulous are going for it has got a lot of folks wondering if it isn't about time to do something about it. After all, it isn't hard to imagine the effect on some of our present crop of young squirts of those 1.5- and 2-kw. bargain combinations that can be bought for practically a song. And it's only natural that their normal sense of fair play becomes slightly dulled when they find that most of us hams, who should be actively reading the lawbreakers out of decent company, do nothing more than exhibit a slightly unhappy attitude about it all.

What's the answer?

One suggested solution that has been kicked around a little is, "Remove the power limit" — presumably on the theory that you make people honest by not giving them a chance to be dishonest. To that extent the idea has merit, but we can't imagine such things as rules of League contests providing, instead of power multipliers, entries in classes such as "under $3000 income," "under $10,000 income," and the like. Too many hams would take up photography and pigeon breeding.

Dozens of law-abiding amateurs who've written to us or talked to us on field trips during the past year, and who are concerned over the general trend to higher power (not necessarily above 1 kw.) have suggested lowering the power limit from 1 kilowatt to 100 or 200 watts. Not a solution to the problem we're discussing, to our way of thinking; the type of fellow who exceeds the limit now would certainly exceed it then.

Another possibility that has been suggested seriously in recent months would be to restrict the tube types in one's final amplifier (and driver, in case you're thinking about grounded-grid amplifiers). All available tubes would carry an FCC rating and installation of tubes with higher ratings would be prima facie evidence of violation of the power clause in our regulations, and basis for suspension or cancellation of licenses. While at first glance this may seem like a partial solution to the prob-
lem, it puts a terrific strain on the sane individual who likes his rig to last beyond the first twelve seconds of operation and it would penalize anyone interested in using high-quality linear amplifiers for harmonic reduction. In addition, because it would specify equipment in our regulations, ARRL would have to oppose it in principle, as discouraging experimentation and development.

Better enforcement? We'd like nothing better than to see some of these deliberate lawbreakers laid low by FCC and barred from the amateur air permanently, as we hope they will be. Continuous supervision and regular inspection of all amateur stations would be an expensive business, however, and, we suspect, would be accompanied by proposals of a stiff licensing fee to pay the costs. We'd deplore such a tax on the law-abiding majority merely to clear our ranks of a relatively few heels.

Is there, then, no immediate solution? We think there is. We think the solution is in the adoption of a healthy contempt, openly expressed, on the part of the real amateurs in the game to those in our bands whose tactics in this respect are not only ruining the game for the rest of us but also — and make no mistake about it — will, unless checked at the start, threaten the solid foundations of amateur radio itself. Amateurs of today probably do not realize that in the beginning the rest of the radio world regarded us with suspicion, as likely to prove too irresponsible to be permitted to operate at all. The respect we have earned with the regulatory agencies of this country, with the military and with the citizenry and with the governments of other countries, was earned the hard way. It was earned because from the beginning organized amateur radio was characterized by intense technical interest, and insistence on principles of cooperation, keen but honest competition — and strict observance of our regulations. It has been retained and enhanced over the years only after we demonstrated that we could continue to operate on those principles, that we do so because of pride in our game and in our accomplishments, and that we have proved our ability to keep our house in order without the necessity for constant supervision and government intervention. But only the constant practice of such principles will keep it for us; it won't take much complacency on our part to the complete disrespect of ethics and law that these Dead-End characters of amateur radio are engaging in to undermine that respect to a serious degree.

The solution, therefore, is something we ourselves must achieve. We think it is high time to start, too. What is needed is an end to looking the other way and instead a cold realization that this deliberate lawbreaking is not only a violation of all the rules of good sportsmanship but, if permitted to go unchecked, may constitute a threat to the continuation of the existing privileges of all of us. What is needed is the realization that the "friend" down the block or in our club who goes in for this sort of thing merits only our contempt for his demonstrated inability to compete on even terms with his fellows, and our condemnation for his wilful violation of one of the fundamental regulations laid down for our operation. What is needed is for the law-abiding majority to ostracize those guys who have forfeited the right to class themselves as amateurs.

—— A. L. B.

FLASH

PORTIONS OF "160" OPENED

On April 7th FCC released for amateur use portions of the band 1800-2000 kc. under provisions identical to those appearing on page 28 of March QST. The band segments are open to A-1 (c.w.) or A-3 (a.m. phone) use by all classes of amateur licensees. The authorization is subject to condition of no interference to the loran radionavigation service and any amateur causing interference must cease operation immediately if so notified by FCC.

This is an experiment by our Government to determine whether sharing of the loran bands by amateurs is a workable arrangement. Watch your frequency and power input with extreme care and observe closely the day-night changes in authorized power.

Canadian General Manager Reid announces that Canada on the same date released frequencies for amateur use as follows: In British Columbia, Alberta, Saskatchewan, Manitoba and the Mackenzie River District: 1900-1925 and 1975-2000 kc. In Ontario, Quebec, Maritime, Newfoundland and Labrador: 1800-1825 and 1875-1000 kc. Power limits are 250 watts day, 100 watts night. No operation in the Yukon.

NATIONAL EMERGENCY FREQUENCIES

C.W. 7100 kc. (day) 3875 kc.
3650 kc. (night)
Simple Gear for the 420-Mc. Beginner

Using the 6J6 for Transmitting and Receiving

BY EDWARD P. TILTON,* WIHDQ

As we have gone higher into the radio-frequency spectrum, developing improved techniques for each new band, v.h.f. operation has taken on most of the characteristics of work on our lower frequencies, in that equipment is becoming increasingly complex and costly. Crystal control and superheterodyne receivers, both admittedly superior and highly-desirable techniques, have tended to remove 50, 144 and even 220 Mc. from the simple-equipment category.

If we are to have any simple-equipment territory left at all, 420 Mc. is it. The band is 30 Mc. wide, so it matters little whether the signals are sharp or broad, from the standpoint of interference potentialities, and we need to have little concern over the possibility of wandering outside the prescribed band limits. The use of crystal control and superheterodyne receivers is recommended for the skilled worker, even on 420 Mc., but the important point is that they are not necessary. You can have a lot of fun on 420 with simple gear, and here's how:

The Circuits

Both the transmitter and receiver employ 6J6 tubes in their r.f. portions, the circuits being practically identical schematically. The tuned circuit in each is a half-wave line, with the tube plates at one end and the tuning condenser at the other. The plate voltage is fed into the line at the approximate middle, the exact point being determined by experiment. Two 100-ohm resistors, R7 and R9 in Fig. 1, are used at the feed point in the transmitter, as a precaution against loss of r.f. into the power-supply lead. The receiver uses a small center-tapped choke, R'F'C1 in Fig. 2, for this purpose, and a similar arrangement may be used in the transmitter, if desired. The only other oscillator circuit difference between the two units is the value of the grid leak, and the use in the receiver of the bypass condenser C1 in the grid lead, to induce superregeneration. The cathode and heater are maintained above ground potential in both units by small self-supporting r.f. chokes.

The audio portions of the receiver and transmitter are also quite similar circuitwise. In the transmitter a 6C4 speech amplifier is operated with the microphone transformer primary connected in its cathode lead, thus doing away with the necessity for a microphone battery. This drives a 6AQ5, providing more than enough output for modulating the 5 or 6 watts input to

* V.H.F. Editor, QST.
† "Four-Twenty Is Fun!" Tilton, Nov., 1947, QST.

The 420-Mc. transmitter is built in two units. The modulator portion, on a 7 x 7 x 2-inch chassis, uses a 6C4 driving a 6AQ5 modulator. The oscillator uses a 6J6 and is assembled on a removable trough-shaped chassis.

May 1949
Fig. 1 — Schematic diagram of the 420-Mc. transmitter.

C4, C5 — 10-µfd. 25-volt electrolytic.
C2 — 3-µfd. 450-volt electrolytic.
C9 — 0.01-µfd. tubular.
C5 — Miniature split-stator variable, 2 µfd. per section.
(Millen 21912D, with one rotor plate removed from each section.)
R1 — 470 ohms, 1 watt.
R2 — 0.33 megohm, ½ watt.
R3, R4 — 5000 ohms, 5 watts.
R5 — 0.47 megohm, ½ watt.
R6 — 680 ohms, 1 watt.
R7, R8 — 100 ohms, ½ watt, carbon.
R0 — 2700 ohms, ½ watt.
L3 — Midget filter choke.
L2 — Plate line made of two pieces of No. 12 wire, ¼ inch long, ¼ inch apart, center to center.
L3 — Hairpin of No. 18 wire. Portion which couples to L2 is about ½ inch long. Position should be adjusted for maximum transfer of power to antenna.
R4 — 5000 ohms, 5 watts.
R2 — Closed-circuit jack.
H1, H2 — 0.47 megohm, ½ watt. RFC1, RFC2 — 12 turns No. 20 enameled wire, ¼-inch diam., ¼ inch long.
R1 — Single-button microphone transformer.

the 6J6 oscillator. The receiver audio system uses a 6J5 and a 6F6.

Mechanical Details

The secret of success in getting the 6J6 tubes to operate satisfactorily at 420 Mc. lies in the elimination of all "leads" in the radio-frequency circuits. The plate line, L2, is connected directly to the socket pins, as are the grid resistors and the heater chokes. Use of the half-wave line, in place of the more common capacitance-loaded quarter-wave arrangement, permits the use of a standard readily-obtainable tuning condenser, yet leaves a line of appreciable length. Using half-wave lines in the manner shown the 6J6 can be made to oscillate up to 700 Mc. or more with ease.

The oscillator portion of the transmitter is built inside a trough made of flashing copper, which is easy to work with simple tools and ideal from the standpoint of conductivity and shielding qualities. It is inexpensive and may be obtained from building-supply houses everywhere. The trough is fitted to a copper clip fastened to the main chassis. Power connections are made with a small plug and socket, the latter being mounted on the rear wall of the main chassis. This permits experimentation with the oscillator portion, or even substitution of r.f. sections for other bands, without the necessity for making changes in the modulator unit. This trough construction also helps prevent direct radiation from the tank circuit. The useful output with this type of assembly is nearly twice that obtainable with open construction.

Readers of the article referred to earlier 1 will recognize the receiver as a revamped version of the acorn job described therein. It also appeared in the 1948 and '49 editions of the Handbook. Some constructors of the original design reported difficulty in getting 955s to oscillate at 420 Mc., and it has been found that only a few of the acorns one usually finds in the surplus bins can be made to work satisfactorily at this frequency. The receiver version shown here was made by substituting the 6J6 push-pull circuit for the 955, leaving the rest of the receiver intact. It utilizes the same dial and antenna coupling adjustment, and is shown in this form in order to permit builders of the original receiver to make the substitu-

Bottom view of the oscillator assembly. The trough in which the components are mounted is made of flashing copper. It is 6 inches long, 1½ inches high, and 2¼ inches wide, with ¼-in. h edges folded over for sliding into a clip attached to the main chassis.

QST for
Fig. 2 — Schematic diagram of the 420-Mc. superregenerative receiver.

$C_1$ — 470-µfd. mica.
$C_2$ — 0.0033-µfd. mica.
$C_3$ — 0.01-µfd. tubular.
$C_4$, $C_5$ — 10-µfd. 25-volt electrolytic.
$C_s$ — Miniature split-stator variable, about 4 µfd. per section. (Millen 21912D, with one rotor plate removed from each section. See text and photograph.)

$C_7$ — 0.1-µfd. tubular.
$R_1$ — 3800 ohms, ½ watt.
$R_2$ — 47,000 ohms, ½ watt.
$R_3$ — 0.5-megohm potentiometer.
$R_4$ — 2200 ohms, 1 watt.
$R_5$ — 0.1 megohm, ½ watt.
$R_6$ — 470 ohms, 1 watt.
$R_7$ — 50,000-ohm potentiometer.

Coupling is an absolute necessity. Don't try to do without it — the detector cannot be made to operate at maximum sensitivity unless the coupling is adjusted with extreme care.

**Firing Up**

Unless you have worked on 420 Mc. before, you'll need a set of Lecher Wires. Information on the construction and use of Lecher Wires may be found in the “Instruments and Measurements” chapters of recent Handbooks. Once the frequency is established by this method, an
absorption-type wavemeter can be made and calibrated for use in most work thereafter. Such a device may be made by bending 6 inches of No. 12 wire into a "U" 1½ inches across, and soldering its ends to the two stator terminals of a Cardwell Trim-Aire, the stator plate of which has been sawed down the middle. Only one rotor plate is used with this split stator plate. With a spacing of ¾ inch between rotor and stator, the band will cover approximately three-quarters of the tuning range.

Many checks on the transmitter can best be made by measuring the grid current. This may be done by inserting a meter between R9 and ground. Grid current, with 200 volts on the plate, should run about 5 or 6 ma. with a load connected to the antenna terminals. This load may be a 6-8 volt 150-ma. pilot lamp, which will light to about full brilliance with 200 volts on the 6J6 plates and an input of about 90 ma. The adjustment of the antenna coupling will probably be different with the lamp load than when an antenna is connected, however, so the setting of the position of the antenna coupling loop, Ls, should be made with the aid of some sort of field-strength indicating device. A simple indicator may be made by connecting a 60-ma. pilot lamp in the center of a folded dipole made of No. 12 wire, as shown in Fig. 3. The antenna coupling loop can be adjusted with a fiber crochet hook, through the hole near the antenna terminals.

For most efficient operation, the point of connection of the two resistors, Rs and Rs, on the plate line should be adjusted carefully. First the connection should be made at approximately the middle of the line. Now, while watching the grid-current meter, touch the point of a lead pencil along the line either way from the spot where the resistors are connected. A point will be found where there is little or no change in grid current when this is done. The plate-voltage connection should be moved to that point. The frequency of the oscillator should be checked again after this adjustment.

Fig. 3 — A simple field-strength indicator for 120 Mc. is made by connecting a 60-ma. pilot lamp at the center of a folded dipole made of No. 12 wire.

In using the transmitter for communication it will often be found necessary to adjust the percentage of modulation according to the receiver in use at the other end. A considerable amount of frequency change is unavoidable when a rig of this type is modulated, and the selectivity of the receiver being used will determine the most desirable degree of modulation. No gain control was included, but the modulation can be controlled within the necessary limits by talking nearer or farther from the microphone.

The first check on the receiver should be for superregeneration, as evidenced by the familiar loud rush. If several 6J6s are available they should all be tried and the one used which oscillates at the lowest plate voltage. With no antenna connected, the rush should be heard with the potentiometer, Rs, well back from its maximum position. With the antenna on, the control will have to be advanced, increasing the detector plate voltage, as the antenna coupling loop is moved nearer to the plate line. It will be necessary to check the tuning range of the detector with the antenna connected, and the coupling loop adjusted to approximately the position in which it will be used for reception, as the degree of antenna coupling and the setting of Rs both affect the frequency considerably.

The frequency range of the receiver can be changed slightly, to bring the band to the desired settings on the tuning condenser, by adjusting the copper plates attached to the stator plates, and by changing the spacing of the line. The tuning range with the condenser recommended in the parts list (one plate removed from each rotor section) is about 30 Mc.

The point of attachment of the center-
Linear R.F. Amplifiers

Their Design and Adjustment

BY STYRK G. REQUE, * W2FZW

Linear r.f. power amplifiers have been neglected by amateurs because of their alleged inefficiency and difficulty of adjustment. However, they are the amplifiers one uses in single-sideband transmitters, and they are far from inefficient in this application. Also, they are far from difficult to adjust, as this article clearly demonstrates. Here is a basic technique everyone should have tucked away in his noggin.

A little over a year ago a few hardy experimenters in the amateur ranks began describing their experiences with a new (amateur-wise) system of communication, single sideband. In general, the techniques they used had little resemblance to the conventional s.m. 'phone technique or, for that matter, to the newer technique of n.f.m. So it is not surprising to find a new jargon to describe these techniques, and one now hears such things discussed as “balanced modulators,” “sideband suppression,” “phase-shift networks,” and “linear r.f. power amplifiers.” This article concerns the last of these, for although the linear r.f. power amplifier is an old technique of broadcast-station design, it has had practically no use in amateur radio stations. Yet almost without exception the pioneers who are introducing us to single-sideband transmission are using this type of power amplifier.

Linear Amplifiers

A linear amplifier is one in which the output voltage is proportional to the input voltage. All of our audio amplifiers are of this type, or we get very objectionable distortions. Similarly the r.f. and i.f. amplifiers of our receivers are linear r.f. amplifiers, for if there were any serious distortion of the modulation envelope the detector would give us a distorted output signal. In fact, any amplification of a signal with a modulation envelope must be linear if we are to be able to recover the modulation in a detector system without severe distortion.1

The simplest form of linear amplifier (r.f. or audio) is the Class A amplifier, which is used almost without exception throughout our receivers and our low-level speech equipment. While its linearity can be made phenomenally good, it is unfortunately quite inefficient. The theoretical limit of efficiency in this case is 50 per cent, while most practical amplifiers run 25-35 per cent efficient at full output. At low levels this is not worth worrying about, but when we exceed the 2- to 10-watt level something else must be done to improve this efficiency and reduce tube, power-supply and operating costs.

The use of Class B amplifiers for high-level audio amplifiers (commonly miscalled modulators2) is now well known and common amateur practice. Class B amplifiers are theoretically cap-

Fig. 1—A circuit diagram of the familiar Class B modulator.

Plate-to-grid or line-to-grid transformer

To plate of final

Final +400

AC

B

X

X

To driver

0.8

0.8

10

Plate of final

To grid of driver

1 N.f.m. is not subject to this rule, because true f.m. or p.m. has no envelope which must be preserved. This is the same feature that gives f.m. its advantage in reducing certain types of BCI.

2 Modulation takes place because of the action of the Class C amplifier. The so-called modulator simply supplies audio power for the process.

May 1949
Our first concern will be the design of the proper plate-tank circuits and drive for the tubes. As an example, let us choose a tube of most of the common power-amplifier tubes are rated for Class B audio work. In a case of this sort the proper plate voltage, bias voltage, load resistance and power output are given, and the sole job is to provide proper tank circuits and drive for the tubes. As an example, let us choose a tube of good reputation as a Class B audio amplifier, such as the GL-805. Typical operating conditions are given in Table I.

**Amplifier Design**

In a large majority of cases the design of a Class B linear amplifier will be rather simple, since most of the common power-amplifier tubes are rated for Class B audio work. In a case of this sort the proper plate voltage, bias voltage, load resistance and power output are given, and the sole job is to provide proper tank circuits and drive for the tubes. As an example, let us choose a tube of good reputation as a Class B audio amplifier, such as the GL-805. Typical operating conditions are given in Table I.

Fig. 1 is a schematic diagram of the usual Class B audio amplifier. Fig. 2 is a diagram of the amplifier changed over for use as a linear r.f. amplifier. Our first concern will be the design of the proper tank circuits for the grid and plate circuits. The subject of proper loading will be discussed under the section on practical adjustment.

Let us design the proper plate-tank circuits first. As in all r.f. amplifiers, this tank circuit should have a loaded $Q$ of at least 12, if we want to have reasonable efficiency and low harmonic output. The loaded $Q$ is defined in terms of the tank-capacitor reactance (equal to the tank-inductance reactance at resonance) and the load resistance by the equation

$$Q = \frac{R_L}{X_C}$$  \hspace{1cm} (1)

Rearranging, and substituting in the figures,

$$X_C = \frac{R_L}{Q}$$  \hspace{1cm} (2)

But we also know that

$$X_C = \frac{1}{2\pi f C}$$  \hspace{1cm} (3)

If we choose the 75-meter 'phone band as our example of design, and hence substitute 4 Mc. for $f$ and 560 ohms for $X_C$ in (3), we will find the value for $C$ to be approximately 70 $\mu\mu$fd. This is the value of the capacity across the tank, and we must double it to find the value for each section of our split-stator condenser, or 140 $\mu\mu$fd. per section. Note that this is the value of the capacity actually in use, and that for proper adjustment a capacitor with a rating of at least 150 (and preferably 200) $\mu\mu$fd. per section would be clearly indicated. The coils should be chosen or pruned until the proper amount of capacity is required to tune them to resonance, with the error if any on the low-inductance (high-capacity) side where it can do little harm. Many troubles in amateur transmitters can be traced to the use of too little capacity in the r.f. tank circuits. This is not a peculiarity of the Class B linear amplifier, but is equally true of the Class C, perhaps to an even greater degree.

The calculation of the grid tank circuit is performed in just the same way as we calculated the plate tank. However, the loading of the grids, which must be substituted for $R_L$, is not given. Our present example, GL-8058, involves a pair of zero-bias tubes. Tubes in this class draw grid current even when very small signals are applied, and the equivalent loading of the grid tank is very nearly constant regardless of signal level. This will mean that a very nearly constant load will be reflected to the driving stage and only a small

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**TABLE I**

<table>
<thead>
<tr>
<th>Class B Audio-Amplifier Data</th>
<th>GL-805 Tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Values given for two tubes)</td>
<td></td>
</tr>
<tr>
<td>D.c. plate voltage</td>
<td>1250 volts</td>
</tr>
<tr>
<td>D.c. grid voltage</td>
<td>0 volts</td>
</tr>
<tr>
<td>Peak grid-to-grid voltage</td>
<td>245 volts</td>
</tr>
<tr>
<td>Zero-signal plate current</td>
<td>148 ma.</td>
</tr>
<tr>
<td>Max.-signal plate current</td>
<td>400 ma.</td>
</tr>
<tr>
<td>Max.-signal driving power</td>
<td>6 watts</td>
</tr>
<tr>
<td>Max.-signal plate input</td>
<td>500 watts</td>
</tr>
<tr>
<td>Effective load plate-to-plate</td>
<td>6700 ohms</td>
</tr>
<tr>
<td>Max.-signal power output</td>
<td>300 watts</td>
</tr>
</tbody>
</table>

---

3 If you are having trouble with harmonics, TVI, or a touchy amplifier that won't take load properly, you might take a quick look at the chart on page 167, *ARRL Handbook*, 1949 edition. See if the $L/C$ ratio is correct.
amount of loading or "swamping" will be necessary to insure that the driving signal is not distorted.

If, on the other hand, we choose tubes that operate at a normal bias of 50-60 volts (such as GL-810s) it is apparent that the grids will not draw any current at all until the driving signal exceeds this bias. In a case of this sort the grids load the grid tank circuit, and hence the driving stage, in a variable manner. Unless some further linear. This can be avoided if sufficient fixed loadings are two in number:

Across the tank will be approximately far beyond the scope of this article. 0 20 exceeds this bias. In a case of this sort the grids delve into the subject, we can state that 00

driving signal, and our amplifier system

impedance matching and controlling load the grid tank circuit, and hence the driving

the simple formula,

\[ R_{eq} = \frac{E_a - \alpha E}{2P_a} \]  

Substituting the proper values of grid-to-grid voltage and grid driving power from the data in Table I gives an equivalent grid loading of 4600 ohms. To be conservative, we might well put a 5000-ohm damping resistor across the tank, so that the net effective resistance across the tank will be approximately 2400 ohms. Substituting this value in Equation (2), and the resultant value of reactance in (3), we find the necessary value of \( C \) to be 200 \( \mu \text{fd} \) per section. A broadcast-receiver condenser of 420 \( \mu \text{fd} \) per section is readily available and will easily stand the low peak voltage on the grids.

Sometimes the value of capacitance as calculated above will be so large as to be unreasonable for the frequency involved. In a case of this type the solution must be obtained in another way, as indicated when we spoke of variable grid loads. The same network rules will apply to the matching network in this case as applied in the case where the grids do not draw current over the entire cycle of excitation (use of negative bias).

Here again it may not be amiss to mention that the large value of capacity indicated is not a result of Class B operation, but in this case is purely a function of the tube chosen. For linear amplifiers it is necessary that the tanks be properly designed. If the Class C stage seems to be tolerant of errors in tank design, it is because few of us have given full consideration to the proper handling of our amplifiers and have been content to operate with the efficiency and the harmonic output accident has provided.

Fig. 3 — Average grid and plate characteristics of the GL-829-B.

**Design from Tube Curves**

There are actually very few power tubes which we might choose to use as linear amplifiers that do not carry a Class B audio rating. However, there are a few tubes, designed for v.h.f. use, which are not so rated. Such a tube is the GL-829-B, a compact tube roughly equivalent to a pair of GL-807s. This tube has recently been popular with the gang running 100 watts or less because it is so well shielded and so compact. If we care to use a tube of this sort we must determine the quantities equivalent to those given in Table I from the characteristic curves and a few formulae which have been worked out by the engineers. Fig. 3 shows the grid and plate characteristics of the GL-829-B.
As a first assumption, let us suppose that the plate-supply voltage is 500 volts. The proper bias is our next consideration, and one good rule of thumb in determining this is to choose the bias such that the resting plate current will produce approximately \( \frac{1}{2} \) rated plate dissipation. Bias determined in this way will usually allow better linearity (less distortion) than a bias chosen closer to complete cut-off. Since our GL-829-B has a rated dissipation of 20 watts per section, the proper bias will allow 6.7 watts resting dissipation per section. At 500 volts plate supply this means a resting plate current of 13.3 ma. per section. From the characteristic curves of Fig. 3 it will be seen that approximately 18 volts of bias will be required. The resting point is marked "A" in Fig. 3.

Since the maximum signal efficiency is going to be in the order of 65 per cent, we can now determine the maximum input power. The 35 per cent power loss must equal the maximum plate dissipation, which is 40 watts (both sections) for our GL-829-B. Therefore, the total power input (100 per cent) must be 115 watts maximum, or 57.5 watts per section.

Dividing the maximum power input by the plate voltage will give the maximum signal plate current. In this case the total current will be 115/500 = 0.230 amp. = 230 ma. This is 115 ma. per section d.c. plate current at maximum signal.

The plate-current pulses of each tube of our Class B linear amplifier are half sections of a sine wave, such as might have been produced by a half-wave rectifier. In such a waveform, the peak current is 3.14 times the value read by a d.c. meter, and this permits us to find the peak current flowing through the tube. Since the d.c. input per section is 115 ma., we know then that the peak current through each section should be 115 \times 3.14 = 360 ma.

Returning to Fig. 3, we see that 360 ma. will flow on the crest of the cycle if the grid is driven up to +10 volts on the peak and the plate is not allowed to swing lower than 75 volts. Since the grid starts from -18 volts (the bias), this will be a peak r.f. grid swing of 28 volts, or a peak grid-to-grid voltage of 56 volts.

The grid driving power may be calculated from the peak grid-to-grid voltage and the grid current that will flow at the operating point "B." This is marked as B' on the grid current curves in Fig. 3. The grid driving power is one-quarter of the product of this peak grid current and the peak grid-to-grid voltage, or 0.39 watt in this case.

The power output of this amplifier may now be calculated by the aid of the formula

\[ P = 0.78 \times (E_B - E_{P_{\text{input}}}) \times I_{d.c.\_\text{max}} \]

Substituting the value of minimum plate voltage, the plate-supply voltage and the maximum-signal d.c. plate current we find the output power to be 0.78 (500-75) 0.23 = 76 watts.

As a double check we subtract this from the power input of 115 watts and find 39 watts plate dissipation for both sections. The actual efficiency is 66 per cent, a bit higher than assumed at first.

The plate-to-plate load resistance is readily obtained from the formula:

\[ R = \frac{2.6 (E_B - E_{P_{\text{min}}})}{I_{d.c.\_\text{max}}} \]

Substituting the same values used with Equation (5), we find the plate-to-plate load resistance to be 2.6 (500-75)/0.23 = 4800 ohms.

Collecting all the values calculated, we can now make up a table similar to the one given for the GL-805a which will apply to the GL-829-B. This is shown in Table II.

The calculation of the specific amplifier will now be the same as the case of the GL-805a, since we have determined all the significant values.

### General Considerations

Before going into detail on the adjustment and loading of the Class B linear amplifier, a few general considerations should be kept in mind. If proper operation is expected, it is essential that the amplifier be so constructed, wired and neutralized that no trace of regeneration or parasitic instability remains. Needless to say, this also applies to the stages driving it.

The bias supply to the Class B linear amplifier should be quite stiff. The Class C stage thrives on grid-leak bias, but for really good operation the Class B should be supplied from a very stiff source, such as batteries or some form of voltage regulator. If nonlinearity is noticed when testing the unit, the bias supply may be checked by means of a large electrolytic capacitor. Simply shunt the supply with 100 mfd. or so of capacity and see if the linearity improves. If so, rebuild the bias supply for better regulation. Do not rely on a large condenser alone.

### Adjustment of Amplifiers

The two critical adjustments for obtaining proper operation from the linear amplifier that has been correctly designed are the plate loading

---

### TABLE II

<table>
<thead>
<tr>
<th>Class B Audio or Linear R.F. Amplifier</th>
<th>Data—GL-829-B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D.c. plate voltage</strong></td>
<td>500 volts</td>
</tr>
<tr>
<td><strong>D.c. grid voltage</strong></td>
<td>-18 volts</td>
</tr>
<tr>
<td><strong>Peak grid-to-grid voltage</strong></td>
<td>56 volts</td>
</tr>
<tr>
<td><strong>Zero-signal plate current</strong></td>
<td>27 ma.</td>
</tr>
<tr>
<td><strong>Max.-signal plate current</strong></td>
<td>320 ma.</td>
</tr>
<tr>
<td><strong>Max.-signal driving power</strong></td>
<td>0.39 watts</td>
</tr>
<tr>
<td><strong>Max.-signal plate input</strong></td>
<td>115 watts</td>
</tr>
<tr>
<td><strong>Effective load plate-to-plate</strong></td>
<td>4800 ohms</td>
</tr>
<tr>
<td><strong>Max.-signal power output (audio or peak r.f.)</strong></td>
<td>76 watts</td>
</tr>
</tbody>
</table>
and the grid drive. Since these adjustments are preferably made with power on, it is a matter of practical convenience to have both controls readily available, at least during initial tune-up.

All adjustment procedures will be described in terms of oscilloscope pictures. The 'scope can show misadjustment at a glance and will greatly facilitate all adjustments. In addition, it is the most reliable instrument for observing modulation amplitude and, once used, is likely to become the most nearly essential instrument in the shack. Nothing elaborate is needed. One manufacturer regularly advertises a suitable instrument complete and ready to run in an attractive case for $24.95. If you prefer, build a unit such as shown on page 477 of the ARRL Handbook, 1949 edition, or the unit described by J. L. Hollis, WAJET, in the Sept., 1948, QST. Using one of the small war-surplus cathode-ray tubes, the cost will be less than a good multimeter.

The proper adjustment procedure for the linear amplifier used with an a.m. system can be covered very briefly. First of all, the driver stage, which will very likely be the modulated stage, may be checked by observing the modulation pattern on the oscilloscope when the driver is loaded by a dummy load (which simulates the input circuit of the linear amplifier). Pages 230–235, Chapter 9, ARRL Handbook, 1949 edition, gives the story on the use of the oscilloscope so well that it need not be repeated here. After the driver has been adjusted for proper operation into the dummy load, it may be coupled to the linear amplifier. The linear amplifier should now be coupled to a suitable dummy load (not the antenna). With no modulation applied to the driver, the drive and the output loading of the linear amplifier should be adjusted so that plate current is approximately one-half of the maximum signal plate current. Then 100 per cent modulation should be applied and the output of the linear amplifier observed on the 'scope. If the positive peaks of modulation are flattened, the loading of the linear amplifier is too light, or the driver is limiting. If the flattening of the positive peaks is caused by the amplifier load being too light, it will be possible to clear up the pattern by temporarily detuning the amplifier plate circuit. In this case, tighter output coupling and probably looser coupling to the driver are indicated. Always maintain the initial plate current by balancing the drive and output coupling. On the other hand, driver overload will usually mean that the driver is undercoupled and the linear amplifier is too heavily loaded. The object of the whole loading procedure will be to adjust the amplifier to a point where, with normal input, the output circuit is just on the verge of flattening the positive peaks at 100 per cent modulation.

In an ideal system, the adjustment finally reached will give simultaneous overload on the driver stage and the linear amplifier. In the practical case it is probably better to have the linear amplifier overload first. If the output-coupling and grid-drive adjustments are available as suggested, this procedure can be followed in less time than it takes to tell, with a few glances at the plate current thrown in as a double check. The antenna may now be coupled and checked.

**Single-Sideband Procedure**

If the amplifier is to be used with single-sideband transmitters, a modification of the above test procedure is helpful. With single sideband, 100 per cent modulation with a single tone is a pure r.f. output with no modulation envelope, and the point of flattening is difficult to observe. However, if the input signal consists of two sine waves of different frequencies (for example, 1000 c.p.s. difference) but equal amplitudes, the output of the single-sideband transmitter should have the envelope shown in Fig. 4. We have called this a "two-tone" test signal to distinguish it from other test signals. Its first advantage lies in the fact that any flattening of the positive peaks is readily discernible, which makes the adjustment of the linear-amplifier drive and output coupling as simple a procedure as that described for a.m. systems. Indeed, the procedure will be the same, except that there is no carrier-level adjustment to be made initially.

Those experimenters using the filter method for obtaining single-sideband signals can obtain such a test signal by mixing the output of two audio oscillators of good waveform. The experimenters using the phasing method of single-sideband signal generation will recognize the pattern as that obtained when a single test tone is applied to one of their balanced modulators. For this latter group a two-tone test signal may be readily obtained by disabling one of the balanced modulators in the exciter and applying a single input tone. Other variations are possible in different exciters, and the final choice of any one operator will be dictated by convenience.

Let us suppose that the linear amplifier has been coupled to a dummy load and the single-sideband exciter has been connected to its input.
By observing the oscilloscope coupled to the amplifier output, it will be possible to adjust the drive and output coupling so that the peaks of the two-tone test signal waveform are on the verge of flattening. The peak input power may now be checked. This is readily possible, for, with the two-tone test-signal applied, the peak input power will be 1.57 times the d.e. power input to the linear amplifier. Should this be different from the design value for the particular linear amplifier, the drive and loading adjustments can be quickly changed in the proper direction (always adjusting the loading so that the peaks of the envelope are on the verge of flattening) and the proper design value reached.

DISTORTED TWO-TONE TEST SIGNAL

Fig. 5 — The distorted two-tone test-signal pattern obtained when the bias voltage is incorrect.

As a final check, before coupling the linear amplifier to the antenna, the single-sideband operator will do well to check the linearity of the system, since distortion in the linear amplifier (for that matter, in any of the r.f. amplifiers) probably will result in the generation of sidebands on the side that was suppressed in the exciter. Here again the two-tone test signal will be of great help, since distortion of the signal will be readily recognized. A check of the bias supply has already been recommended. The next most likely form of distortion will be caused by curvature of the tube characteristic near cut-off, and will be recognizable from a two-tone test pattern that looks like Fig. 5. A slight readjustment of bias (or applying a few volts of positive or negative bias, in the case of zero-bias tubes) will usually straighten out the kink that exists where the pattern crosses the zero axis. Make this adjustment with special care, however, because the dissipation of the tubes with no input signal will be very sensitive to this adjustment. There are a few tubes that will not permit this adjustment to be carried to the point where the kink is entirely eliminated without exceeding the rated plate dissipation.

The antenna may now be coupled to the linear amplifier until the plate input with the excitation is the same as that obtained with the dummy load. The operator can now feel (Continued on page 94)
Bandpass Circuits in a Multiband Transmitter

Fewer Tuning Controls Without Gang Tuning

BY C. VERNON CHAMBERS,* W1JEQ

- All the operating conveniences of gang tuning are obtained through the use of simple bandpass filters and self-resonant circuits in low-level stages. This 75-watt-input VFO-controlled transmitter also has been treated to reduce TVI.

Present-Day operating practices demand the ability to change frequency quickly, with little or no retuning. On the other hand, multistage transmitters are the rule rather than the exception, and more stages mean more tuning controls. The two things can be reconciled by a number of methods, probably the best of which is the use of gang-tuned circuits. However, many of us do not care to struggle with the mechanical problems of that system, which leaves us with the alternative of using stages that tune broadly enough to make retuning unnecessary anywhere within an amateur band.

It is quite possible to get the necessary broad tuning by using low-C tanks, heavily loaded, in coupling circuits of ordinary design. The outstanding disadvantage of such circuits is that, being broad, they do not discriminate against unwanted harmonics generated in the low-frequency stages. The result is that these harmonics only too frequently ride through the amplifiers along with the desired frequency, eventually appearing on the air as out-of-band radiations. With such circuits, too, conditions are only too favorable for the generation and radiation of harmonics in the v.h.f. region where they will interfere with television reception.

It has previously been pointed out 1 that spurious radiation can be reduced by using bandpass circuits between stages. Bandpass circuits will have fairly uniform response over the desired band, but their response drops sharply once the band limits are passed. The transmitter to be described combines bandpass and simple tank circuits in such a way that no retuning is required in any of the intermediate stages when the frequency is changed inside a band, and spurious radiations are effectively suppressed. It is a low-power set using an 807 final amplifier, with a built-in VFO and two frequency-multiplier stages. The only tuning controls are those for the VFO and the final plate circuit.

The Transmitter Circuit

The circuit diagram of the transmitter is given in Fig. 1. A series-tuned VFO operates across the 1,685- to 2.0-Mc. range to provide the proper harmonic relation for the amateur bands from 3.5 through 30 Mc., including the 27-Mc. band. The VFO frequency is doubled in the plate circuit of the 6AG7 oscillator tube and is fed through a simple bandpass circuit to the grid of a 6AG7 buffer-doubler. The bandpass circuit attenuates all frequencies outside of the 3.37- to 4.0-Mc. range, thereby suppressing harmonics other than the second, and is wired in permanently because it is in use on all bands.

A "self-resonant" coil is used in the plate circuit of the buffer-doubler. To prevent a tuned-grid tuned-plate oscillation that occurred when the stage was working straight through, the circuit is made slightly degenerative by omitting the by-pass capacitor customarily connected across the cathode resistor, Rs. The buffer-doubler furnishes excitation for the amplifier tube at 3.5 and 7 Mc. As a doubler, it may also be capacity-coupled to a third 6AG7, which drives the final amplifier at 14 Mc. and above.

The last frequency multiplier uses a fixed-tune plate circuit and is capacity-coupled to the 807

May 1949
amplifier at 14, 21 and 27 Mc. At 28 Mc, a band-pass filter is used between the driver and the 807. The filter, a plug-in affair which replaces the self-resonant circuit, aids in attenuating TV-range harmonics generated by the frequency multiplier. This last driver tube is made either active or inactive by means of the heater switch, S2.

In the final amplifier, parasitic oscillation is prevented by the combination of RFC4 in the grid circuit and C26 in the plate circuit. C26 also helps in reducing r.f. harmonics, but in addition a parallel-tuned trap, C11La, is connected in the plate lead of the 807. The trap constants permit tuning to harmonics between 54 and 88 Mc.

Fig. 1 — Circuit diagram of the broad-band exciter.

C1 — 50-µµfd. variable (Millen 19050).
C2 — 100-µµfd. variable (Millen 20100).
C3, C4, C5, C6 — 5–20 µµfd. ceramic trimmer (Centralab S20-5203).
C7 — 100-µµfd. air trimmer (Millen 26100).
C8 — 250-µµfd. variable (National TMS-250).
C9, C10, C11, C12, C13, C14, C15, C16 — 0.01-µfd. paper, 400 volts.
C17 — 15-µµfd. mica.
C18, C19 — 0.001-µfd. mica.
C20, C21, C22, C23, C24, C25, C26, C27, C28 — 470-µµfd. mica.
C29 — 12 µµfd. (Millen 15015).
C30 — 0.01-µfd. mica, 1200 volts.
C31 — 340-µµfd. mica (two 680-µµfd. units in series).
R1 — 47,000 ohms, ½ watt.
R2, R3, R4, R5, R10, R11, R12, R15, R16, R17, R18 — 100 ohms, ½ watt.
R4 — 47 ohms, ¾ watt.

RFC1, RFC2, RFC3, RFC6, RFC7, RFC8, RFC9, RFC10 — 0.001-µfd. r.f. choke (Ohmite Z-50).
RFCs — 26 turns No. 18 enam., ½-inch diam., close-wound on National PRE-3 form.
S1 — 2-pole 2-section 11-position selector switch (Centralab Type 1413).
S2 — 5-p.s.t. rotary toggle switch.
the second harmonic to reach the second tube with appreciable amplitude. This selectivity is important, when it is remembered that the oscillator harmonics are less than 2 Mc. apart; it is wise to get rid of them before they can be built up in later stages.

Simple plug-in coils, tuned by the circuit and tube capacitance, are used in the plate circuit of the buffer-doubler stage. Four are required. Two of these are used for driving the 807 on 3.5 and 7 Mc., respectively. The other two are for coupling to the 6AG7 multiplier when that tube is used. One has the proper inductance to drive the 6AG7 to optimum output over the 14-, 21- and 28-Mc. bands. The coil inductance is adjusted so that the amplification is greatest at a harmonic of the frequency at which the response curve of the preceding bandpass circuit (Fig. 2) has a dip; this makes the excitation to the following tube as uniform as possible over the band. However, a coil so adjusted does not result in good performance from the 6AG7 in the 27-Mc. band because, as shown by curve B in Fig. 3, the circuit does not tune broadly enough. Consequently a separate coil is provided for 27-Mc. operation only.

The third 6AG7 is used to double to 14 Mc., triple to 21 Mc., or to quadruple to 27 or 28 Mc., so that the final amplifier can work straight through on all these frequencies. Self-resonant plate coils, peaked at 14.3, 21.2 and 27.1 Mc., approximately, are used for the first three bands, but a bandpass circuit is used for the 28-Mc. band. The primary reason is that it is difficult to obtain sufficiently-broad frequency response with a simple coil at this frequency, because even when it is tuned only by the tube and stray capacitances the circuit is fairly high-C. This raises the Q to the point where it becomes difficult to cover a 1.9-Mc. band without retuning. In addition, the bandpass

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For further description of the operation of coupled resonant circuits see Chapter 2 of *The Radio Amateur's Handbook* — p. 53 in the 25th and 26th editions.

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circuit does a better job of suppressing v.h.f. harmonics generated in the multiplier stage than would be the case with a self-resonant circuit and capacitive coupling.\(^4\)

The frequency response of the 28-Mc. bandpass filter is shown by Fig. 4. Although the output is somewhat irregular within the band limits, the excitation voltage for the 807 stays close to the optimum value over the whole band.

**Transmitter Layout**

The transmitter shown in the photographs was built primarily to try out a number of ideas for broad-band circuit operation, so to facilitate the many soldering and replacement operations associated with experimental work the components were mounted on a piece of \(\frac{3}{4}\)-inch aluminum measuring 7 by 17 inches. A regular chassis, 3 inches deep, serves as a mounting for the aluminum plate and acts as a shield for the components mounted below the actual "chassis." The whole assembly is then installed in a No. CA-303 Par-Metal cabinet — one of the few cabinets that will accommodate a \(7 \times 17 \times 3\)-inch chassis.

The rear view shows the oscillator tube at the right-hand end of the chassis with the low-frequency bandpass assembly to the left. A slot, \(1\frac{1}{2}\) by \(2\frac{1}{2}\) inches, is cut in the aluminum plate to allow clearance for the filter components. The buffer-doubler tube, the frequency-multiplier tube and the VR-75 form a line from rear to front just to the left of the filter. The oscillator band-set condenser, \(C_2\), is to the right of the VR-75. Coils for the driver tubes, and a crystal socket (contacts \(X\) and \(Y\) in the circuit diagram) are next in line to the left. The 807 amplifier tube, the tubular bypass capacitor, \(C_{50}\), the harmonic trap, and the tank coil are at the left end of the chassis. Connections to points \(W\) and \(Z\) in the circuit diagram go through feed-through bushings mounted between the 807 and the driver-coil sockets. The stand-off insulator mounted in front of \(C_2\) is used as a low-capacity holder for terminal \(Z\) when inductive coupling from the multiplier tube is used. The antenna terminals are to the rear of the tank coil and the power-cable terminals are to the rear of the oscillator tube. The set of terminals behind the 807 is for an external meter and need not be included if a meter is mounted on the panel.

The bottom view shows how the components are laid out around the various tube sockets. The meter switch is mounted on a small aluminum bracket and the heater switch, \(S_2\), is equipped with long leads so that the switch may be mounted on the front panel prior to final assembly of the unit. The power-wiring filters are closely grouped around the power terminal strip.

**Coil and Filter Construction**

When winding the self-resonant plate coils, it is advisable to make provision for varying the spacing between the last one or two turns of the windings. It takes only a small change in inductance to make an appreciable change in the resonant frequency when the shunting capaci-
Coil Set-Up for Various Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>L4</th>
<th>L5</th>
<th>L6, L7</th>
<th>L8</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>A</td>
<td>—</td>
<td>—</td>
<td>J</td>
</tr>
<tr>
<td>7</td>
<td>C</td>
<td>—</td>
<td>—</td>
<td>K</td>
</tr>
<tr>
<td>14</td>
<td>B</td>
<td>E</td>
<td>—</td>
<td>L</td>
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<tr>
<td>21</td>
<td>B</td>
<td>F</td>
<td>—</td>
<td>M</td>
</tr>
<tr>
<td>27</td>
<td>D</td>
<td>G</td>
<td>—</td>
<td>M</td>
</tr>
<tr>
<td>28</td>
<td>B</td>
<td>—</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

*End turns adjustable — see text.

**Power Supplies**

Two power supplies are required, one capable of delivering approximately 375 volts at 75 ma. for the 6AG7s, and one delivering 750 volts at 110 ma. for the 807. (The 807, of course, may be operated at 600 volts if lower input is sufficient.) The regulation of the low-voltage supply need not be exceptionally good because the frequency-
control stage of the transmitter is protected against any reasonable variation in supply voltage by a VR-75 regulator tube included as part of the transmitter proper.

Testing & Operation

Alignment is not difficult even though the bandpass filters do require fairly careful adjustment. Before attempting to adjust any of the coupling circuits the oscillator tuning range should be adjusted to cover 1.685 to 2.0 Mc. by means of the oscillator band-set capacitor, C2.

A low-range vacuum-tube voltmeter, connected across the buffer-doubler grid leak, R6, provides an excellent means for checking the performance of the low-frequency bandpass filter. If the filter is a reasonable facsimile of the one described here it should be possible to duplicate either one of the curves shown in Fig. 2. The simplest method of aligning the filter is to adjust C3 and C4 to make the 6AG7 buffer-doubler grid voltage peak up at 3.5 and 3.9 Mc.

If a vacuum-tube voltmeter is not available, it is possible to use the 807 grid-current readings instead. Output from the buffer-doubler stage is fed to the amplifier tube by inserting output plug W in position Y of the crystal socket, and the frequency-multiplier circuit is made inactive by opening the heater switch, S4. If the 3.5-Mc. buffer-doubler plate coil is resonated at about 3.7 Mc., the 807 grid-current curve should resemble curve B of Fig. 2. The peaks at 3.5 and 3.9 Mc. should reach a value of 4 ma. and the grid voltage, if measured across R18 with a high-resistance voltmeter, should average 90 volts as the oscillator tuning is swept across the 3.5-Mc. band.

Alignment at 7, 14, 21 and 27 Mc. is similar, but the higher-frequency plate coils require more careful pruning than does the 3.5-Mc. coil. The r.f. connections at 7 Mc. are identical with those used at 3.5 Mc. At 14 Mc. and above the frequency multiplier is made active by closing the heater switch and by changing the r.f. output plugs, W and Z, to socket positions X and Y, respectively. In aligning each band the oscillator frequency should be varied to give complete coverage of the band under test. In each case the 807 grid current should average 4 ma. over the band, but when the band edges are passed the current should fall rapidly. If initial tests show a pronounced grid-current peak at either end of a band, it is an indication that the self-resonant plate coils need further adjustment.

Fig. 4 shows the frequency response of the 28-Mc. bandpass filter. The filter tuning capacitors, Cb and Cc, should be adjusted to give peaks at 28.4 and 29.6 Mc. It is essential that the r.f. output plug, terminal Z, be mounted in the insulated jack whenever the multiplier stage is being used at 28 Mc. Otherwise, the operation of the filter will be affected by the stray capacity resulting when the plug is allowed to lie at random on the chassis.

The plate tank of the power amplifier is tuned in the normal way. The harmonic trap requires critical adjustment, however. Where necessary and possible, this circuit can be tuned to trap out an offending harmonic by observing the effect on the screen of a TV receiver. A second method is to use a rectifier-type wavemeter link coupled to the amplifier plate coil. Using an instrument having a 200-µa. meter as the indicator we were able, with the amplifier running at 75 watts input at 28 Mc., and with maximum coupling between the amplifier and the wavemeter, to eliminate every indication of r.f. at either the second or third harmonics.

Current and Voltage Data

The plate and screen circuits of the oscillator should each draw approximately 3 ma. when the supply voltage is held at 75 volts by a regulator tube. The grid current for the next two 6AG7s should average 1 ma. Screen and plate currents of the buffer-doubler tube should be about 4 and 10 ma., respectively, and the screen and plate voltages should measure approximately 110 and 220 volts. Operating conditions for the screen of the frequency-multiplier tube are 7 ma. at 280 volts and the plate should draw about 20 ma. These figures can be expected to vary as the operating frequency of the transmitter is varied, because the self-resonant plate circuits will perform most efficiently over only a small band of frequencies. However, the readings should remain within a few per cent of the values listed above.

The screen of the 807 amplifier tube draws 5 to 6 ma. with an applied potential of approximately 300 volts. Normal full-load plate current for the 807 is 100 ma. and, with excitation removed, the 6V6GT clamper tube should hold the d.c. input to less than 15 watts.
Antennas for 160 Meters

A lot of the new blood (and the old, too) in amateur radio has been getting excited over the imminent availability of portions of the 160-meter band. Attracted by the complete coverage possible up to a hundred miles or so, they anticipate correctly that the band will open up new areas for QSO that are available now on 10 and 6 only under unusual conditions or with superb antennas. The old timers know about antennas for the band but some of the newcomers don't. This article is a brief résumé of 160-meter antennas.

First off, you have to realize that 160 isn't like 10 meters— in fact, it isn't even like 80. On 10 you can build a compact rotatable beam and squirt most of your power in the direction you want. If your antenna has gain and is high, you can work over ground ranges that the fellow with the dipole can't touch. On 80 you can put up a horizontal antenna not too high off the ground --- ao or 40 feet will do the trick ---- and work over long distances. A vertical antenna on 80 will give you a better ground wave and is generally superior for ground jobs, but you can do right well most of the time with a horizontal job. In the case of DX with the vertical, it isn't the ground wave that does the trick but the low-angle radiation --- the ground wave is attenuated fairly fast and doesn't have much range.

But on 160 the ground wave isn't absorbed too fast, and so what you want for that consistent coverage is a good ground wave. However, a ground wave can only be a vertically-polarized one, and such signals are obtained from vertical radiators. A quarter-wavelength vertical for 160 would be about 125 feet high, so how does one get a good signal on 160?

One way, of course, is to use a 125- or 250-foot vertical, but you may guess that a lot of prewar 160-meter signals didn't get any such luxurious start. They did almost as well by the simple expedient of running the high-current portions of the antenna vertically, and stretching the rest out in some way to resonate the antenna and make it easy to feed. Here, then, is your basic principle in 160-meter antenna design: Keep the high-current portions of your antenna as close to vertical as you can.

Fig. 1 shows how this can be done reasonably. If the over-all length of wire is about a quarter wavelength, as in Fig. 1A, a series-tuned circuit can be used to couple to the transmitter. As much as possible of the high-current portion of the antenna should be run vertically --- 62 feet is shown in the sketch, but less than this can be used, with a corresponding increase in the length of the flat-top portion. A good low-resistance ground connection is important, since high currents flow in this circuit, and the ground should be the cold-water system in the house, a buried radial network or a counterpoise. The coupling network L1C1 should resonate to the operating frequency. A 250-µµfd. condenser and a coil that will resonate with about 200 µµfd. will do the trick. If you can't load the transmitter easily with this arrangement, try a larger inductance at L1. The system at Fig. 1B uses a half-wavelength antenna, with the high-current portion at the high point in the antenna. The horizontal 62-foot portion can be run 6 or 8 feet above the ground, since the radiation from it is not too important. The height does not have to be as great as shown, of course, but it is wise to plan on having the center of the antenna wire come at the right-angle bend at the top of the antenna. Thus if the vertical run were reduced to 42 feet, the lower horizontal run should be increased to 82 feet. None of these dimensions is critical in the sense that they are at 29 Mc., and many liberties can be taken with the design to fit it best into available room and supports. The antenna coupling circuit, L2C2, should be one that will resonate to the operating frequency, with constants similar to L1C1. If adequate coupling cannot be obtained, reduce the number of turns of L2 and increase C2 accordingly. The ground connection in this system is not as critical as that in Fig. 1A, and generally any water pipe will be adequate.
Small Antennas

The previous discussion will show you what a straightforward system looks like, but everyone isn't going to have room for such systems. Don’t worry — there are still a few dodges that you can use. Probably your first thought will be to use whatever long wire you have around the shack: an 80-meter Zepp, a long receiving antenna, or a 40-meter Zepp. The 40-meter Zepp resembles the antenna of Fig. 1A if the feeders are long enough, and all you have to do is to tie the two feeders together and couple the thing to your transmitter. If the antenna is high and the feeders are long enough, you will do fairly well. The 80-meter Zepp with feeders tied together will be a little better, because the current loop will show up at the junction of feed line and antenna. If the feeders are short, however, you may have to experiment with the coupling, trying both series- and parallel-tuned circuits, until you find a suitable combination. One possibility is the series loading coil shown in Fig. 2A — this system resembles that of Fig. 1B, except that the lower horizontal run of wire has been replaced by a loading coil. This loading coil, $L_5$, should be adjusted until $C_2L_2$ resonates to the operating frequency with the antenna system either connected or disconnected at “X.” Some of the adjustable inductors found in surplus should be ideal for this use, since the roller contact makes them very easy to adjust. The ARC-5 series of transmitters uses such coils in the antenna circuit, and similar coils have been available as separate units. The long-wire receiving antenna can be coupled through series- or parallel-tuned circuits, depending upon its length, or a so-called “Collins coupler” or $\pi$ network can be used. This will work best when the over-all length of the wire is more than 75 feet and less than 175 feet. It is shown in Fig. 2B. Constants will vary with the antenna, of course, and considerable experimentation may be necessary to find the proper values. If the wire length is close to a quarter wavelength (125 feet), $C_4$ may be fairly large, and may require connecting several fixed mica condensers in parallel with $C_4$, $C_3$ and $C_4$ can be 250-$\mu\text{fd}$ variable condensers, and $L_4$ a surplus adjustable loading coil.

If one doesn’t have the room for the antennas just described, but has a high mast or tree available, a “top-loaded” vertical antenna is a good one to use. Such a system is shown in Fig. 3. The top-loading capacity can be a 4-foot diameter circle of $\frac{\pi}{4}$-inch copper tubing supported by two crossed sticks and connected to the center with six or eight radials of No. 12 wire. The two wires making up the antenna proper can be the usual No. 12 enameled, spaced 6 inches by ceramic feeder spacers. If the available length (height) of the antenna is between 105 and 62 feet, the system of Fig. 3A should be used. Little or no inductance will be required at $L_6$ if the loading “hat” is 4 feet in diameter and the antenna length is 100 feet, and the inductance required at $L_4$ will increase as the height is decreased. A $\frac{\pi}{2}$-wavelength antenna (62 feet long) loaded with the 4-foot diameter hat will require about 120 $\mu\text{h}$ at $L_6$. Such a coil resonates at 1900 kc, with 57 $\mu\text{fd.}$, and represents a $5\frac{\pi}{2}$-inch close-spaced winding of No. 12 d.c.e. on a 3-inch diameter form, to give you a rough idea of the size. For antenna lengths shorter than 62 feet, the system of Fig. 3B is recommended. The value of coil $L_6$ will run around 120 $\mu\text{fd.}$ as mentioned above, while $L_6$ would be 20 $\mu\text{h.}$ for a 40-foot antenna and 10 $\mu\text{h.}$ for a 50-foot skywire. In any case, $L_6$ should be adjusted for maximum signal at a distance of a quarter mile or so. The coil $L_6$ should be made weatherproof and of at least No. 12 wire. The variable inductor $L_6$ can most conveniently be one of the surplus adjustable loading coils described for use at $L_4$ and $L_6$ in Fig. 2. The coupling circuit to the top-loaded verticals, $C_4L_6$, is similar to that shown in Figs. 1 and 2. The top-loaded vertical
is an excellent radiator and has the additional advantage that the ground current is low and hence the losses are kept down. While an excellent ground will work better than a mediocre one, generally a good connection to the water system or to three or four 4-foot metal stakes driven in the ground will be sufficient.

**Fading**

Needless to say, the first antenna most newcomers to 160 will try will be something they already have, loaded in some weird and wonderful way until it takes power. There is nothing wrong with this, of course, but such stations are likely to find that they can do little or nothing during the daytime unless they have a good ground wave. This good ground wave will be obtained only from the vertical portions of the antenna. In many compromise antennas, such as those of Figs. 1B and 2A, where there will be both low-angle vertically-polarized and high-angle horizontally-polarized components, there is a good chance that the signal will show many distant regions of bad fading during the evening, when the direct and reflected (from the ionosphere) waves will meet out of phase. One solution is to overlook it and not let it bother you — the other is to decrease the sky wave and increase the ground wave by using one of the antennas of Fig. 3.

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**Silent Keys**

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

- W1GGF, Burney J. Jones, Rockland, Me.
- W2HQS, Roger C. Carlton, Fair Lawn, N. J.
- W2MSZ, Dexter M. Moody, Haynerville, N. Y.
- W2OUP, Albert A. Kaplin, New York City
- W2WCD, Albert L. Vanderbilt, Williamstown, N. Y.
- W4LJS, Robert L. Rhinehart, Lake Worth, Fla.
- W6RXII, Allan L. Marek, Kilgore, Texas
- W7DRY, Arvid E. Peterson, Tacoma, Wash.
- SM5RF, Sten Rudkvist, Stockholm
- VE2BFJ, John H. Clarke, Peterborough, Ont.
- VE3BRU, Robert J. Hawke, Toronto, Ont.

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**25 Years Ago**

Recently returned from Europe, President Maxim reports in May, 1924, *QST* on the Paris meetings leading to the formation of the new International Amateur Radio Union. Amateurs in France, Great Britain, Belgium, Switzerland, Italy, Denmark, Spain, Luxembourg, Canada and the United States were represented at the sessions, which named Mr. Maxim president and Dr. Pierre Corret of France secretary of the new world organization. A congress to effect a permanent union is scheduled for 1925.

"The Navy's Work on Short Waves" is an inspiring feature article by Dr. A. Hoyt Taylor, physicist, USN. Amateur investigations below 200 meters have much in common with those of the Navy, Dr. Taylor points out, and our stations will be depended upon to report reception of the 100-meter rig of the dirigible Shenandoah.

Amateur radio continues to be the lone lifeline of communication with the MacMillan Arctic Expedition, though adverse radio conditions during February and March have made two-way work impossible. At press time, 7AI B reports copying a brief "all's well" from Operator Don Mix. "The Eastward Voyage of the Tahiti" (Sydney, Australia, to San Francisco) was a more successful demonstration of amateur communication, as long lists of calls heard and worked would evidence. Aussies C. D. Maclurcan, 2CD, and Jack Davis, 2DS, were operators of the temporary amateur station installation on the ship.

Timely technical offerings in this issue include J. L. A. McLaughlin's description of a two-range low-loss tuner, I. V. Iversen's (7ADQ) how-to-build-it discussion of the Meissner transmitting circuit, C. E. Dengler's (8KS) pointers on erecting a gutter-pipe mast, and Frank Reid Stansel's practical methods for measuring inductance and capacity.

Hoover Cup winner for 1923, Don C. Wallace, 9ZT, Minneapolis, describes the gear that won him the coveted Department of Commerce award. A 250-watt Hartley transmitter, 124-jar electrolytic rectifier, low-loss tuner, and 6-wire flat top with 23-wire radial counterpose are the equipment of this outstanding American station.

Gleanings:

- L. W. Hatry, 5XV, and Maurice G. Goldberg, 9APW-9ZG, both well known for their excellent *QST* articles, are introduced in the "Who's Who" section.
- Porter H. Quinby has succeeded George Turner as Midwest Division manager.
- 5NW has worked all districts and Canada with his 5-wattier.
- 6AXD and 2ADM have QSOed transcon in broad daylight.
- Black and gold have been adopted by the Board as the official ARRL colors.
BOARD AGENDA

As indicated in the previous issue of QST, the annual meeting of the League's Board of Directors is being held later in the month of May than usual because of the Inter-American Conference, the first day of the meeting to be May 27th.

One of the first matters to come to the attention of the Board this year will be the report of its Building Committee, appointed last year to make a thorough study of the whole question of the location of League headquarters, desirability of owning our own building, and examination of the effectiveness of W1AW in getting information to the membership. This committee, under the chairmanship of Vice-President McCargar, has worked long and hard during the past year, has had meetings in both Milwaukee and New York City, and will submit a voluminous and detailed report to the Board on every phase of the matters referred to it.

Perhaps because the Federal Communications Commission has not yet taken any action (as we write, at least) on the Board's recommendations last year with respect to 'phone suballocations, there have not been as many advance proposals for discussion on the 'phone-c.w. question as usual. However, Director Groves, of the West Gulf Division, who last year made a fruitless attempt to promote a recommendation for daylight operation of 'phone in a substantial portion of the 7-Mc. band, has served notice that he will resubmit his proposal this year; he suggests 100 or 150 kc. for Class A and B operation between the hours of 10 A.M. and 4 or 5 P.M. CST. Director Collett, of the Midwest Division, has suggested that the Board reexamine the "formula" approach to the 'phone question advanced by former League Secretary Warner in 1946, wherein under 'phone operation would be permitted in each band in terms of the ratio of total 'phone interest among amateurs modified by a "k" factor to be determined by the Board; Atlantic Division Director Martin has suggested to his brother directors that they study the merits of a straight 50-50 division of all bands between 'phone and c.w.

Organizationwise, one of the tasks before the Board this year will be the designation of a successor to former Secretary and General Manager Warner. In this connection, Director Collett has proposed the appointment to three separate positions of three separate individuals, each reporting to the Board annually, to be known as secretary, general manager, and QST editor, respectively, and Hudson Division Director John-
League shall be directed to request of the U. S. House of Representatives Committee on Post Office and Civil Service the issuance of a commemorative stamp, preferably of 1¢ denomination, depicting the American radio amateur’s contribution to the electronic science and its part of our public service and national defense. Finally, he proposes complete reexamination of his motion last year to study a plan for the formation of five supervisory committees to supervise various departments of the League.

Directors desire membership comments and suggestions on these or any other subjects, prior to the annual meeting on May 27th. Your director’s name and address appear in the directory in the front pages (page 8 this month) of every issue of QST.

FOURTH INTER-AMERICAN CONFERENCE

With further delays in the wind-up of the Mexico City High-Frequency Broadcasting Conference necessitating consequent postponement of the original opening date of April 1st for the Fourth Inter-American/Region 2 Conference at Washington, the prospect as we go to press at the end of March was that the Inter-American affair would probably open April 25th. Preparatory work for the United States was largely completed by the end of March, principally as a result of almost continuous meetings of the allocations group from mid-February on; League representatives were constantly present at all these meetings, the only amateur representatives on the committee. Principal conference agenda item of amateur interest will be in connection with the 3500-4000 kc. band, which under Atlantic City (as under all previous world regulations since 1927) is assigned jointly to the amateur, fixed and mobile services; it is at these regional conferences that disposition of the band among the three services is arranged. Traditionally, the U. S. has always proposed the band exclusively for amateurs, in line with its domestic policy. We are pleased to report that, as one result of the allocations committee meetings, our Government is proposing the band exclusively as amateur at the Fourth Inter-American as well: advance indications, however, are that some of the other American countries, principally in South America, may wish to make somewhat different disposition of the band in their countries, a situation not helped by the fact that the amateurs of some South American countries have never had any particular interest in this low-frequency band.

CANADIAN REGS

Canada issues amateur licenses on a one-year basis, the anniversary date being April 1st, and such changes in regulations as are contemplated are put into force at that time. From Canadian General Manager Reid, who had had conferences with the Controller of Radio at Ottawa during March, we learn that the only change in Canada’s amateur regulations this year will be to permit n.f.m. on all frequencies open to ‘phone, effective April 1st.

DANGER!

By now, most of our readers are probably familiar with the discovery, in mid-March, that certain war-surplus radio gear being sold in the open market still contained the explosive devices installed in them during wartime to wreck them in the event of forced landing of Allied planes in enemy territory. ARRL immediately got out warning bulletins via W1AW and our Official Bulletin Stations pending consultation with Washington to determine what equipments may contain the destructors and what amateurs should do in the event they have purchased such equipment. We quote the latest word from the War Assets Administration on the subject:

Upon reports that certain surplus radio equipment contained explosive devices designed for its destruction in military emergency, the WAA and the Armed Services joined today in an investigation to determine the extent to which such equipment had found its way into private hands.

Although only a handful of sets sold is known to have contained this explosive device, the Agencies acknowledged the possibility that more of those sold had not been deactivated before sale to private individuals. The Armed Services as well as WAA have disposed of some thousands of sets.

Upon reports that certain surplus radio equipment contained explosives designed for its destruction in military emergency, the WAA and the Armed Services joined today in an investigation to determine the extent to which such equipment had found its way into private hands.

Owners of sets carrying these designations were urged to take them to the nearest Naval or Army District Headquarters for examination by qualified Ordnance Disposal Experts to determine whether they have been deactivated.

WAA and the Armed Services are tracing disposals of all such equipment in order that purchasers may be warned of potential danger in handling these sets.

Play safe! Don’t attempt to remove the destructors yourself under any circumstances! If you own any of the listed equipments, get them to your nearest Naval or Army District Headquarters for examination by qualified Ordnance Disposal Experts to determine whether they have been deactivated.

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The Additive Frequency Meter

An Improved System of Heterodyne Frequency Measurement

BY GEORGE GRAMMER,* W1DF

At one time or another most of us have had need for some means for measuring frequency to a reasonable degree of accuracy. What constitutes "reasonable" accuracy is no doubt a matter of opinion; however, most of us would agree that since we deal in kilocycles rather than percentages the ideal frequency meter would have about the same accuracy in kilocycles at 30 Mc. as it does at 3.5. Most of us also would agree that a frequency meter should be directly calibrated, to avoid the bother of having to look up calibration charts.

The heterodyne frequency meter, which is the instrument usually employed for such measurements, does not meet the requirements very satisfactorily. As ordinarily constructed, it covers a fundamental range such as 3.5-1 Mc. and uses harmonics for the higher-frequency ranges. Although the percentage accuracy is the same on all bands, the error in kilocycles goes up in direct proportion to the harmonic used. Also, with direct calibration the dial itself puts a ceiling on the accuracy obtainable.

Of the available dials that can be directly calibrated, the National ACN has about the greatest scale length, approximately 10 inches. Ordinarily only about 90 per cent of the scale is usable, since the extremes of the tuning condenser range do not offer a useful capacitance variation. If the frequency range chosen is 3600-4000 kc., 500 kc. is spread over about 9 inches of scale. The width of calibration lines and the accuracy of drawing is such that calibration points cannot be located to better than about 0.01 inch, so there is a basic uncertainty of something more than 500 cycles before calibration errors and oscillator frequency variations are even considered. Since this uncertainty is multiplied by the order of the harmonic used, the unavoidable error, even at directly-calibrated points, increases to over 4 kc. at 28 Mc. When oscillator drift and other errors are added, the uncertainty increases to 10 to 20 kc. at 28 Mc. — even with quite stable oscillators — at the directly-calibrated points. In between such points the error may of course be considerably greater.

The over-all result is that while the instrument is useful for approximate frequency measurement, it cannot be trusted for band-edge measurements without spot checking against some such device as the 100-kc. oscillator.

There are ways to reduce the dial errors, such as switching to restrict the range on the higher frequencies; also, the direct calibration can be abandoned and a long-scale dial such as the PW mechanism substituted, together with a calibration chart. These, however, do not effect any improvement in the inherent oscillator stability. Furthermore, it is frequently desirable to make measurements outside the amateur bands, and wide range does not go hand in hand with precise calibration.

The Interpolation System

The measurement system to be described provides practically all of the advantages of the 100-kc. standard and the directly-calibrated heterodyne frequency meter, with almost none of the disadvantages of the latter. It is quite simple in principle. As shown in Fig. 1, the harmonic output of a 100-kc. oscillator is fed to a mixer. The output of a variable oscillator covering a 50-kc. range (100-150 kc. is convenient, but by no means the only range that can be used) is fed to the same mixer so that its output modulates

*A Technical Director, ARRL.

1 After building an experimental model, the writer learned that a similar principle is used in a system developed at the Bureau of Standards for s.h.f. frequency measurement.
each 100-kc. harmonic. The sidebands so generated supply a series of signals that can be used in the same way as the signal from an ordinary heterodyne meter.

The operation of the system can be understood from Fig. 2, where each pair of sidebands associated with a particular harmonic is identified by being drawn the same (solid, dashed, etc.) as the harmonic. Considering the spectrum between 7000 and 7100 kc., the upper drawing shows that with the variable oscillator set at 115 kc., the upper sideband produced by the beat between 6900 and 115 kc. gives a signal at 7015 kc., while the lower sideband resulting from the beat between 7200 and 115 kc., gives a signal at 7085 kc. As the VFO frequency is increased these two sidebands move closer together, as shown by the lower drawings.

At 150 kc. the two sidebands coincide and there is only one signal, exactly halfway between 7000 and 7100 kc. When the two sidebands are in zero beat with each other, the VFO acts as a precise frequency divider. Consequently, the accuracy with which a multiple of 50 kc. can be determined anywhere in the frequency spectrum depends solely on the accuracy of the 100-kc. oscillator, and is completely independent of the VFO calibration.

The advantages of this system are numerous. Because the tuning range is only 50 kc. the dial errors are only of the order of 50 cycles and are independent of the frequency being measured. The bandspread and tuning rate are exactly the same anywhere in the spectrum, so the instrument tunes just as noncritically at 50 Mc. as it does at 3.5 Mc. The errors caused by instability of the VFO are likewise the same anywhere in the spectrum, and are measured in cycles rather than percentage. Since the oscillator operates at a very low frequency, the drift is quite small, even without taking any special precautions in construction. The accuracy is tied directly to the accuracy of the 100-kc. oscillator, and can be quite high if a 100-kc. crystal is used. Furthermore, measurements can be made in any part of the spectrum in which the 100-kc. harmonics can be heard, not just in a restricted range such as an amateur band. In addition, the instrument has within itself the means for direct calibration at intervals of 1000 cycles.

There are two disadvantages, if they can be called that, to the system. The dial does not supply the complete frequency reading directly: the proper hundred must be supplied from prior knowledge, after which the tens, units, and fractions may be added on. This is no great disadvantage, particularly in the amateur bands, since one usually has a fairly good idea of which 100-kc. harmonic is which. The other is that at frequencies near the even 100-kc. points the 100-kc. harmonics and the sidebands come within audible beat range of each other, and a similar situation occurs at the 50-kc. points where the two sidebands approach each other. In both cases more than one signal is heard, and it becomes necessary to choose the right one. This is easily done, but requires a little preliminary practice.

The dial of the instrument shown in the photographs is calibrated from 0 to 50 kc. in the counterclockwise direction, and from 50 to 100 kc. in the clockwise direction. The upper sideband is used in the former case and the lower sideband in the latter; the reason for the reversal of calibration will be clear from inspection of Fig. 2. Unless the receiver is capable of distinguishing between the upper and lower sidebands, it will be necessary, in measuring the frequency of a signal, to determine whether it lies above or below a 50-kc. point. For example, suppose the signal to be measured lies between 7000 and 7100 kc., and that when it is heterodyned to zero beat the dial reading is 34 kc. on the counterclockwise scale and 66 kc. on the clockwise scale. To determine the proper reading, set the dial to 50 kc. and note whether the signal is above or below the 50-kc. point.
When single-signal reception is used the two sidebands can readily be distinguished. As the frequency-meter dial pointer is moved continuously in one direction the two sidebands approach the receiver setting from opposite directions. One approaches from the “right” side of zero beat, the other from the “wrong” side. For example, if the receiver b.f.o. is set so that the “other side of zero beat” occurs at a higher frequency (on the receiver dial) than the desired side, rotating the frequency-meter pointer counterclockwise will cause the upper sideband (counterclockwise scale) to pass through the weak side of zero beat first, while the lower sideband (clockwise scale) will approach from the strong side. The opposite will be true if the pointer is rotated clockwise, and both will be reversed if the receiver b.f.o. is shifted to the other side of the signal. Since most of us habitually use the b.f.o. on the same side, in single-signal reception, it is a simple matter to determine once and for all the tuning characteristics that distinguish the two sidebands, and thus know automatically which scale to use in making a measurement. It should be emphasized that this peculiarity occurs only when tuning the frequency meter, not when tuning the receiver.

**Circuit Design**

Fig. 3 shows a practical circuit for an instrument of this type. There is only one design point of major consequence, and that is the elimination of all harmonics and spurious beats, excepting only the 100-kc. harmonics from the fixed oscillator. If harmonics of the VFO frequency reach the mixer they will modulate the 100-kc. harmonics along with the VFO fundamental, giving rise to “birdies” that, depending on their strength, can be confused with the main signal. In addition, harmonics generated in the mixer circuit at relatively low frequencies will not only be heard at higher frequencies but also will mix
with all other frequencies present to produce what, in bad cases, can only be described as a mess. Both types of trouble are readily overcome by exercising reasonable care in design and adjustment.

The series-tuned oscillator circuit shown in Fig. 3 is a good one for the purpose, not only because it is convenient to dispense with a feedback tap on the coil, but also because the large shunting capacitances tend to discourage harmonics. In this case one triode section of a 6SN7 is used as the oscillator and the second section as a cathode follower. The oscillator frequency is practically unaffected by anything that is done at point X in this circuit. The coupling circuit, $C_7C_8$, between the oscillator and follower prevents overloading the latter and also provides some additional harmonic suppression. Finally, the remaining harmonic content is, for all practical purposes, completely eliminated by the low-pass filter consisting of $L_a$, $L_b$, $C_{13}$, $C_{14}$, and $C_{15}$, together with the terminating resistor, $R_7$.

To prevent harmonic generation in the mixer circuit it is necessary to keep the signals applied to the Nos. 1 and 3 grids small enough so that the tube operation is substantially linear. There should be little or no trouble from excess VFO signal with the constants given, but the harmonics of the 100-kc. crystal oscillator will cause trouble if something is not done to reduce the amplitude at the lower-frequency end of the spectrum. The 6SL7 "harmonic amplifier" in the diagram is, in fact, an attenuator at the lower frequencies. Its plate circuit is self-resonant in the 20–30 Mc. region, and the over-all effect is a leveling-off such that the 100-kc. harmonics throughout the 3–30 Mc. range are substantially of the same strength. From an operating standpoint this is a most desirable feature; it is neither necessary to search for almost inaudible harmonics at 28 Mc. nor to cringe from powerhouse blasts at 3.5 Mc. But most important, in combination with the harmonic filtering in the oscillator, it results in the reduction of spurious signals to the point where they are undetectable under ordinary circumstances.

The plate circuit of the 6SA7 mixer is likewise adjusted to peak the output at the high-frequency end of the 3–30 Mc. spectrum. If the lower-frequency harmonics are allowed to become too strong in the mixer plate circuit spurious beats will appear. The amount of low-frequency amplification is controlled by $R_8$, which should be larger than is necessary for adequate signal strength. Since the output requirements will vary with the type of input circuit in the receiver as well as the antenna used, some experimenting may be necessary to secure an output circuit for the 6SA7 that will give signals of the desired strength throughout the spectrum. For example, a 50-µh. coil substituted for $R_8$ will considerably increase the output at 7 Mc. and below.

The spare section of the 6SL7 double triode is used as a marker oscillator, for determination of 100-kc. points in case the calibration of the station receiver is not good enough. The marker crystal can be any convenient frequency; a spare amateur-band unit can be used. One in the vicinity of 2 Mc. is rather suitable, since it will give markers spaced 2 Mc. apart. The principal requirement, however, is that the crystal frequency be known fairly accurately; the frequency meter itself provides a means for measuring it.

No special pains need be taken in construction to make the VFO exceptionally stable, although of course no good purpose is served by being careless. The oscillator shown in the photographs uses components of standard design, including ordinary mica condensers. $C_1$, a ceramic having a negative coefficient of 220 p.p.m., provides a small amount of temperature compensation. The maximum drift observed so far is about 200 cycles at the 150-kc. end of the range. In both this and in an earlier experimental model it was found that the drift at the 100-kc. end is almost negligible. From a percentage standpoint the oscillator stability is not especially high, but in this case it is only the drift in cycles that counts. Such frequency variations as occur are almost wholly in the circuit components, since other tubes can be substituted in the oscillator without causing a frequency change of more than a few cycles.

The frequency meter shown in the photographs was built primarily to fit in a box from some surplus gear, and not especially as something to
be copied. It illustrates the few constructional points that need to be kept in mind. One is that the circuit components should be placed so that they will not be in the direct path of heat convection from the tubes. The other is that the VFO should be placed as far from the other circuits as the chassis space will allow, simply for the purpose of reducing stray coupling. If these two points are observed the layout can be anything you please.

Preliminary Testing

Most of the preliminary testing should be done with the 6SL7 and 6SA7 out of their sockets. On any receiver capable of tuning to 600 kc., tune in the 6th harmonic of the 100-ke. crystal oscillator. Connect a wire from point X to the antenna post of the receiver. Turn the VFO condenser over its whole range and note the number of harmonics heard at 600 kc., C2 being at about 75 per cent of full scale. Adjust L1, and C2 if necessary, until there are just three such harmonics, one at each end of the scale and one between. If the tuning condenser and dial specified are used, set the two outer ones to zero beat at about 95 and 5, respectively, and the third should occur at about 60. This adjusts the oscillator to the proper range, by making the 4th harmonic of the high end and the 6th harmonic of the low end full at 600 kc.

After noting the strength of the oscillator harmonics, shut off the 100-ke. crystal oscillator and move the receiver antenna connection from X to the No. 3 grid connection (output of the harmonic filter) on the 6SA7 socket. It should be impossible to hear any harmonic output from the oscillator when the tuning is varied. Then insert the 6SA7 in its socket, allow it to warm up, and again tune the VFO over its range. If harmonics now become audible the oscillator signal is too strong. It may be reduced by increasing the capacitance at C6 as much as is necessary to make the harmonics disappear.

Next, check the operation of the unit, with all tubes installed, throughout the h.f. spectrum. The operation should be as described earlier, with fairly-uniform signal strength at all frequencies and with no birdies or spurious beats of any consequence. Since the output of the unit is intentionally low, it will be necessary to connect the output terminals to the receiver antenna post and not depend on stray coupling. After this check the meter is ready for calibration.

Calibration

Calibration is best carried out in a series of steps. Remove the 6SA7 and 6SL7, connect the receiver antenna post to point X, and tune in the 2000-ke. harmonic from the 100-ke. crystal oscillator. Set the VFO at 100 kc., and bring its harmonic to zero beat with the crystal harmonic. Mark this point “0” on the dial. Then tune the receiver to the 21st crystal harmonic (2100 kc.) and slowly tune the VFO higher in frequency until its harmonic is at zero beat with the crystal harmonic. At this point the 20th harmonic of the VFO coincides with the 21st harmonic of the crystal, and so the VFO frequency is 2100/20 = 105 kc. Mark this point “5” on the scale, move the receiver to 2200 kc., and increase the VFO frequency until its 20th harmonic coincides with 2200 kc., giving the 10-ke. point. Continue until the scale is calibrated at each 5-ke. point up to 50 kc.

The next step is to calibrate at 2-ke. intervals, and for this purpose it is necessary to increase the strength of the harmonics. The marker oscillator can be used as an amplifier, by removing the crystal and making the connections shown in Fig. 4A. Clip leads are satisfactory. It is necessary to replace the 6SL7, of course, but do not put the 6SA7 in its socket. Tune in the 5000-ke. harmonic of the 100-ke. crystal oscillator, set the VFO to 100 kc. by beating its 50th harmonic with the 5000-ke. harmonic of the crystal, and proceed up through the spectrum one 100-ke. point at a time, using the same procedure as before. The VFO harmonics will tune quite rapidly, and the previously-determined 5-ke. marks will ensure that the calibration points do not get out of proper order.

The impromptu harmonic amplifier alone will not usually give enough output to repeat this process with the 100th harmonic, by means of which 1-ke. points are obtained. The necessary harmonics can be generated by using a crystal

A view from the other side of the chassis. The harmonic filter occupies the space at the lower edge of the chassis, and its output runs in a shielded lead to the mixer tube. The socket for the marker crystal is mounted simply by soldering its terminals to the grid and plate terminals on the 6SL7 socket. The fixed condensers in the VFO circuit are at the lower left in this view.

QST for
rectifier as shown in Fig. 4B. In this case the lead from the receiver antenna should be brought near, but not connected to, the harmonic amplifier. The crystal acts as a mixer and introduces many secondary beats, but if the coupling to the receiver is loose enough the desired harmonics will be the strongest and can easily be identified, particularly since the 2-ke. points already plotted will practically show where they should fall. There should also be no trouble in hearing the oscillator.

The calibration points should be plotted on the scale as accurately as possible. It should be noted that any errors in setting to zero beat during this process are divided by the order of the harmonic used. Thus if a particular harmonic is off zero beat by as much as 500 cycles, when calibrating the 1-ke. points, the actual error is only 5 cycles, which is inconsequential. The principal source of error in calibration, aside from getting the wrong harmonics, is the simple one of getting the pencil to go where you want it to go on the scale. It may also be noted that the 100-ke. crystal introduces almost no error, for a similar reason, even though it may be a couple of hundred cycles off WWV at 10 Mc. In fact, the only electrical precaution to take is to make sure that the VFO is thoroughly warmed up before the calibration is started.

**Accuracy**

The accuracy of measurement with an instrument of this sort depends considerably on the way it is used. A number of test runs of 6 to 8 hours, made in room temperatures varying between 70 and 80 degrees, have shown that the maximum VFO deviation (starting cold) is about 200 cycles in the unit pictured. The crystal-oscillator deviation amounts to about 200 cycles at 30 Mc. over an 8-hour period, after a 15-minute warm-up, when the instrument is not near other heat-producing apparatus. (This drift is just about doubled when it is placed on top of a receiver, because of the additional heat from the latter.) The power dissipated is about 15 watts, and the case is not ventilated.

It is evident that the over-all accuracy is determined principally by the crystal oscillator. If the instrument is to be used without checking against WWV, it would be well to make some drift runs on the crystal oscillator to determine the variations likely to be encountered. The maximum deviation so determined, plus the VFO deviation, plus the calibration and reading error, gives an accuracy rating for the instrument. Using the figures given above, the crystal-oscillator error amounts to 600 cycles at 30 Mc. and to 70 cycles at 3.5 Mc. The dial error at the calibrated points should not exceed 50 cycles. The 1-ke. divisions average a little under 0.2 inch in width; this makes it possible to interpolate to about 1/10 division, particularly if the 1-ke. divisions are divided in half to give approximate 500-cycle divisions as is done on the scale shown in the photograph. Such interpolation will introduce an error of 50 to 100 cycles, plus or minus.

The possible error is therefore $600 + 200 + 100 = 900$ cycles at 30 Mc., and $70 + 200 + 100 = 370$ cycles at 3.5 Mc.

On the other hand, if the crystal is adjusted to zero beat with WWV and the VFO is warmed up so that its calibration is exact (or if a small compensating condenser is provided for adjustment to exact frequency at the 50-ke. point) the principal source of error is that of marking and reading the scale. Under these conditions a skillful interpolator can make readings that are accurate to plus or minus 100 cycles at any frequency up to 30 Mc.

The average, of course, is between these two extremes. In any event, the status of the calibration can be determined in an instant or two. The crystal can be checked against WWV to determine the percentage error. The VFO error can be determined by checking the scale at the “0” end against the crystal harmonic, and at the “50” end by zero-beating the two sidebands as previously described.

It is obvious that the system can be extended to give higher accuracy, if desired. One method is to make the basic frequency lower than 100 kc. and restrict the VFO tuning range accordingly. Another is to discard the direct calibration and use a dial having several hundred divisions, in conjunction with a calibration chart. For most requirements these refinements are not necessary. In any event, the attempt to attain higher accuracy will require increasing precision in the components used. One of the chief advantages of the arrangement described is that it achieves a degree of accuracy considerably higher than is ordinarily required, without costing any more than the usual 100-ke, marker and heterodyne frequency-meter combination, and with less care in construction.

May 1949
Military Amateur Radio System

The MARS Advisory Committee, composed of eight military and three civilian members, held its first meeting at the Pentagon, Washington, D. C., in February. In addition to the eleven advisors, seven observers were present. The Committee discussed reserve credits for participation in the MARS program (one point for three hours of participation — not necessarily consecutive), additional MARS frequencies for v.h.f., and participation of civilians in MARS activities. Further information on the subjects considered will be disseminated as soon as decisions are reached.

To mark the 86th anniversary of the establishment of the Signal Corps, KH6USA, at Fort Shafter, Oahu, T.H., was dedicated on 3 March and officially designated as headquarters station for the Military Amateur Radio System (Army) in the Pacific Ocean area. KH6USA is the Army's first overseas MARS station.

As part of the dedication ceremonies a QSO was effected between KH6USA and K4USA-WAR, the Signal Corps amateur station in the Pentagon. Colonel C. H. Hatch, KH6SC, signal officer of USARPAC, acted as master of ceremonies at Oahu and introduced Maj. General F. L. Parks, USARPAC commanding general, and other notable guests.

At the Pentagon end of the QSO Lt. General H. S. Aurand, director of the Logistics Division of the Army General Staff, Brig. General C. H. Arnold, chief, Procurement and Distribution Division of the Office of the Chief Signal Officer, and Lt. Colonel D. W. Eddy, assistant chief, Army Communications Service, Division of the Office of the Chief Signal Officer, all extended their congratulations to the MARS station in Hawaii.

Maj. Gen. F. L. Parks, commanding general, USARPAC, operating KH6USA, Fort Shafter, Oahu, T. H., during dedication of the first overseas MARS amateur station. Standing by is Colonel C. H. Hatch, KH6SC, signal officer, USARPAC.
The following Naval Reserve amateur call signs have been assigned since the last list appearing on this page:

- K2NRJ Gardiner, Maine, K2NAS Arbuckle, Calif.
- K2NRA Addison, N. Y., K2NAT Merced, Calif.
- K2NRM Elizabeth, New Jersey, K5NAC Huntington Park, Calif.
- K3NAR Anacostia, D. C., K5NAV Tulare, Calif.
- K3NMC Washington, D. C., K7NAD Kingman, Ariz.
- K3NRA Allentown, Pa., K7NAG Clifton, Ariz.
- K4NAZ Davella, Ky., K9NRC Kokomo, Ind.
- K5NB Conway, Ark., K9NRI Charleston, Ill.
- K5NRC Wewoka, Okla., K9NAU Salem, Mo.
- K5NBD Ruston, La., K8NAV Ft. Dodge, Iowa
- K5NAP Martinez, Calif., K8NAW Cortez, Colo.
- K5NAT San Francisco, Calif., K8NAW Winona, Minn.

The 1st ND now has eighteen Naval Reserve Training Center radio stations licensed for amateur operation.

Radio amateurs in the Taunton, Mass., area interested in the formation of an Electronic Warfare company should contact Ens. Francis T. Coughlin, 26 Adams St., Taunton.

Volunteer Electronic Warfare Company 1-2, under the command of Comdr. R. W. Hart, USNR (W1RH), has complete Electronic Warfare facilities installed in the Malden, Mass., City Hall Annex.

A new station has been licensed in the 1st ND under the trusteeship of Comdr. Gil Countryman, W1RBK, ex-W3HH. The station, W1USN, is available both for Naval Reserve use and for general amateur service by the many hams working in the Boston Naval Shipyard. W1USN is located in the Electronics Exhibit quarters, Building 202, Boston Naval Shipyard.

The severe winter of 1948-49 found Naval Reserve Electronic Warfare units providing emergency communications on many fronts. When snow and sleet fell on commercial telephone and telegraph lines between San Angelo and Dallas, Texas, NR radio circuits were activated and 150 messages handled. During the now-famous "Operation Snowbound," NR units at Omaha and Lincoln, Neb., cooperated with the Army, National Guard, U. S. Engineers, amateurs and civil authorities to handle over 1000 emergency messages. Similar reports of outstanding work done in traditional Naval thoroughness have been received from Electronic Warfare units in Harrison, Little Rock and Camden, Ark., Enid, Okla., and McKinney, Abilene and Lubbock, Texas.

An Army-Navy radio net has been successfully established in the Eighth Naval District, involving radio communications using joint Army-Navy procedure between the 4th Army station, ACG, Ft. Sam Houston, Texas, and 8th ND NR stations (of the Organized and Volunteer Reserve) located in Arkansas, Louisiana, Oklahoma and Texas. The net utilizes Army frequencies, which are guarded 24 hours daily by operators at ACG.

May 1949
Preview of High C.W. Scores — 1949 DX Contest

Hmm. What's this — 4X4CZ? Sounds like the dimensions for an antenna mast. He's standing by. [sigh] Holy smokes, listen to that racket. My receiver's bawled... [click]... the f.o. ain't working... no difference with it on or off! [moan] This would happen to me right in the middle of things! [groan] Maybe I should change my way of living. No more listening DX from the gang, so help me. Eh, what's this? It's gone. I'll never find... Jepp, what a sock that guy Lindy has! Hey, 4 by 4 of living. l'lo more swiping DX from the gang, so of things! [groan]

... Yipp... Mr. receiver's busted... [sigh]

dimensions for an antenna mast. He's standing by. He says "Hi." Boy oh boy, here's for some cases even less experienced amateurs and those with... during both week-end periods. Stations outside of... occurred that produced sounds in... realm! There were some cases of poor operating practices on the part of overzealous DXers, but clean, courteous operating was the general rule. Propagation conditions for long-distance work were favorable during both week-end periods. Stations outside of W and VE were on in fairly large numbers on all bands from 3.5 through 28 Mc. Three-, four- and five-band contacts were not uncommon. It was a DX test to outshine all previous DX tests.

Among the individual claimed scores in W and VE, that of WSBHW is outstanding. With a tremendous lead on all his competitors, "Lindy" reports the staggered total of 390,450 points. He claims 479 QSOs, a multiplier of 274 and a "different countries worked" total of 113! The second-highest reported score, 368,538 (multiplier 257), was made by W2IOP, who was followed closely by W4KFC with 305,100 points and a 255 multiplier. Reports are still arriving in large batches as this issue goes to press, but it is doubtful whether a "dark horse" with a score higher than any of the above will appear.

Just short of the 850-grand mark, and a fairly certain fourth place, is the 349,263-point score of W6JIN. Other contestants who claim more than 150,000: W3BES 343,000, W2SAI 336,000, W2AQW 331,000, W3LOE 279,210, W6GL 278,640, W2BXA 263,648, W6RN 253,800, W6LDJ 253,022, W1BPX 246,000, W8FGX 234,498, W9IU 224,220, W7HIC 214,000, W6CEN 204,000, W6HST 201,606, W9CA 200,718, W8EWS 193,068, VE4RO 191,922, W6MVQ 189,317, W2DSB 185,556, W6SQO 183,768, W6NE 180,726, W9DAE 179,400, W9PSR 177,970, W6TT 177,018, W7VY 177,000, W9FJ 176,420, W4RBB 175,000, W6QD 173,570, W4JE 167,338, W1BH 167,067, W8LEC 161,775.

Outside the W0VE area, the highest score comes from KV4AA — 491,222 points, 79 multiplier, 2085 contacts. Other high reported scores in this category are those of W4D1HZ 301,300, W0AW 230,202, W6GHU 227,910.

The first amateur transoceanic radioteletype QSO's of record were achieved on March 26th when W0ITH, and later W7JCU, worked J3RO. Nagoya, Japan, operated by Lt. W. C. "Doc" Wiley of the U. S. Occupation Forces. On the 26th and 27th W0ITH QSO'd J3RO again, and on these dates several hundred words of GI and congratulatory message traffic were "printed." All stations taking part in this pioneer work used true f.s.k. on either 10 or 11 meters. During the same period, J3RO was heard and printed by W0DOW, W3ODF, W3QGH, W2BFD and W2BDA.

AMATEUR TWO-WAY TELETYPE SPANS PACIFIC PATH!

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How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

With the balmy breezes and the birds and bees having taken over, we find the rebuilding season in full swing. While ourselves contemplating a revamping after a fashion (Jeeves wants to ditch our 24As in favor of something up-to-date, like, say, 6D6s) we'd like to see the brains get bllily and hit the market with a few items like these:

-- Gadgets that filter r.a.c. signals in the receiver.
-- Beams with such sharp vertical angles that Vs are only rarely audible the long way around.
-- The allocation of an auto-ignition band other than 14 and 28 Mc.
-- Persuasive pamphlets convincing TVLs that too much TV may lead to cataracts.

Perhaps we expect too much from our engineering genii but there's a lot of surface left, to be scratched along this line. Of course, the climactic triumph would be the perfection of a DX Hog eliminator but perhaps we shouldn't set our hopes too high.

Even if you are engaged in some remodeling of sorts, don't fail to get something on the air for May 14th and 15th if you're on the DXCO roster. All of the best people will be there, you know. it being DXCO Round-up time.

And so to work.

What:

The QRN may be closing in fast but ere this development we hear via W4BRB that W4JQ completed his postwar 3.5-Mc. 'phone WAC upon nailing down JA2AT (3870), plus chats with KP6AA (3890), KS4AD (3855), KH6HV (3880) and KH6UA (3860). Gene, himself, crossed off the wanted list ZBIAR (3527), HA5B, HP1BR and ZS6DW to make it 60 even on the band. People awaiting ZS3D's QSL had better untwiddle their thumbs, says W2QHH. A letter to Howy from ZS3D asserts that the latter knows of no past S.W.A. activity on 80 for some time past, least of all himself. W2QHH recently had his WAS endorsed for four bands and his 6L6 now has accounted for 50 3.5-Mc. countries. FASBG presented VE7IC with that last continent for another West Coast WAC. FASBG, by the way, looks for contacts on voice during week ends, using 4100 kc. Among other catches, W40NX worked TG9JK, ZS5G, 6DW and VY4AW while W4CMV adds KV4AA, HC1JB, KP6AB, Tl2FG, ZL5 1CI, HIIM and VK5KO. A2KG, KGC6D1, LU3EL, Q2EC, OX3BC and an FAS netted W9CFB a fast WAC during the Test. Other victims: KW6AP, Tl2KP, VK2s E0, QL, RA and ZL2ACV. W9AND made it a Big Six through JA3AA (3606) and also KW6AP (3505), VO6A, VP2LX (3518) plus others.

Forty has simmered down a bit but W6ZGY wrapped up W1LBW/C1 (7040), UAl6FB (7032), W8SJR/KG6 (7030), HR1AT (7055), YVSAL (7023), ZS1M (7053), ZS2G (7033) and SM2AWG. W2YGO's 50-watter crept onto KV4AA, HK6CR, VP2AA, VP9CC, GD3UB, EA5CG and ZL2MM while W2WWP recommends ISIAHK, HK3CT, T12EXO, ZC8PM, FASBA, FT4BA and SU1CR, all close to the low edge. KS4AD (7282), VP6CDI (7060) and T12AM (7023) wound up in W8YGR's log and VE30Y scored with EL7A (7090). 25 watts at W7MGO knocked off the ZL/VK gang with ease, interspersed with folks like VR2AM, HC1JB, UA9FB and JA2AZ. W2RDK passes by the easy ones for CR7IZ (7036), UQ2AB (7020), UR2KAB (7012), VP3ACS (7050), ZG6UJ (7001), VS6AL (7015), EL3A (7080), KG6DI (7040), CPI1AQ (7004) and CR9AG (7010). This makes Charlie's whopping 7-Mc. total 126 countries! The VS6 appeared out of nowhere around midnight and has him somewhat dubious. W4MPF must remember his high-school Spanish since his latest novel

KV4AA, HC1JB, KP6AB, Tl2FG, ZL5 1CI, HIIM and VK5KO. A2KG, KGC6D1, LU3EL, Q2EC, OX3BC and an FAS netted W9CFB a fast WAC during the Test. Other victims: KW6AP, Tl2KP, VK2s E0, QL, RA and ZL2ACV. W9AND made it a Big Six through JA3AA (3606) and also KW6AP (3505), VO6A, VP2LX (3518) plus others.

Forty has simmered down a bit but W6ZGY wrapped up W1LBW/C1 (7040), UAl6FB (7032), W8SJR/KG6 (7030), HR1AT (7055), YVSAL (7023), ZS1M (7053), ZS2G (7033) and SM2AWG. W2YGO's 50-watter crept onto KV4AA, HK6CR, VP2AA, VP9CC, GD3UB, EA5CG and ZL2MM while W2WWP recommends ISIAHK, HK3CT, T12EXO, ZC8PM, FASBA, FT4BA and SU1CR, all close to the low edge. KS4AD (7282), VP6CDI (7060) and T12AM (7023) wound up in W8YGR's log and VE30Y scored with EL7A (7090). 25 watts at W7MGO knocked off the ZL/VK gang with ease, interspersed with folks like VR2AM, HC1JB, UA9FB and JA2AZ. W2RDK passes by the easy ones for CR7IZ (7036), UQ2AB (7020), UR2KAB (7012), VP3ACS (7050), ZG6UJ (7001), VS6AL (7015), EL3A (7080), KG6DI (7040), CPI1AQ (7004) and CR9AG (7010). This makes Charlie's whopping 7-Mc. total 126 countries! The VS6 appeared out of nowhere around midnight and has him somewhat dubious. W4MPF must remember his high-school Spanish since his latest novel

* DX Editor, QST. Please mail reports of DX activity to W9BRD's home QTH: 1517 Fargo Ave., Chicago 26, Ill.
A new VP5 is ready to open up on 7010 kc. So KS6 (14,020), MI3ZZ (14,115), KC6EA (14,110), YK1AB (14,107), VS9AL (14,071), ZC4AB (14,034), HZ1AB (14,064), YK1VU (14,018) and VSI CX (14,182) while WA1U0 lists CN5MZ (14,047), EL3A (14,060), FESAB (14,020), HAB (14,100), OEF8FF (14,058), Q5QF (14,070), TF3SF (14,055) and VS8IR/KG6 (14,012) ....... W2TXB forsook A3 for a while and came up with ZC4AC (14,080 t7) and three 4X4s, and W2EMW hooked U05AC (14,000), WHW/KS6 (14,020), MI3ZZ (14,115), K06BA (14,110), YK1AB (14,030), 4X4B (14,105) and FK5SA (14,050).nf ... Hooking his 7-watt VFO to a half-wave vertical enabled W4IYT to raise VP1AA, KV4AA, HI3L, PZIFM, VP4TT, YS1ZG, T12DL and umteem VK/ZLs ....... W4MR managed VR5PL, ZM6AF, F08AC, CP1AQ and the questionable Z45AC, and W9AND collared JA3AA, VR5IP, GC5OU, VK9W1, C4RX, CIJH, UA9IKOG, UAIKCA, UA8VB, VI2BH and CT3AV ....... Needing 10 more cards for the honor roll, W6BIL dalled with Q55s BQ, QF, RA, CR7AY, VU2DF, KM6AJ and UA9CC. George writes of an additional Swedish prefix as used by SK56C and is busily stalking YU7RO (14,001) ....... W5VT employs a "haywire" Windom job with a 200-foot feeder, yet chats amiably with UA3AC, OE1AD, GD3UB, F08AC and PZ1WX. ....... Lamentering the difficulties of QRP in this modern era, W7WEN owns up to W6ZNT/K4W, HP1LP (14,030), KX6AF (14,039), VR2BD (14,074), CR7BC (14,070) and more juicys besides; not bad for 40 watts. ....... Local-competitor W9DGA awaits QSLs from CR7AP (14,140), CT1JS (14,090), VK9GW (14,000), FT4AJ (14,080), GM3ANO/-VPS (14,022), UC2CB (14,090), UBSK (14,045), EA6AZ in the Balearics (14,075) and HA4SA (14,060).

In the A3 department, W9TJ spent a little time down by the station early in the morning with AC4RF (14,022.5) whose 10-watter is powered by a vibrator supply. AC4RF's operating hours — as

Concluded in by W9GA — are usually between 1200 to 1500 GCT. Other W9TJ 'phone items: UV7AF (14,304), AP2F (14,142), EBCO (14,196), ZM6AF (14,315), ZK1AE (14,130), C1D1H (14,322), VS7NX (14,390), ZZKSN (14,392), MD4BPC (14,064), PK4DA (14,300), VR3A on Fanning and YK1AB (14,346) ....... W9RBI adds VR3C and FY4BJ denotes communication with EA2BL, KO1PZ, ZS5FN, KG6AD and a J for a fast WAC. ....... At WA1U0 we find GD6IA (14,370), HP1MB (14,300), HHIEMF (14,140), M13SC (14,305) and VMEP (14,320) ....... XE1AC’s quality choices feature EA9AI (14,100), YK1AA (14,350), ZC1AZ (14,349), US6BK (14,320), FT4AT (14,375), AR5BC (14,348), FN5SN (14,306), VU2CU (14,185), ZD4AB (14,332), ZD1FW (14,045) and CR9AG (14,186).

So far as ten is concerned, W9AND satisfied himself with ZD2S, ZA4F (28,050), LDI/Trieste, VQ8AD, GD3US, IS1AFM, ZD4AU, LK1AC, OQ5CH, HA5B, UR2KAE and a helping of JAs. Was hit 27 Mc. for TA3GVU, too ........ W3MDE found TA4GUV on 28,000, plus FT3SF (28,035) and CP5EB (28,440) ....... VR3A (28,092), FO8AS (28,192) and KJ6AF (29,384) were located by W9TJ on voice while W1DYV's microphone manipulating resulted in KR6AD, MB9BN, MF2AA, MT2E, EL6A, VP2KM, OQ5TF, VQ4SC, PZ1M and JA2s AN, AZ, BO and RO.

Where:
Add Spanish bureaus: EA6, Box 3, Valencia ........ W2NFR/W2CAG have been doing an excellent job handling cards for some of the OE gang as have other WS who volunteered their services. When in doubt as to where to send any OE QSL ship same to ARRL Hq. for handling.

(Continued on page 96)
V.H.F. QSO Party
June 4th-5th
Certificates for Leaders

ARRL is pleased to announce another of its popular V.H.F. QSO Parties. This is an invitation to all amateurs who can work any or all v.h.f. bands (50 Mc. or above) to use phone, m.a.w. or c.w. between 2 P.M. local standard time (E.S.T., C.S.T., M.S.T., P.S.T.) Saturday, June 4th, and midnight local standard time Sunday, June 5th. Give a fair try; see what stations can be worked, what v.h.f. DX is possible. States for WAS, a test for new antennas and gear, and a renewal of friendships in the v.h.f. circle are all possible through participation. Don’t miss out. Mark your calendar today.

How To Take Part

Use “CQ contest” to get in touch with other contestants. Exchanging signal-strength and readability reports is suggested but not required. When you work another v.h.f. amateur, you must give him the name of your ARRL section. Page 6 of this issue is a register of the League field-organization set-up, and serves as a convenient section check-off list. You compete only with amateurs in your own ARRL section for the certificate award. ARRL staff members are not eligible for awards.

Count 1 point for successfully-confirmed two-way exchanges of section information on 2 or 6 meters. A one-way exchange, confirmed, does not count. When two-way exchanges are accomplished with your transmitter on the 220-, 420-, 1215-Mc. or higher band, you may record 5 points per QSO.

Multiplier

The sum of station points earned is multiplied by a section multiplier. Each time a new section is worked two-way it adds one to the multiplier. The multiplier grows by one if you rework this same section on another band. This scoring differs from other kinds of League competitions to encourage everyone to make use of as many v.h.f. bands as possible. A simple tabulation with points is all that is required. QST of one year ago shows a sample form or drop a card to Headquarters for a mimeographed form.

Rules

1) Name-of-section exchanges must be acknowledged by both operators before either may claim the point(s).
2) All claimed contacts must fall in the contest period and must be on authorized amateur frequencies above 50 Mc., using permitted modes of operation.
3) Contest score must represent points earned from operation exclusively within a given ARRL section.
4) Fixed-, portable- or mobile-station operation under one call and by one operator is permitted.

(Continued on page 100)

TVI Patterns

On the next two pages you will find a series of photographs showing what happens on a television screen when a near-by amateur 28-Mc. transmitter opens up — and what doesn’t happen when adequate preventive measures are taken. These pictures, taken by Phil Rand, WIDBM, are arranged in four columns of six each. Each column shows, in order, the effect on the six New York TV channels (2, 4, 5, 7, 11, 13). The ham transmitter was a 50-watt affair on 28.5 Mc., installed in the same building as the TV receiver.

In the first column, nothing had been done to either the transmitter or receiver to prevent interference. Both transmitter harmonics and receiver overloading are responsible for these patterns. The heavy black-and-white horizontal bars are “modulation bars” caused by amplitude modulation of the transmitter. In some of the pictures it is possible to see “cross-hatching,” caused by a beat between the TV carrier and a radio frequency — usually a harmonic.

In the second column a high-pass filter had been installed in the TV receiver’s antenna lead-in to prevent overloading and a filter had been connected in the a.c. line to the receiver. The remaining interference is caused principally by transmitter harmonics. The second harmonic, falling in Channel 2, is naturally the worst. A rather faint cross-hatching is visible in Channel 11 (the only other channel in which a harmonic actually falls) in the original photograph, but probably will not be discernible in the reproduction. Two other channels, 5 and 7, do show interference, but in these cases it is chargeable to the receiver as well as the transmitter.

The third column shows the result of installing an antenna coupler, harmonic traps in the plate circuit, some shielding around the transmitter, and harmonic filters in the supply leads. Channel 2 is the only one in which there is any visible interference, and in this channel it has been reduced to the point where the cross-hatching is simply superimposed on the transmitted picture without affecting the picture quality. The transmitter was modulated with narrow-band f.m. in this case; with this type of modulation the modulation bars do not appear.

The pictures in the fourth column show the effect of further cleaning up in the transmitter. Additional shielding and lead filtering, plus harmonic traps in the plate circuits of the buffer amplifier and last doubler, have reduced the harmonic radiation to the point where there is no longer any interference in Channel 2. The transmitter was amplitude-modulated while the pictures in this column were being taken.

Show these pictures, particularly the first two columns, to your neighboring TV set owner if he insists that TVI is entirely your fault. — G. G.
High-Pass Filters for TVI Reduction

When the television receiver and amateur transmitter are quite close to each other, the most serious cause of TVI may be simple overloading of the receiver’s front end by the fundamental output of the transmitter. There is nothing that can be done about this at the transmitter, but something can be done at the receiver to prevent so much fundamental from getting into it.

Trap circuits tuned to the fundamental, inserted in the antenna leads at the receiver, usually will do the trick. However, traps are selective devices and so cease to be effective when operations are shifted to another band, or even to a new frequency in the same band.

A more generally useful fundamental suppressor is a high-pass filter. If the cut-off frequency is chosen somewhere below the lowest TV frequency, but higher than 30 Mc., an ideal filter would pass all the TV signals without attenuation but would greatly reduce the strength of signals below the cut-off frequency. The filters shown in the accompanying diagrams have been found from experience to do just that. They can be made up in a few minutes from parts that, if not already in the junk box, cost very little.

![Diagram](fig_1.png)

Fig. 1 — High-pass filters for installation at the TV receiver antenna terminals. A — balanced filter for 300-ohm line. B — for 75-ohm coaxial line. Important: Do not use a direct ground on an a.c.-d.c. chassis. Ground through a 0.001-µfd. mica condenser.

Fig. 1 shows two filter circuits used successfully by Robert M. Morris, W2LV. The circuit at A is for receiver installations using 300-ohm Twin-Lead; that at B is for 75-ohm coax. In both types the cut-off frequency is approximately 50 Mc. W2LV writes: “The coils and condensers can be mounted on two small three-lug mountings of the type used as terminal strips inside a chassis. The only thing particularly critical in the use of the filter is to mount it very close to or on the television-receiver chassis and to use a very short connection between the coil center-tap and the chassis of the set. This gadget was devised as a result of a complaint from one of my neighbors which indicated that he was getting cross-modulation from my kilowatt on 4 Mc. There was no interference so long as the transmitter was not modulated, but modulation caused horizontal lines similar to a variable-density sound track on a motion-picture film, and also could be heard in the sound channel. Application of the filter to the receiver completely eliminated the interference. It also reduced some interference visible on all channels which apparently was coming into the receiver as intermediate-frequency radiation in the 21-27 Mc. band from other television receivers.

“...This unit was also tried by W2BZR on a receiver in his 40-family apartment house. The result was complete elimination of interference on all channels except Channel 2, from his 10-meter transmitter.

“I have not measured the attenuation of this filter, but based on S-meter readings in a communications receiver I believe it has approximately 40 db. attenuation at 4 Mc. and 12 to 14 db. attenuation at 30 Mc.”

The filter shown in Fig. 2, devised by Stanley P. Bird, W2JHE, is a two-section arrangement designed for balanced 300-ohm input. It should also be installed as close as possible to the receiver input terminals. W2JHE’s filter is built in a box 1½ inches square at the end and 3 inches long, formed from thin copper sheet. The box is divided into three sections by two 1½-inch-square copper partitions. Each coil is in a separate section, with its center-tap soldered to the copper wall. The condensers, 20-µfd. ceramic units, are mounted in holes of slightly larger diameter in each partition so that the leads at one end connect to the coil in one section and the leads at the other end connect to the coil in the next. The box should be connected to the receiver chassis. Information on W2JHE’s filter came to us via W1DBM, who built one according to these specifications and found it to work very well.

(Continued on page 100)
The month of March, blustery interval between winter and spring, always carries at least a hint of better things to come, whether one is interested in the turn of the weather or v.h.f. propagation. After months of creeping along close to the minimum of operating ranges, we get a big lift out of the extended coverage which comes along coincidentally with the first mild weather. The refreshing smell of spring in the air and the thrill of hearing those signals begin to roll in from 200 miles and more are companion pleasures for the v.h.f. enthusiast.

This March seemed to outdo its predecessors in stirring the v.h.f. urge in the minds of those who had deserted 6 and 2 for lower frequencies during the winter months, and it rewarded the faithful richly for having stuck by their guns. Spring and the sporadic-E season arrived almost simultaneously for the 50-Mc. men, an opening the 20th being one of the best ever experienced at this season of the year. In the mild weather that followed in the next few days the 144-Mc. gang had their innings, tropospheric propagation bringing in signals that had been heard all too seldom during the colder weather.

The generally poor quality of the 50-Mc. sporadic-E openings during the 1948 season had many of us wondering whether we were not in for a period of infrequent and erratic skip sessions this year too. The spring and summer of 1947, just before the solar-activity peak, had been extraordinarily good, and the big drop right after the passing of the top of the cycle, in 1948, looked bad. The 1949 season appears promising, however; the 50-Mc. openings so far have been fairly frequent and widespread; more so than in any corresponding period in our experience. Maybe it was just that there are more fellows active in the right places, but the fact remains that a lot of 50-Mc. DX was worked during March.

Quite a few fellows boosted their states-worked totals, and the advent of two stations, W4CPZ and W4KYW, in South Carolina put W9QUV, Moline, Illinois, into the exclusive group who have worked all 48 states on 50 Mc. If Ivan gets his cards in before someone else makes it he's in line for 50-Mc. WAS Award No. 2, W3ZHB never having submitted a claim. This South Carolina activity also enabled W9QIN, W9B3J and W9DZM to climb into the 47-worked spot. They now need only Nevada, Nebraska and Montana respectively for the Grand Slam.

**Here and There on 6 and 2**

**Clacton, Essex, England** — Amateur operation in the region between 29.7 and 145 Mc. was scheduled to cease on March 31st, when the Atlantic City assignments became effective. This did not keep G6DrH from taking advantage of a fine 50-Mc. opening to South Africa on the 30th and 31st. ZS1P and ZS1AX were worked on both days in openings of nearly four hours duration.

**West Palm Beach, Fla.** — The prize for the most elements in a 50-Mc. array goes to W4H1U, who is using four half waves in phase, with reflectors, and two sets of directors; count 'em — 16! It must be doing all right, too, for Glenn had the 5-meter band all to himself for a couple of hours on the morning of March 19th, during which he worked just about every station that was on the band in the northeastern part of the country.

**Minneapolis, Minn.** — This low-end business is being carried too far, according to W0TKX. Bob says that he was able to make contacts with his 51.066-Mc. frequency only when W0QIN asked DX stations to look for him. Let's tune the band and give those courageous souls who operate above 51 Mc. a break!

**Heard Island, South Indian Ocean** — VK1FE (see this department in April QST) reports reception of the 50-Mc. signals of VK4BT, Brisbane, Australia, a distance of some 4500 miles, in early February. Unfortunately, no 50-Mc. rig was on the air at the time. This information comes by way of VK3UM and W1ME.

**Wauwatosa, Wis.** — Aurora contacts were plentiful during March, if the log of W9IZQ is any indication. George had contacts on c.w. by means of auroral reflection on the 6th, 13th and 21st, and worked a flock of W4s and 5s during the Es opening of the 20th. On the 21st W2, 3, 4, VE2, VE3, W8 and 9 and 0 were heard via aurora.

**Guayaquil, Ecuador** — March was the best month so far for H2O2T. Steve got in 64 contacts on 50 Mc. up to the 26th. The band was open to U.S.A. on the 20th, 21st and 26th, when W5s SM, VY, EEX, HVP, OTT, BAJ, JTI, VY, W8AMD and W8UEL were worked. The latter two, California and Colorado, were new states, bringing Steve's total to 15, and they leave him with only 47 worked states.
Signals were heard up to 48 Mc. as early as 8:45 A.M., and commercial harmonics and diathermy are now equipped for 144-Mc. work, and will be in there if and when the band opens for long-haul work.

*Brownsville, Texas* — W5KSW reports 50 Mc. open on the 9th, 19th, 20th, 21st, 22nd, 26th and 27th. HC2OT and HC1JW were worked on the 19th, 20th, W5BAJ and W5CSX also worked HC2OT, and the band was open to various points in the States at the same time. HC2OT was heard by W5PKX on the 19th, and by W5KSW on the 22nd. The 26th provided QSOs with OA4AE, HC1JW, HC2OT and LU9EV, and YV5AC was heard. LU9MA was worked on the 27th, and HC2OT, LU9EV and YV5AC were heard. All these South American openings except the one to OA4AE were evening affairs, mostly between 8 and 9 P.M. CST, though HC2OT has been heard as late as 11:10. The OA4AE contacts were made in early afternoon.

*Jackson, Miss.* — A v.h.f. program is being planned for the Jackson Amateur Radio Club Hamfest on May 28th and 29th, according to W5JTI. Tim says that W5s NLP, ITL, EYY, FFF and NYH are now on 2. W5NYH is on both 6 and 2, and is consistently workable over the 50 miles from Lexington to Jackson. Signals are best on 2. W5JTI has 200 watts and a 16-element horizontal array on 2, and knowing how he has gone to town with the near future:

Jacksonville, Fla. — If anyone has any good dope on noise generators for 6- and 2-meter work, W4EID would like to hear about it. Miles has been trying to measure noise figures on 6- and 2-meter converters, but without too much success as yet. He is still hoping to work some real DX on 144 Mc., and will be in there trying until July, when he will be leaving Florida.

*Rochester, N. Y.* — W2NES advises that W1, 3 and 9 signals have been heard on 144 Mc. recently in this area, and he asks that fellows aim in that direction when conditions are good. Horizontally-polarized stations are asked to look for western W2 and VE3 signals between 7 and 8 P.M. Fridays.

*Red Bank, N. J.* — The Monmouth County Radio Amateur Emergency Corps has 31 stations in its 2-meter net. Drills are held each Monday night at 9 p.m. Coördinator is Lloyd Manamon, W2VQR. A station maintained at the County Red Cross Headquarters at Shrewsbury is in operation each drill night, manned by a different pair of operators each time. Once a month the net has a personal get-together. The control channel for the drills is 146 Mc., and three other frequencies, 145.51, 145.8 and 145.92 Mc., are employed.

*Columbus, Ohio* — The Franklin County Emergency Net is now in full swing, operating each
Chicago, Ill. — The Midwest V.H.F. Club is now laying plans for its 2nd Annual Picnic, to be held Sunday, July 31st, at Thatcher Woods, on the outskirts of Chicago. There will be transmitters in operation on 10, 6, 2 and 1 ¼ meters, and activities are being scheduled for the whole family. Admission is one dollar for adults, with children under 12 admitted free. It is hoped to make this the biggest v.h.f. gathering ever held. Further information can be obtained from Melvin Mendelsohn, W90BW, 4644 W. Adams St., Chicago.

The Polarization Argument — Our Last Word!

"Let’s get this polarization situation straightened out — but soon!" This is the substance of scores of letters recently received at Headquarters. It was also the comment this writer heard most frequently on a four-day trip in W2-land, during which we had an opportunity to talk with hundreds of hams in one of the country’s hottest v.h.f. areas. Swell idea — but unfortunately “straightening out” the polarization situation means different things to different people. To what is undoubtedly a major portion of the 2-meter operators presently active, it means standardization on vertical antennas; but to equally determined groups in the Middle West and elsewhere a shift to horizontal is the only answer. Both parties seem to think that all that is needed is for ARRL to take a stand one way or the other — but each feels that, it should be according to his personal preference!

At the risk of being repetitious, let’s go back over the arguments for each once more, to see if either side carries more weight in logic. For horizontal, it may be said that: (1) It has a lower response to most forms of man-made noise. (2) Simple parasitic arrays are more effective in a horizontal position. (3) High-gain horizontal arrays are generally simpler mechanically. (4) Horizontal arrays look better, especially when combined with other horizontal systems for lower frequencies on the same rotating structure. (5) General use of horizontal permits use of multiband antennas (rhombics, Vs, long wires, etc.) designed for lower bands.

The following arguments for vertical may be accepted as valid: (1) Because a dipole has two nulls, off its ends, a vertical dipole is as effective in all directions as a horizontal one is in its two best directions. (2) Nondirectional qualities of the vertical dipole are useful in heavily-populated areas, and in station locations where remotely-controlled rotary arrays are not practical. (3) Vertical favors the mobile station. (4) Gain, without directivity, is readily obtainable. (5) A fixed radiator may be employed, rotating only the parasitic elements. (6) Vertical polarization offers a 20-db. headstart in licking TVI (and FMI) in instances where interference is caused by the fundamental radiation, as picked up by the TV (or f.m.) antenna.

The big question, which up to now has never been satisfactorily answered, has been whether either polarization offers any real advantage in working over the long indirect paths in which amateurs are most interested. It has been in the hope of finding the answer that we have urged Eastern stations to try horizontal experimentally.

Up to recent months a provable answer to that one would have swung the balance one way or the other by the arguments so far presented. The Polarization Argument — Our Last Word!
Correspondence
From Members-

WRITE YOUR DIRECTOR

[The following letters touch upon subjects which may be
among those discussed at the annual meeting of the Board of
Directors. As only the Board may establish League policy in
such matters, you are urged to write to your division direc-
tor concerning these or similar topics pertaining to amateur
radio. He will appreciate your comments, criticisms and
suggestions. The Board meeting will be held May 27th, so
don't delay — write your director today. You'll find his ad-
ress on page 8. — Ed.]

Blackhawk Park, Chicago 39, Illinois

Editor, QST:

With the possibility of the 160-meter band reopening, it
has been decided that our club go on record to limit our power
voluntarily to a 50-watt maximum in congested areas, due to the limited frequency bands allowed, and also to cut BCI.

In prewar days on the old 160-meter band both coast
calls could be worked from Chicago with low power, when condi-
tions were good. And with the equipment that has been
developed since those prewar days, low-power operation will
give a few more hams a chance to operate the good old
160-meter band.

Any old timer will tell you how 3 or 4 half-kw. rigs could
take out the whole prewar band so with the 25-ke. segments
that are now proposed to us, it is only logical that we cut
our power to a bare minimum for the survival of the 160-
meter band and ham radio.

— Arnold H. Miller, W6KXD, Secretary
Chicago Amateur Radio Club

3 Stadium Place, Allston 34, Mass.

Editor, QST:

In the spirit of true ham radio, "for the advancement of the
radio art and of public welfare, etc.," I think the 160-
met~r band should be restricted to the use of simple sideband.
Otherwise it will revert to its prewar days of overmodulation,
etc.; much of this exists on the 75-meter 'phone band today.
Why repeat?

— Sidney V. Stadig, W1IVI

411 Court St., Janesville, Wis.

Editor, QST:

I have heard rumors that the ARRL is requesting the 160-
met~r band to be limited to Class A operators only. I hope
this is not so [T'daint so. — Ed.], but if it is true I hereby
enter a very loud and long yell of rebellion.

It seems to me that the Class B boys have been shoved
around long enough and that it is about time they were get-
ing the break they deserve. Also, in the interest of lessened
TVI it would seem to me to be most expedient to allow some
form of 'phone operation for the majority of hams away
from the TVI-infested bands of 10 and 6 which are the only
heavily-populated bands open to Class B ops. . .

— Edward B. Harmon, W6GG

Stanton, Nebr.

Editor, QST:

Let's give our proposed 160-meter band for an emergency
system with a power limitation of 50 watts. Let's give our
portable equipment a chance and furnish an incentive for a
larger number of hams to build low-powered rigs so that in
the advent of an emergency more outlets will be available.

— Willis B. Hohme, W6ZUT

2366 Caspian Ave., Long Beach, Calif.

Editor, QST:

... TVI can be eliminated.

We are running too much power. I think the best thing
that could happen to the amateurs is for the FCC to cut the
maximum power allowable to 200 watts. I use 500 watts to
override the QRM consisting of key clicks, rusty signals,
and the boys having parallel-push-pull 250TII finals with a
bandwidth five times wider than necessary. If everyone
would cut down on power the QRM would be less, and we
wouldn't need that gallon final. Power is no substitute for
good engineering practices, even though a lot of fellows
think so. . .

— J. R. Gardner, W6DLC

Greenwood, S. C.

Editor, QST:

... I believe the one big and which may well become a
fatal mistake is that no proposal has been offered to the
Federal Communications Commission by the League to re-
duce the power limit of amateur stations. The congestion on
all amateur bands has reached the point where a 100% QSO
is almost a thing of the past, becoming a dog-cat-dog affair
with high power bucking high power. A power limit of 100
watts would hurt no one and certainly help reduce QRM,
give every amateur a more equal chance, reduce BCI, TVI,
harmonic radiation, and would have an untold number of
other advantages.

— Charles M. Sparks, WA4KEI

Box 157, Custer, Mont.

Editor, QST:

Possibly the most pressing problem confronting the W/VE
ham on the frequencies below 30 Mc. is adjacent-channel
QRM. It seems to me that single sideband and
should be allowed in the new 15-meter
band.

— A. H. Mehner, W7DOS

335 No. 2nd St., Tipp City, Ohio

Editor, QST:

... When radio was first founded, code transmission was
about all that was practical. But as science progressed,
'tphone transmissions became so easy that c.w. is about like
riding in a one-horse buggy. It is slow and very uninter-
esting to the average individual of this modern era.

Can you picture airplanes and the control tower using tele-
graph code and trying to get a number of planes landed?
Some of the planes would run out of gas before the control
tower could get to them.

I want someone to cite just one good reason why a ham
who is going to operate 'phone and "chew the fat" should be
compelled to pass even a code test so he can operate.

— G. D. Bettolon, W3MFV

315 Air Div., APO 929, % PM, San Francisco, Calif.

Editor, QST:

During the last war, while flying on a bombing mission,
I turned my jack box to the long-range radio receiver and
listened to the traffic. The mass of QRM from the Jerry-

(Continued on page 104)

50 QST for
On Our Use of the Ability To Communicate.

We could have labeled this paragraph "Against the Formula QSO" or "About DX vs. Friendships." It is laudable to know formulas, it is praiseworthy to work DX and to be able to boast about our contest score or countries in amateur gatherings. But these things can become less than desirable if permitted to become a sole, selfish, and all-consuming aim in any amateur life. Amateur radio and the individual too will suffer when any narrow phase of our hobby becomes an obsession so that we do not have enough casual friendly contact with one's own radio neighbors. Such contact, buttressed by traffic handling and local cooperation between hams, has for years maintained the wonderful spirit of amateur radio. QSOs can be most potent in perpetuating amateur fellowship! Or they can mark you as a cut-and-dried operator who is unable to get beyond a formula.

It is cold and inhuman to make every QSO a "formula." A name or nickname added to an old formula does not keep it from being a formula. Our QSOs are a mirror of ourselves. We can, of course, operate altogether by formula but that is neither the way to cultivate friendships nor progress in knowledge of the technique of amateur radio nor cultivate an appreciation for other bands and other people. Talking a radio-political formula is just as dreary to the average amateur as to limit one's exchange to a swap of RST reports. Soap-box oratory and "broadcasting" are usually narrow perversions of amateur radio and when carried beyond a few chance remarks these things tend to create in many listeners an apathy and distaste. To talk a little about a lot of subjects is a good way to arrive at interesting common interests in amateur radio. Our amateur radio should not be allowed to become less enjoyable or less human than it used to be and it is a personal view that it should not be marred by a lot of talk by people with axes to grind, like unto "commercial" radio. FCC's Sec. 12.106 can help protect us from such things.

We have it in our power to make amateur radio anything we wish. By c.w. or voice, let us learn to talk and convey friendly information and ideas; let us make our QSOs more than mere short formulas. More precious than any QSL cards or DX is the ability to communicate. Let our QSOs reflect the helpful attitude toward our fellow amateurs. All of us ought to be willing to exchange data on our hobbies, families, aims, failures, plans and successes. If opportunity to handle a message or assist in an emergency comes along, cultivate the knowledge that will help us to grasp it. Let us operate well, with correct and uniform procedure and with signals that are self-monitored to suppress thumps, clicks, and spurious radiation that may bother fellow radio workers. It's also time we found out about the whole field of amateur opportunities instead of letting formula QSOs and limited subject-matter curtail the richer opportunities for fraternal contact that may benefit our whole amateur lives.

An Official Observer Observes. An interesting analysis was recently completed by one official observer on all cooperative notices and responses received in 1948. Mr. Henry Spillner, W2NCY, notes that in all instances in which he sent a citation, the amateur concerned was in the process of receiving from others both a Readability 5 and Strength 9 report! This, he says, makes two parties who are lacking one without ability or sense to monitor his own signal, the other open to indictment for not recognizing or giving data on a poor signal.

W2NCY writes:

There are enough good signals around to establish a yardstick in the minds of the gang as to what should constitute a good 1949-model signal. FCC regrades that omitted signals shall be as free from spurious radiation as the state of the art permits. Section 12.133 identifies spurious radiations as including key clicks, modulation products, transient effects and parasitic oscillation and further states that the frequency of emitted signals shall be as constant as the state of the art permits.

To recognize a bad signal and then not let the other fellow know he has it is a bonehead practice, surely not in the amateur spirit. Any fellow would like to know if you or others think he has a poor signal. Many articles are now being presented on the elimination of television interference, mostly directed to "phone man's headache." Fellows, this goes for the transmitters, too.

Re "local" clicks: The theory advanced by certain amateurs that clicks get out in near-by localities only has no true engineering basis. If one has a click he has a click, local or DX. FCC requires that you shall operate your station in a manner that does not interfere on reasonably-selective receiving equipment in other stations. About chirp, the trade name for a frequency shift, FCC requires frequency stability and believes we have not tried to split hairs in OO work. We have cited only "chirpers" that you have to follow with the VFO all the time, and their numbers seem to be legion. To say they cause additional QRM on adjacent.
channels goes without saying. All amateurs can do much to help cure this condition, also showing others they have the ham spirit simply by telling the fellows that have defects in their signal about it.

The parasites are as numerous as the rest. A few operators you tell about this would like to indicate this an exclusive trouble of "phone rigs. Not so! Where a rig is keyed with cut-off stages following a driver some amateurs have never checked for parasites. Some do not know what to look for. When a VFO is moved too far off the amplifier tuning and conditions for spurious oscillation exist, these parasites will start and cause a heck of a racket on adjacent channels. Many times two receivers are required to track down that "squoshy" stuff you hear. One may have to tune hundreds of kilocycles away before the parasite can be matched to the keyed signal.

All amateurs, please let all these fellows you hear know what you observe. I can prove, in every case, that the amateur would much rather hear the worst from you than to hear from the FCC. You yourself decry inaccurate reports; you yourself decry inaccurate reports; give frank, honest reports to all amateurs.

Voice-Operating Technique. In using voice, as in c.w. communication, fills and repeats are a necessary evil. The necessity for repeats can be minimized by putting into effect some of the precepts set down on the reverse of CD Operating Aid No. 1. To communicate intelligence requires some concentration by the receiving operator, more than is involved in listening to a musical-background. When you are on the air you owe it to the person taking time to talk to you to concentrate on what he has to say. A scratch pad is useful for note-taking, especially on long contacts.

As transmitting operator you can do much to put over your subject by using good phraseology, complete but concise thoughts, by speaking slowly, and by developing points systematically instead of jumping around to different disconnected ideas. Voice contacts are capable of conveying intelligence quickly, excelling other modes in speed for conference purposes. But to vie with c.w. for handling record traffic, as in emergencies for example, more systematic practice in daily record communication work by a greater number of "phone operators would be advantageous. Another factor, not named in our Operating Aid, becomes important in handling messages (record traffic). That is, the procedure or order of the parts of a message should always be sent in the same sequence. Number identification (put on by originator), call (of originating station), check (NR words in text), city of origin, date, address (full), text and signature are copied most easily without error when always sent in the same order of parts, so we don't have to hop all around on the message blank to get them down. Accuracy is improved by watching the check to see that no words are lost. Use of a standard phonetic word list, not a liberal but an "as-required" use, will also help approach the accuracy standards of our c.w. friends! A message in proper form to W1AW will bring any amateur voice operator a copy of our phonetic word list.

--- F. E. H.

**CODE-PROFICIENCY PROGRAM**

The next qualifying run from W1AW/W0TQD will be made on May 20th at 2200 EST. Identical texts will be sent simultaneously by automatic transmitters. Frequencies of transmission from W1AW will be 3555, 7215, 14,100, 28,060, 52,000 and 146,000 kc., from W0TQD 3534 kc. The next qualifying run from W60WP only will be transmitted on May 6th at 2100 PST on 3500 and 7248 kc. For additional dates, see the ARRL Activities Calendar elsewhere in these pages. These W60WP-only runs will have different text from the runs sent by W1AW and W0TQD, but copy will be handled in exactly the same way as the transmission from W1AW and W0TQD.

Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the five speeds transmitted, 15 through 35 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m., you may try later for endorsement stickers.

Codo-practice transmissions are made from W1AW each evening, Monday through Friday, at 10:00 p.m. EST. References to texts used on several of the transmissions are given below.

**ARRL ACTIVITIES CALENDAR**

May 6th: CP Qualifying Run — W60WP
May 20th: CP Qualifying Run — W1AW, W0TQD
June 3rd: CP Qualifying Run — W60WP
June 4th-5th: V.H.F. Contest
June 18th: CP Qualifying Run — W1AW, W0TQD
July 23rd-24th: CD QSO Party
Aug. 1st: CP Qualifying Run — W60WP
Aug. 15th: CP Qualifying Run — W1AW, W0TQD
Sept. 6th: CP Qualifying Run — W60WP
Sept. 16th: Frequency-Measuring Test
Sept. 19th: CP Qualifying Run — W1AW, W0TQD
Sept. 24th-25th: V.H.F. Contest

First Saturday night each month: ARRL Officials Nite (get-together for SCMs, RMs, SECs, Ecs, PAMS, Headquarters Staff, Directors, Alternate and Assistant Directors).
**BRASS POUNDERS LEAGUE**

Winners of BPL certificates for February traffic:

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<tr>
<th>Call</th>
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<th>Del.</th>
<th>Rel.</th>
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<td>W9OFC</td>
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The following made the BPL for deliveries:

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<th>Rel.</th>
<th>Credit</th>
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<tr>
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<td>145</td>
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</tbody>
</table>

A traffic count of 500 or more points, or a total of delivery and extra delivery points of 100 or more, will put you in line for a place in the BPL.

**TRAINING AIDS**

We are glad to announce that at last the film F25, *"Rhythm, Speed and Accuracy in Hand Sending,*' has been received and is now available for use of affiliated clubs. Several clubs who have previously requested this film have been turned down because of the long delay in receiving it. We believe that F24, *"The Techniques of Hand Sending,*' and F25 will make a valuable addition to any beginners' code class. Judging by some of the fests we hear in the air, a lot of us could use some pointers.

ARRL Training Aids are still being used extensively by ARRL-affiliated clubs. At present the Training Aids include 25 motion picture films, 16 film strips, one slide collection, two albums of code records, inked tape recorders, inked tape keyers, inked tapes, quizzes and reviews. New projects are in the works and will be completed just as soon as possible, but the present Training Aids list has been static for about six months. Not so the Training Aids themselves. They have been moving around aplenty, and many clubs have commented on their value. In general, they cater to the beginner, both in code and theory, and are of the greatest value in beginner training programs. A few old-time amateurs, however, have commented that even for them something was to be gleaned from the elementary material presented.

ARRL Training Aids quizzes are not quite so elementary, for they were designed for the practicing amateur rather than the beginner. A mark of 100% has been scored by very few club members on any of these quizzes. You think you can answer any question on any certain phase of amateur radio? Get your club to try the quiz (if any) on that subject.

Motion picture films are probably the most popular of the Training Aids; much more so than the film strips. Yet, if the truth be known, the film strips are the more educational of the two because the motion can be stopped and there can be discussion and explanation before you go on to the next frame. If you want to, you can easily refer back to a previous frame. We supply some of the material for discussion in the lecture outline that accompanies each film strip. Since film strips have not been used much, we are making them available to all clubs, whether or not they are affiliated. This applies also to quizzes. Requests from affiliated clubs will continue to receive priority, however.

**SUPPLEMENT TO DIRECTORY OF ACTIVE NETS**

The following additions and changes have been made to the directory as published in November, 1948, *QST* and the supplements in January and March, 1949, *QST*s, pages 68 and 63 respectively:

<table>
<thead>
<tr>
<th>Net</th>
<th>Freq.</th>
<th>Time and Days</th>
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<tbody>
<tr>
<td>Delaware Emergency Net</td>
<td>3600</td>
<td>1000 EST Sun.</td>
</tr>
<tr>
<td>Eastern Teenagers Net (BYN)</td>
<td>7118</td>
<td>1800 EST Mon.-Fri.</td>
</tr>
<tr>
<td>Ga. Slow Speed*</td>
<td>358</td>
<td>2100 EST Mon.-Fri.</td>
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<tr>
<td>Golden Slate Net (Calif.)</td>
<td>3765</td>
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</tr>
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<td>Ill. Slow Speed*</td>
<td>3781</td>
<td>2000 EST Mon.-Fri.</td>
</tr>
<tr>
<td>Kentucky Blue Grass 'Phone Net (KYB)</td>
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<td>3672</td>
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</tr>
<tr>
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<td>Ky. Traffic Net (KYN)*</td>
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<tr>
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<td>1300 EST Mon.-Fri.</td>
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* Change from previous listing.

May 1949
TRAFFIC TOPICS

We have a new trunk line, gents. After months of having W8UKV, the champion of the slow-speed traffic handler, figuratively pounding on our desk and shaking his finger under our nose, we have broken down and recognized the Slow Speed Trunk Line as ARRL Trunk Line S. This trunk, although operating at slow code speed, will perform the same functions as all other ARRL trunk lines. It runs from New York City to California with outlets along the way in Ontario, New York State, Pennsylvania, Michigan, Ohio, Indiana, Illinois, Missouri, Arkansas, Kansas, Oklahoma, Colorado, New Mexico, and prospective outlets in Utah, Arizona, Nevada and California. TLS meets on 3545 kc. at 2000 EST, Monday through Friday. Slow-speed traffic handlers in the above states should contact W8UKV regarding the possibility of openings.

W2TUK, in the NYC-LI Net Bulletin, points out that when delivering messages by postcard a return address should be included with the notation "return postage guaranteed" under it. If you do not do this, and the card cannot be delivered, it will not be returned to you, and you will never know for sure whether it actually reached the addressee.

There are a few points which seem to be commonly misunderstood, or not understood, among many traffic handlers. Do you, for example, know the following?

1. "Extra" check is included in the complete check. That is, a message with "CK 10/6 EXTRA" is a message with a text of four words and six extra words added to the signature. Thus, "CK 10/6 EXTRA" does not mean that the check is ten plus six extra, but that it is ten of which six are extra.

2. The station of origin is always the station from which the message originated by radio. If W5XYZ down the street calls you on the telephone and gives you a message he was supposed to have originated but couldn’t because his transmitter went bust, the station of origin, as you send the message, is your station, not his, and the number assigned is your number, not his.

3. Relayed messages do not always count two points. If the message in the above example had been one which W5XYZ had previously received for relay instead of one he was to originate, you would get only one relay point when you sent it on toward its destination.

4. It is possible to get an "extra delivery credit" without also having a "delivery" credit. If, in (3) above, having taken the message from W5XYZ over the telephone you subsequently find you cannot relay it and you mail it, you then get one "extra delivery credit" but no "delivery" credit, since you did not receive the message by radio.

5. Other common faults: failure to include the signal AX to separate the parts of the address; using the word "SIG" instead of the signal BT to indicate the end of the text and the beginning of the signature; failure to send AR at the end of the signature; misuse or nonuse of the letter "B" to indicate that there is more to follow, or "N" to indicate that there is no more to follow.

Traffic for American personnel in Germany can now be handled via KAUSA at the Pentagon Building. W3ECP has indicated he will be glad to handle such traffic.

The Eastern Teen-agers Net (ETN) operates at 1800 EST Monday through Friday on 7118 kc. W2VJN writes that they want more members. The net will accept traffic for anywhere but can handle only eastern traffic direct.

W8HOX is organizing a slow-speed net in Ohio. Slow-speed traffic handlers with traffic for Ohio might report into this net, which meets at 1830 EST Monday through Friday on 3730 kc. Interested parties should contact W8HOX, or write him at Box 30, Wilmington, Ohio.

Each month we try to publish a picture of an outstanding traffic station in conjunction with this column. How about yours? We like to have a big backlog of snapshots for use on these pages, or for use with the "Family Album" supplement to the ARRL CD Bulletin. Why be modest? Send us a snapshot or photograph of yourself at your operating position, along with some material for the caption. We would much appreciate it.

Gordon Walter, W3EYX, says, "I'm proud of my station and my ARRL appointments." Gordon holds appointments as official observer and official relay station, as well as a Code Proficiency certificate. He also belongs to the Rag Chewers Club. Active in amateur radio circles for many years, Gordon is a past vice-president and past treasurer of the Washington Radio Club.

QST for
COUNTRIES-LIST ADDITION

Since the adoption of the ARRL Postwar Countries List, the official standard used in connection with the annual DX Competition and the DX Century Club, several changes have been reported in this department. See page 40 of March, 1949, QST for the latest revised list. We are pleased to announce the addition of one more country to this list: Heard Island, VK1. Make this change on your list and watch the Operating News department for further changes and additions.

WITH THE A.E.C.

The following, taken from the Western Massachusetts Route Manager's Bulletin, should be of interest to every member of the ARRL Emergency Corps.

"Ham radio exists because our government thinks that it is in the Public Interest, Convenience, and Necessity. That means that at least some of our hams must so operate their stations! That means to me operating in such a manner that when an emergency strikes our community we are able to do something about it. Oh, yes, you say; you are perfectly willing to help with your rig during an emergency. Being willing and being able are two different things! Whom would you work? Would it be haphazard or would it be definite—that is, into a regularly established net? You know the answer as to which country to the list: Heard Island, VK1.

During emergencies, many messages are sent by officials and thus require signature. These are not sent just to "another station." They must be written down by the receiving operator, accurately. There is a very definite form for message traffic. Do you know it? It could be that an operator in an isolated section had just been able to rig up a simple c.w. transmitter. You might be the only station near enough to hear him. Is your code good enough so that you could copy him, even at a slow speed? In my opinion, if you can't qualify under every point mentioned, you are not operating your station in the Public Interest. Maybe this is rather blunt, but think it over."


Last February, when the western plains of Canada were hit hard by a series of blizzards, VE6KU and VE6TA, located near Hussar, Alberta, and VE6MP and VE6HZ, near Chancellor, were instrumental in obtaining the swift restoration of power to their communities when the power lines had failed, unknown to the power company, as a result of the fury of the storm. The outage at Hussar and Chancellor was less than 36 hours instead of the several weeks which would have been the case had amateur radio not been avail-
able. VE5JS at Moose Jaw and VE6OD of Calgary were of great assistance in this relief undertaking.

When it appeared, in early February, that the Pacific Northwest might again this year be devastated by flood waters, the Pioneer Net (the Pacific Coast's prime traffic instrument) was placed on a stand-by basis by net manager W6REB — just in case. Fortunately the Pioneers didn’t have to go to work on this one, but they once again proved their willingness to serve in the public interest.

The Heart of America Radio Club has been assigned the call W0RVG for the club station installed in the Red Cross Headquarters in Kansas City. Less than 36 hours after the station had been licensed it was in emergency communication work associated with flood waters on the Missouri River north of Kansas City. The club’s portable units, W6NNU/0 and W6ICD/0, were sent into the field to maintain communications between Red Cross relief workers and the K.C. Headquarters. The operation occurred on February 5th and 6th, and fortunately no great damage was recorded.

INTERCITY RIFLE MATCH

The Amateur Transmitters Association, Pittsburgh, Pa., and the Pole Cat Net, in cooperation with the Detroit Amateur Radio Association and the Carnegie Tech Radio Club, were responsible for the success of a rifle match held between Pittsburgh and Detroit. At Pittsburgh a Stancor 60P and an S-20R were set up at W3NKI, the C.T.R.C. station, and contact with the Carnegie Tech range maintained by an army field telephone. W8IHR operated his home station at Detroit with a private wire connecting him to the Vickers Range there. All match scoring and information was handled on 3.5-Mc. c.w. Exactly one hour after the last shot was fired, Pittsburgh was declared the winner. Under normal match procedure, targets must be exchanged by mail and the final result is not reached for several days.

The following are those known to have participated in this activity: W3s CEO, YDJ, KSR, NUG, KVG, LFK, MTA, OZT, John Miller and Bill Kail of C.T.R.C., W8IHR, W8SCW.

HAMS AT HEADQUARTERS

The following calls and personal signs belong to members of the Headquarters gang:

W1BAW R. T. Beaudin, “rb”
W1BDI F. E. Handy, “fh”
W1BUD A. L. Buddong, “bud”
W1CEG H. M. McGowan, “mac”
W1DF George Grammer, “ge”
W1DX Byron Goodman, “by”
W1FTX R. M. Smith, “rs”
W1FWH W. E. Bradley, “wb”
W1GS F. C. Beeley, “beck”
W1HDQ E. P. Tilton, “ed”
W1IN Albert E. Hayes, Jr., “nvx”
W1KEE Richard L. Baldwin, “ike”
W1FEQ C. V. Chambers, “vo”
W1JMY J. A. Monkey, “joe”
W1LVQ John Huntoon, “jh”
W1MFA H. K. Isham, “bk”
W1NJM George Hart, “geo”
W1PEK L. T. Waggoner, “roy”
W1QJS Murray Powell, “mp”
W1WQF T. F. McMullen, Jr., “fm”
W1YNT E. H. Lyon, “by”
W1RUP R. N. Eidel, “rn”
W1RWZ John E. Can, “je”
W1XCI R. E. Morrison, “hr”
W1ZTS D. H. Mix, “don”
W1VG J. A. Morrow, “pete”

ARIZONA FIELD DAY

The Radio Clubs of Arizona invite the radio amateurs in the United States to participate in Arizona Field Day on May 14-15th. Operating hours will be 2-12 P.M. MST on May 14th and 7 A.M. to 3 P.M. MST on May 15th. A certificate of award will be given to the amateur in each call area who scores the most points. Two points will be given for every Arizona station worked. Either field day or home stations may be worked. The same station may be worked on different bands. The number of Arizona field stations worked is to be used as a multiplier in computing final score, which will be two points for each Arizona station worked, times the number of Arizona Field Day stations worked. Scores are to be sent to Gladden Elliott, SCM, 39 North Melwood, Tucson, Arizona, not later than June 1, 1949. Rules for Arizona amateurs can be secured from the above address or from any Arizona radio club.

Here is a view of W5LUX in operation during the Harrison, Arkansas, ice-storm emergency reported in April QST. John Saxon, W5OXC, is on the landline. J. A. Patterson, W5FIV, is busily pounding the key, while the chief op, W5LUX himself, W5OXU, and C. Rushing are observing from the sidelines. Operating solely on battery power when their town was cut off from all communications with the outside world, W5LUX's traffic total speaks for itself.
• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3GEE — After six months of work ELL finally has a VFO on 3.5 Mc. to his satisfaction. AON has the ASC doing yeoman duty in the York area. VMF has a fine BPL total this month. QUC uses 20 wats on 7155 kc and lacks only a card from Utah for his VAR. EQK also has worked many DX stations with his five power. FRI The Harrisburg Club has an emergency net on 3500 kc and also is getting set for Field Day. KBT has presented his bulb for Charlie is solicited. RLY is chairman of the Field Day activities for the Hamilton Township Club. RFC, at Fort Dix, has just presented his mobile equipment. ZWV, NFP/2 is now is Emergency Coordinator for Hunterdon and Warren Counties. Get behind him, boys. Traffic honors go to 51 this month. KBT, EQK and NST have the most recent addition to the 420-Mc. Net, K2BG has 41 states using fifteen watts input. The New Jersey 75 Meter Amateur Emergency Net is carefully organizing for action. PIN and RDR were knee deep in equipment difficulties during the first week end of the DX Contest. Atlantic City's most active Station, K2RR, Club, has presented the usual 'phone performers plugging along on the key for the name and fame of their radio club. EKA worked out very well in the contest with a 24% element beam. The high winds have wrecked general havoc on the antennas of the nearby brethern. QVA has the only rig I ever heard of calibrated in nets. Brad is building a kw rig which will be T.V.I. proof. (?) Traffic: WSVP 849, CUL 272, NHI 230, DZ 160, QGZ 97, EU 64, ELI 62, WTS 49, ADB 49, AON 26, OML 22, AXA 16, NVY 6.

MARYLAND-DELWARE-DISTRICT OF COLUMBIA — SCM, Eppe W. Darne, W3BTWT — Subject for the first February meeting of the Washington Radio Club was a demonstration and discussion of an automatic call system used by members of the Washington Radio Club for mobile units calling into fixed stations. The talk was presented by NL, assisted by CDL. The Club's second February meeting was a technical talk on the use of GKP. The Baltimore Amateur Radio Communications Society now has 15 mobile units in its Emergency Corps. A net control station will be set up in Baltimore Red Cross Headquarters, and also will serve as the club station. The first March meeting of the BCARS featured a talk by AFR and a demonstration of GKP mobile equipment. The SCM wishes to express his thanks to those who nominated him for a second two-year term. He was declared elected by a prodigious amount of work to get their sheet into print and they deserve the support of all their members, but it would appear from the editorial comment that such support is sadly lacking. DWA informs us that the Northeast Radio Club meetings are well attended. There is no news this month from most of the clubs. Presumably they were too engrossed in the DX Contest. It is interesting to learn many of the regular 'phone performers plugging along on the key for the name and fame of their radio club. EKA worked out very well in the contest with a 24% element beam. The high winds have wrecked general havoc on the antennas of the nearby brethren. QVA has the only rig I ever heard of calibrated in nets. Brad is building a kw rig which will be T.V.I. proof. (?) Traffic: WSVP 849, CUL 272, NHI 230, DZ 160, QGZ 97, EU 64, ELI 62, WTS 49, ADB 49, AON 26, OML 22, AXA 16, NVY 6. [Continued on page 68]
Polecaters meet Sundays at 11:30 am.

The Nearby-organized Ohio River Valley Net is working in conjunction with the Weather Bureau during high water periods. NUG and UPB may be contacted if you have an interest in participating. The WX Net finds itself conducting business, each week. Districts amateurs please note, the annual hamfest given by the Southern Bass Founders and Modulars will be held at South Park Ave. This year, the net that was the result of the passing of another real amateur radio operator, UG. The Gisk Valley Amateur Assn., of New Kensington meets the third Saturday of the month at the Star Market Allegheny invited. The Gisk Valley Amateur Assn., of New Kensington meets the third Saturday of the month at the Star Market Allegheny invited.

The New Hampshire Express, a 450-word text given by the CEO to NUG for use as a news item, was received from NUG. A Nicola contact may be used if you are interested. The W8ZL card and Carty Cartwright 921 to win and place in the Tri States Amateur Radio Society QST Contest. The Gisk Valley Amateur Assn., will be held.

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This month we want to touch briefly upon several subjects which we hope will be of interest to you, so forgive us if we seem to ramble.

Recently we were called to task by an enthusiastic HRO-7 owner. It all came about because the HRO-7 had been in service for over a year and the operator unaware of the "bandspread only" 10-11-meter coil. (We are referring to type 7AA coil, developed some time ago, and first mentioned in our catalog last year.) Our friend wrote us after procuring and using a 7AA coil for a few days. Our crime, according to our critic, was in not proclaiming this development in bold-face type.

Probably the most noteworthy feature of the 7AA coil set is the fact that it affords a signal/image ratio of about 50db. It also has a little more gain than the dual purpose general coverage-bandspread coil set. The improved performance is, of course, due principally to the fact that the restricted frequency coverage allows us to use a more efficient coupling arrangement.

Yes, others have "discovered" this coil and likewise seem entirely satisfied with its operation. Now, wait a minute! Before you dash out to order an HRO-7AA coil set from your distributor, we want you to realize that it cannot provide the performance outlined above unless it is aligned in the receiver with which it is to be used. If you have the gear and the know-how to lick this problem yourself, all well and good. If not, we will be glad to give you the name of your nearest authorized National Service representative upon request. Incidentally, these coils can be used in all previous models of the HRO except the HRO Jr. It should be noted, however, that the increased gain may result in oscillation in some of the military models. Please do not ask us to furnish HRO-7AA coil sets equipped with handles of type used on earlier models.

Since introduction of our line of Narrow Band FM Adaptors for the NC-173, NC-183, and HRO-7, we have received several complaints that the HRO-7 suffered a loss of gain when the NFM-07 Adaptor was plugged in. Investigation of the matter revealed that these complaints were almost invariably due to the purchaser having discarded the instruction sheet along with the package in which the NFM-07 was received, a stunt which most of us have pulled at one time or another! It is not necessary to make any adjustment to the NC-173 and NC-183 Receivers when the appropriate NFM Adaptor is plugged in, but the primary of the last IF Transformer in the HRO-7 must be retuned when the NFM-07 is plugged in. This means readjustment of trimming capacitor Number 22 shown in Figure 5 on Page 11 of the HRO-7 manual.

A great many amateurs these days are building new rigs or revamping the old one to take advantage of the band changing convenience afforded by the National MB-150 Multi-Band Tank, and every mail brings a new crop of requests for further information about it. Some inquire as to the possibility of using the MB-150 as an antenna tuner; our answer is that it was not designed for this job, but experiments are now going on and we may have more to say on the subject at a later date. In the meantime, do not overlook the fact that the MB-150 is a natural for the grid circuit of that high power final.

Seth Card, W1DRO
**THE FIRST PLATED AMATEUR CRYSTALS.**

Drift less than .0002%/°C.

Precision calibrated.

Peak performance.

**USE THE RIGHT COMBINATION**

CC0-2A

Packaged crystal control for 2-6-10-11 meters.

Efficient VHF performance with proven design.

**BLEILEY CRYSTALS**

CRYSTAL CONTROLLED OSCILLATORS

BLEILEY ELECTRIC CO. • UNION STATION BLDG. • ERIE, PA.

(Continued on page 68)
FIVE NEW 7" MODELS

F7-T ST-804
F7-T ST-807
F7-U ST-806
F7-U ST-808

FIVE NEW 6"x9" OVAL MODELS

P69-T ST-812
P69-T ST-814
P69-V ST-810
P69-V ST-813
F69-U ST-811
F69-U ST-814

ONE NEW 5½" MODEL

P525-V ST-803

The addition of these new models brings the number of speakers in the Jensen Standard Series to fifty-three—the most complete array in speaker history. In addition are the Jensen Concert Series, Special Series, Coaxial, and Professional Series. There is a genuine Jensen available for every purpose.

Write for Catalog 1010-F
**GREAT LAKES DIVISION**

KENTUCKY — SCM. W. C. Alcock, W4CDA — February was another good month of activity-reporting, with 714 messages handled. DX & added points on 7 Mc. is building p.p. T55s on 14 Mc., and new p.u.p. T250s on 28 Mc., and p.p. T150s on 3.5 Mc. Both were recorded in traffic, and X for the first time slow-speed (for KKWY) at 6:45 A.M. This net also works at 8 P.M. CST. NWQ and VD graduated to KY Net, with OSE, OET, and LEI building up code speed. FKM still is active on both nets. JQY reports that he is working a night "phone" net (KYB), 8 P.M. on 3890 kc. (M-W-F). CDA is clashing it out one more final to make 4.6, 7 Mc. by throwing switchers. JNC makes work for himself by metering each pendente in push-pull rig. TXC says the KPY Net is going strong. MSC is active in Ohio River Valley Net. KWO is new Official Phone Station. VP is new Official Observer. CRI is new Official Bulletin Station on 4.38-Mc. frequency. One for the girl. JEL has 111 countries now, and is now icing out Olaowse, TXO. He has trouble with his rig, but is very active on KYP Net. KKG experiments 90 per cent of the time at "Harmonie Acres." His new QTH, HAV is working Ohio River Valley Net and KYX Net. The Blue Grass Amateur Club reports in its club paper that RJC has plenty of audio.

NCQ is active in Lexington club work. VD is a new-comer to the KYX Net. Traffic: W4AZ, YR, 173, MWX, FKM 47, JOY 43, CDA 25, JCN 24, TXC 19, MSC 17, VD 17, KWO 15, CRI 12, EZWZ/4, W4EDV 6, FBJ 6.

MICHIGAN — SCM. Robert R. Coonjar, GAN — SCM. W4QQA — SIGQ: GJH, RM: GSJ, NOH, PVK, and UKW. EC Certificates have been issued to CNN, KJJ, and UGG. HPL cards go to CP, and on delivery totals to CJC, TRN, UUR, and UKW. A TLS Manager Certificate has been issued to UKW. This slow-speed transcontinental net is existing rapidly. The success of the Mid-Winter Hamfest held in Grand Rapids has given the officers of the Grand Rapids Club the assurance necessary to make this event a part of the Club's permanent calendar. The Grand Rapids Emergency Net, operating on 40,158 kc. with a transmitter at the Red Lake Headquarter under the call SWRJ, had very fine turnouts during net drills on Monday nights. WXO states that the code class sponsored by the Genesee County Radio Club has 30 members who meet once a week and have code practice twice per week on 144 Mc. YNG is testing a portable "phone" rig with a single 304TL, for use during his vacation. TBP has transmitter troubles but still furnishes an outlet on QMN for CNN and his Hawaiian and South Pacific traffic. CUP is getting DX traffic from Okinawa, TXO. He has trouble with his rig, but is very active on KYP Net. KKG experiments 90 per cent of the time at "Harmonie Acres." His new QTH, HAV is working Ohio River Valley Net and KYX Net. The Blue Grass Amateur Club reports in its club paper that RJC has plenty of audio.

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**CATALOG NUMBERS FOR B & W PLUG-IN LINKS**

For Types TVH, TVL, BVL and other small inductors

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Keep it at your fingertips for full details on inductors, variable capacitators and accessories for almost any ham need.

BARKER & WILLIAMSON, INC.

Dept. Q-59, 237 Fairfield Avenue, Upper Darby, Pa.

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**JUST PLUG IN THE LINK THAT MATCHES YOUR LINE**

W3GC

AVAILABLE IN 1-3-5-10 TURNS

**B&W NEW! PLUG-IN LINKS FOR IMPEDANCE MATCHING!**

For TYPE 3550 FOR TVH, TVL, BVL and other small inductors

Adaptable To All B & W Swinging Link Assemblies

These handy plug-in links save you money—save time—and make your rig adaptable to practically any impedance, in no more time than it takes to plug in one coil into which the link coils are plugged. This is easily accomplished by removing the pin that forms the arm hinge and inserting the pin that forms the arm hinge and inserting the pin to which the swinging link is to be connected. On present swinging link assemblies, it is only necessary to replace the swinging link arm with a new one, into which the link coils are plugged. This is easily accomplished by removing the pin that forms the arm hinge and inserting the pin to which the swinging link is to be connected.

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The Florida State Fair proved to be a strong source of traffic for Pl. Traffic: W4PL 1905, NJJ 927, ETN 277, APC 125, QYM 102, BAO 99, LCB 37, DLY 51, CZL 23, HOJ 18, ONX 15.

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BARKER & WILLIAMSON, INC.
Many years of reliable service in many types of application have established the Eimac 450T as the standout triode in its power class.

Recent technical achievements make the 450T a still better tube. Adoption of the Pyrovac plate and a non-emitting grid have amplified this already rugged tube's ability to "take it." Life expectancy and overload handling qualities have been increased multifold.

Comprehensive technical data on the Eimac 450T are immediately available... write direct.

**EIMAC TYPE 450TH**

**ELECTRICAL CHARACTERISTICS**

<table>
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<th>Filament: Thoriated tungsten</th>
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<tr>
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<td>Plate-filament</td>
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<tr>
<td>Transconductance (I=500 ma., E=4000v.)</td>
<td>6650 umhos</td>
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**MAXIMUM RATINGS**

Radio Frequency Power Amplifier and Oscillator
Class-C Telegraphy (Key-down conditions, 1 tube)

<table>
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**EITEL-McCULLOUGH, INC.**

728 San Mateo Ave., San Bruno, California

Export Agents: Fraser & Hansen, 301 Clay St., San Francisco, California
The ULTIMATE in BEAMS

the new universal

JOHNSON ROTOMATIC

The new JOHNSON Rotomatic plus the new JOHNSON Phased Array, a unidirectional beam employing driven elements. Elements are also available for conventional parasitic beams. Both arrays are furnished in two and three element beams for 10, 14 or 20 meter bands.

DUAL BAND OPERATION

Deluxe Models of the above arrays are available for two band operation, employing two separate sets of elements but only one transmission line.

NEW JOHNSON PHASED ARRAY

The new JOHNSON Phased Array is the result of a search for an antenna with gain and front to back ratio equal or better than the conventional parasitic array, which could be erected and tuned without the usual laborious adjusting required by past beams. Due to symmetrical construction, the tuning is simple, erected and tuned without the usual cumbersome parts, which could be front to back ratio equal or better than the performance is excellent.

NEW JOHNSON PARASITIC ARRAY

When you see it you will realize it's in a class by itself! New, unique design allows an infinite variety of element lengths and spacing. Perfect impedance matching on two bands — any impedance from 50 to 600 ohms — with the same transmission line.

NEW ROTATOR AND DIRECTION INDICATOR

The new Rotomatic Rotator was designed for those who want the very finest. The heavy duty drive unit will take rain, sleet and high winds in its stride — will turn on the coldest morning. Rotation is instantly reversible, 360° at 1/4 RPM. The direction indicator is a selvyn. Motor control and antenna relay switch are contained in the indicator case. The elements, rotator, direction indicator, etc., may all be purchased separately.

Write for ROTOMATIC folder or see it at your jobber.
We devote this edition of the Mallory Ham Bulletin to an announcement of the greatest importance to the amateur designer and experimenter. The ham who builds his own equipment from the ground up, and who is exceptionally particular about its stability and efficiency, will be extremely interested in this announcement.

Your Mallory Distributor now has (or soon will have) available, for the first time to the amateur designer, the same styles of ceramic capacitors which in the past have been available only to commercial laboratories and other large buyers of these fine capacitors. Variable, as well as fixed ceramic dielectric capacitors are included in this new addition to the Mallory family of precision parts.

Included are general purpose fixed ceramics in values from 10 to 5000 Micro-microfarads, zero temperature coefficient fixed ceramics from 3 to 100 mmfd., and negative temperature coefficient types of -750 parts/million/°C. in nominal values from 5 to 100 mmfd. Here is every value you'll need for stabilizing that VFO.

In the variable ceramics you will have available singles and duals from 1.5 to 45 mmfd., as well as zero temperature and negative temperature coefficient styles.

But that's not all. For the ham who has been bitten by the TV bug, a special 500 mmfd. ceramic filter rated at 15,000 volts is also included!

The next time you visit your Mallory Distributor have him show you these new ceramics. We think they are exactly what the doctor ordered.

In the meantime don't forget the Mallory ham band switches; push button switches, controls—rheostats—potentiometers—pads, tubular capacitors, transmitting capacitors, dry electrolytics, dry disc rectifiers, vibrators, and vibrator power supplies—those other precision components needed to keep your rig in A-1 condition.

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA
Jerry is seeking an 18-w.p.m. group and welcome correspondence. VKC has a BC-65 receiver converted for Field Day. He still is on FSN and has new VFO. BKO, after 18 years of solitude, now has two hams in new houses within a stone's throw of him. DRQ, in very busy and spends only 1 per cent of his time in NLL. YDQ celebrated his first year of hammering. Jack has 40 counties on 7 Mc. KVAF/2 has joined KNAB. TKU has the rig and fancy on relay on 380 Mc. ZNM is very active with high school, NLL, 160-meter rig, and also wants ORS appointment. UFR had rig on 3.5 and 7 Mc., but radio mode somewhat changing and is now on 7 Mc. only. PF is a member of the Military Army Radio System with the call ABF. FYS is using low power on 28-Mc. e.w., c.w., temporarily retired from active participation with the NLL. QBS is preparing 3.5-Mc. mobile for ABC use. WHB is developing overseas schedule with Red Cross. PZL is on 28-Mc. phone. Cal's first activity is a 2111. November. LBW 2still is at Halloran V.A. Hospital making recordings for WHA. RTZ ran up a terrific score scheduling DEU even though his coil socket was held together with Scotch tape. UIPE was inadvertently promoted to president in our last issue. Sorry for the error. OAI. Traffic: W2TYU 862, UNX 679, FTC 744, VNI 222. OBU 195, VOS 174, BO 115, QYZ 77, ZNM 73, EC 56, VSS 43, OUT 40, QBS 38, KVAF/2 29, W2BGO 20, LWB/2 13, PF 10, DBQ 9, YDG 9, VAF 7, TUK 5.

KNOTT IN NEW JERSEY — SCM. Thomas J. Lydon, W2ANW — SEC: LIN. RMS: CCTV, LFR, and NKK. PAM: DRA. The N.N.J. C.W. Net meets daily except Sunday on 3930 kc. at 7 P.M. The NJN Net meets Monday through Friday on the same frequency at 7 P.M. The 40-Mc. Net meets Monday through Friday on 7260 kc. at 7:30 P.M. The 75-Mc. Phone Net, which meets on Sunday at 9 A.M. on 3930 kc., handled 42 messages during the recent N.J.R.C. contest. A.M. is always on the air. He is recovering from a serious accident and is back on the air with BC-410. DLK is operating mobile on 28 Mc. He now is building a mobile rig for 3.5 and 7 Mc. KJU, member of the Central Kansas Ham-lo, now is completely emergency-powered, using 500-watt generator. ZTJ has been busy logging stations out of the band during the DX Contest. The DX Center is building a 10-Mc. station. 98MC has moved to West Orange. NIVY received a certificate for high e.w. score of VE2/15035 m. con test. EWX has been completely repaired, 7200 kc. The first edition of M.J. Traffic Bulletin has been mailed to all net members. Thanks to Tony Ryan, NKK, for the hard work. Anyone desiring this bulletin please send self-addressed stamped envelope to NKK. OPH has taken up phone and is active as J38 and 14 Mc. New ORS appointees include NQJ, LABJX, KS, AVO, and EC for IHC. City, HH/4 is now ORS. VNJ is on 28-Mc. e.w. AIW was elected president of the PNAA. CKW now has 34 counties on 3.5 Mc. Traffic: W2HCG 241, RUS 253, LFR 192. K2USA 172, W2 NKD 137, CSL 128, NCJ 119, HII 94, CCB 74, W2BKW 7, DM 5, GSP 4, OTP 4, CWO 2, NITY 2.

MIDWEST DIVISION

IOWA — SCM. William G. Davis, WPP. — The Sioux City gang had a full page write-up in the Feb. 12th Journal. FZQ has new rig built around a Hunter exciter. One of our real old-timers, Art Collins of Cedar Rapids, recently got back his old call, CXX. AXH is holding code classes for embry hams. FKB has new IHT-18. TKQ is on Tall Corn. VIA. The Dix Moines gang put its 28-Mc. through a simulated emergency drill which was recorded. Those taking part were ATN, WSI, LFF, OLY, EVE, HKE, MVC, CSC, AIW, and HII. The Davenport gang put on a public demonstration for the Red Cross and had the boys, the girls, and a V.L helper in a department store window. EHT has bag traffic total because of emergency traffic. YNW has new Hunter exciter, EQN has 100TH; too much excitement for its smaller tubes. AHQ is on 14- and 28-Mc. phone and 14-AE, e.w., with a pair of 813S. EMI and CWT are on 14-Mc. phone. FUM is getting DX on 28 Mc. MBW remodeled his shack into a ultra-de luxe class. GFK is happy with his new rig. DX, QPZ, and JCMW are busy in his OES report. JBV will have 900 watts on 144 Mc. shortly. The Council Bluffs gang is working hard at 230 and 340 Mc. The WOC gang has a new rig built. The WOC gang is hard working. The Council Bluffs Club hamfest will be held July 17th. KOC is leaving 7 for 28 Mc. PDA/M's first DX was KX0BH. OAI has a class of 17 new hams. Triffic: (Feb.) WJH1MM 717, FP 208, RFI 208, SCA 103, AIU, 89, NOK 41, FTC 41, VNI 222, OBU 195, VOS 174, TIU 17, QVY 10, FKB 7, HII 94, LFR 192. (Apr.) WSSQ 53.

KANSAS — SCM. Earl N. Johnson, WBVCY — YHL reports interest in organizing a club in Emporia. The WARC, Wichita, is sponsoring an emergency-eye-building contest and inviting competition among individual groups within the city for Field Day. The Center for the blind is organizing the Field Day Club of Salina holds emergency drills every Friday night. The Navy GCA Radio Club, Olafie, is initiating new hams with PUY and W2TJ is now calls. Two others are away on vacations. All are products of BPS's high school night. BRK has completed new electronic keyer and is very active on (Continued on page 38).
Silicone—the amazing new synthetic—made headlines when General Electric brought it out during the war. It’s news again today—for G.E. has now made Silicone bushings and gaskets a standard feature of all its specialty capacitors up through 5000 volts.

This means that your new G-E capacitor is sealed positively, permanently—for maximum life. For Silicone seals by compression alone, without the use of contaminating adhesives. It will never shrink, loosen or pull away—it remains elastic at any operating temperature a capacitor will ever meet. Moreover, it is impervious to oils, alkalies and acids, and its dielectric strength is permanently high.

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Silicone bushings used with capacitors 660-v a-c, or 1500-v d-c and lower.

Silicone bushings and plastic cups used with capacitors 660-v a-c, or 1500-v d-c and lower.

Silicone gaskets and plastic stand-offs used with capacitors rated 2000-v d-c and lower.

Silicone gaskets and porcelain stand-offs used with capacitors rated 2500-v to 5000-v d-c.

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The 7 MHz antenna may be plumbed to provide both vertical and horizontal polarization. The 50-foot lead-in is used for the dipole and the feed.}

New England Division

Connecticut — SCM, Walter L. Glover, W1VB — LKF was appointed SEC, effective Mar. 1. It is hoped all the gang will give him their utmost cooperation in order to establish a QC in this section second to none. Other current appointees in the section are ORP, Route Manager, and VW, Phone Activities Manager. The Yale University Club is completing repairs to its rig and expects it to be on 3.85 Mc. with 300 watts. OTX, DJC, LJO, EJT, LMK, QX, and OAX are going mobile. QIS is working full time at Headquarters. BYBV reports all the emergency work around Waterford, which is FB. BYBV has just moved to Brimfield.
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- Rugged terminals and brackets—terminals secured by spot welding—heavily tin dipped for easy soldering. Brackets designed for easy mounting.
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with easier, JE reports that work interferes with ham radio although his traffic total doesn't show it. BDV now has compact, variable emergency job and plans to try it out on Field Day. Activities at school crowd radio activities at BDV. JYH has new two-element beam and his DX Contest score will show how good it is. The Hammondsport Radio Club had a hang-up shindig on March 5th. QWJ, RPJ, and NY are giving 50 Mc. a try. KPY added POFAC, CFSA, and a CQ JTJ to his list of QJ's. OJQ and GYJ are new members of HCRC. The Quinquebus Radio Club now is well organized. EPC is EC for South­ender and GYS. We are sorry to have to report that NY has relinquished the appointment as PAM. JLT missed the first half of the DX Contest because of transmitter troubles. RJJ, in Lenox, is working DX on 28-Mc. ARJ is back on the air after a few years of silence. ORV is on 28-Mc. phone using f.m. Traffic: WIGZ 127, JE 92, IJH 84, BVR 97, RJJ 65, NY 45, AMJ 34, AZW 30, GYJ 16, BDV 7.

NEW HAMPSHIRE — SCAL, Gilman K. Crowell. W1AQG is now running 120 watts on 75; still needs Utah and South Dakota for WAS. ORN is attending the U. of Kansas. QXJ reports on the Swing Shift Net regularly. LJS is ready to go on 3.6-Mc. phone; he has his 2nd-class commercial license. The Farmers Net (100) will be reactivated as soon as the go ahead signal is received. QXK-1 is operating from Sunnook; LGG and QVW have their Class A tickets. RVG now is a new ham in Tilton. BFT obtained an accuracy of 8 p.m. in the last, FMT with only a Collins receiver. KXJ, BBM, and QVJ are New England Controls for the 28-Mc. net. IP, LCC, JJB, and MAF can be heard on the Baby Sitters Net. IP, meaning; QVJ has been on 28, 50, and 144 Mc. Net Control Stations on the C.W. Net are as follows: Mon.; CVK; Tues.; QYJ; Wed.; WEE. WEE is operating, FPU; SDT; JXW, JXW is the local theater's sound screen. Get your Field Day gear together, gents! I'll be awaiting your next reports.


RODHE ISLAND — SCM, Roy B. Fuller, WICHIR — The Cranton Radio Club has formed an Emergency Net and will drill on Monday evenings at 703 p.m. on a spot frequency of 147.5 Mc. The organizing efforts of MILL, our "EC", are paying off. He reports six EC's now with four active nets and 15 active members. The waterfront Radio Club is conducting classes in ham radio. The NAARO held an auction, the proceeds going into the building fund. The club has announced it has obtained quarters in the old and Greenwich Chapter of the American Red Cross Building, with facilities for the installation of a station provided.

BFT handied the SB Radio Traffic, Traffic: W1IFY 92.

VERMONT — SCM, Burris W. Dean, WINLO — MEP is building a 420-Mc. square corner reflector antenna and VFO for 29 and 30 Mc. RLS has been operating portable with Collins 3V and 75A in Aldio. ETE visited KJJG. KLVY is handling NCS on c.w. now finding faults with M1N and RNN assisting. ELJ is on 3.5 Mc. with BC-457 and 75 watts. QM1 is operating from K7AHR in Anchorage. 40 and 80, with BC-682. The Band is good on 3.5 Mc. and NN7 also have been under the weather, but are feeling OK now. OCD lost his father Feb. 26th. AC and ORO are sporting names and numbers. The Battleboro Rotary Club has announced it has obtained quarters in the local theater's sound screen. A Police reports that you iust tomatoes in the Sunday News with pictures by QXJ. QGX is using PM on 29-Mc. phone with PB results. QOF has a commission as 2nd Lt. in the National Guard. Aldio has added speech clarifiers. AEI is using a "d'f.m. CAP could use some speech clarifiers. AEI is using n.f.tm. Traffic: W1AOQ. P'F 'l now is running 120 watts on c.w. and 600 MA with excitement. BDV now has plans for the installation of a station provided.

BVT handed the SB Radio Traffic, Traffic: W1IFY 92.

W1AOQ — SCJ, Alan K. Ross. W1WJ — MEP is building a 420-Mc. square corner reflector antenna and VFO for 29 and 30 Mc. RLS has been operating portable with Collins 3V and 75A in Aldio. ETE visited KJJG. KLVY is handling NCS on c.w. now finding faults with M1N and RNN assisting. ELJ is on 3.5 Mc. with BC-457 and 75 watts. QM1 is operating from K7AHR in Anchorage. 40 and 80, with BC-682. The Band is good on 3.5 Mc. and NN7 also have been under the weather, but are feeling OK now. OCD lost his father Feb. 26th. AC and ORO are sporting names and numbers. The Battleboro Rotary Club has announced it has obtained quarters in the local theater's sound screen. A Police reports that you iust tomatoes in the Sunday News with pictures by QXJ. QGX is using PM on 29-Mc. phone with PB results. QOF has a commission as 2nd Lt. in the National Guard. Aldio has added speech clarifiers. AEI is using a "d'f.m. CAP could use some speech clarifiers. AEI is using n.f.tm. Traffic: W1AOQ. P'F 'l now is running 120 watts on c.w. and 600 MA with excitement. BDV now has plans for the installation of a station provided.

NORTHWESTERN DIVISION

ALASKA — SCM, Charles M. Gray, KL7ZG — W7FTM has his KL7 call now. He drew VJ, and along with the new call is getting a new Collins exciter, the 150-watt job. No more fooling with the 2500 chassis. Battery Selections 1% sniffs and multipliers — heavy duty insulated pin jacks — large numerals, easy reading meter.

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Test after test proves that no other type of anode can take the beating graphite anodes can, and last . . . a good reason why it will pay you to use graphite anode vacuum tubes for maximum efficiency at lowest cost wherever operating conditions are severe.
pair of 5514s. Lewiston: FRM writes of the formation of the Lewiston Amateur Radio Club.

MONTANA — 2SCM, Fred Thintinger, W7EGN — The Montana Phone Net now is operating on 3995 kc. every Monday, Wednesday, and Friday at 7:30. W7EGN is doing a nice job as NCS, and is looking for more members. Cal has constructed an electronic key. BYX is converting SCR-292. KVU was hospitalized because of injury received in an auto mishap but is back pounding brass now.

Oregon — SCM, Raleigh A. Munkres, W7HAZ —Astoria: COZ worked A7W-1, who would like to contact other West Coast amateurs on 288 kc. COZ is building transmitters for a comeback. The Astoria Club now has an attendance price. Bakers: The Baker club is about to graduate some 15-w.p.m. men. MI and HAZ are ready to go on 12 and 17 meters. HAZ was elected communications liaison officer of the Ashill's Bay League. LaGrange: H6BO, the group's corpsman, has returned to the states after a tour of duty in Europe. In a meeting, MQ checks in on Oregon Emergency Net, BDN is giving code lessons for the juniors. BEE is retiring from McSaw Day work, and is now moving to Emet. EQM is receiving a promotion and has been transferred to Miles City. Montana: Salem: AWE is building Mi-Mc. rigs for the forest service. LBV is building a Yaesu mobile for a local television station. DFT checks in on OBN. LUZ received his Class A license.

Washington — SCM, Clifford Cavanaugh, W7ACF — The Valley Radio Club elected new officers: EHH, pres.; JKK, vice-pres.; NTTX, secretary; MCM, treasurer; and UJ, trustee. DXZ did the installing. The club is moving to new quarters at EBR's place, and is planning to install mobile gear for a trip south. JKK and KIH are having fun on 28 mc. IVJ still is building his kw.

(Continued on page 76)
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PACIFIC DIVISION

HAWAII — SCM, Dr. Robert Katsuki, KID6HJ — At present the AEC is headed by UM. EGCs are AS, AN, OM1, HI, CL, and LD, all in Honolulu. AEC is associated with the disaster council of the Territory of Hawaii. The recently-opened ham school meets at the club house every Monday, Wednesday, and Friday nights. Present chief is PP, who has taken over from VP left for Europe. Assisting him are GM and KS. At last report the attendance was up around 40. HF is screen grid modulating with much better results than cathode modulation. Ham club membership now is up to 100. The club meets the second Monday of every month. A 1919 president.

NEVADA — SCM, N. Arthur Bowles, W7CX — Asst. SC, Carrol Short, jr., ZB7Z, SEC: IU, EGCs: HI, JYW, KXY, NSS, QR, K7, A7Z, ZT. KIO has new final, LVP is on 9 Me. Nevada State Net is active on 3666 and 7225 ke. PKV is on 27 Me. with f.m. SXX is on 28-Mc. putting out B.F., and KJQ are enjoying 28-Mc. AEC was active in the DX Phone Contest. MMK is on 28 Mc. for local contacts. ONG moved next to T3Z21 CTK is on at Whitney. JUV, KQl, and WCR are on 10-Me. JTA, UIZ, JVL, WAF6K7, IPD, and MAH have renewed interest in 144 Mc. around the Reno, Sparks area. JPI has a load on 28 Mc. LFX just joined. Lover is on 28 Mc. JPI W. was portable on 7 Me. at Sun Valley, Idaho, GC has m.f., on 38.95 Mc. KIU has a new rig and a 20-twin triplex. PIST is aiming all 3800 ke. almost every night. JAV has 5181 read emergency power at the flip of a switch. QHH works the YLRI girls on 29,121 kc. Tuesdays. KLL rebuilt his antennas. BIC has 4011 final, on a.m. ZT is on 3.1, 3.85, 7, and 14 Mr.

SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W5BP — W5O checks into the Mission Trail Net. CREI home study training available. AEC has a course for you. AEC is looking for a better radio job with CREI technical training available. CREI has a course for you.

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MODEL NXL—A fully adjustable noise limiter for use with any superhet receiver. Uses one 6AL5 tube. Size: 2'/4" long, 1'/2" wide, 2'/4" high. Less tube. 4/50.

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A new high sensitivity mobile converter with continuous band spread coverage from 3 to 30 Mc. in three bands. Same compact size as the popular Gonset 10-11 (5'/2" x 3'/4" x 5'/4"). Easily attached to your automobile set or any BC superhet. 39/95.

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A-C Generating Systems for Automobiles

For adequate power from your car battery, replace your generator with a Leeche-Neville A-C alternator. Used by police and other mobile communications services. Not available in a 45 ampere model at a considerably lower price; besides standard 60 and 90 ampere models. This new system gives 25 to 35 ampere output with engine idling and full output from 15 mph to 1500 car speed. Alternator has no commutator with commuting brushes or relaying armature windings to cause sparking, as do D-C Generators. Radio noise level is held to an absolute minimum—no radio "fade-out" and range reduction caused by weak batteries—prolongs life of radio equipment as well as your battery. Write to attention of Frank Miller, W28US, for complete information. Guaranteed. 1-watt phone input is 1500 KC. Complete with tubes and accessories. 4/50.

**STANCOR ST-203A Mobile Transmitter Kit**

25 watt crystal controlled phone transmitter covering 27 to 32 Mc. Will give reliable service in your car or as fixed station. Requires 400-500 volts DC @ 500 Ma. and 6 volts AC/DC @ 2.8 amperes. Uses 6H6 harmonic oscillator working from 7 Mc. crystals, 2056 class C amplifier, 6G5 grounded grid amplifiers and push-pull 6V6 modulators. Press-to-talk mike switch operates transmitter. Front panel has all controls, including pack for antenna, mike and power. Will operate with any 1/4 wave vertical whip or conventional antenna. Accessories needed but not supplied are: tubes, crystals, single-button carbon microphone with switch, power supply and antenna. Furnished complete, all parts, assembly and operating instructions. 44/70.

**SONAR Model MB-611 NBFM Mobile Transmitter**

22.5 watts output on 10 and 11 meter bands. Exclusive Sonar Phase Modulator uses 6-Mc. crystals. Input for high impedance microphone. Dual indicator for RF tuning and deviation, 2-3 Kc. adjustable frequency deviation. Tubes: 6SL7GT, 2-6SK7, 1-6AF6G, 1-2E26. Power requirements are 250 to 400 volts DC @ 100 Ma. and 6 volts AC or DC. Size is 10'/4" x 7'/4" x 5'/4". Complete with tubes, less crystal and power supply. 72/45.

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<td>P-3012</td>
<td>$3.15</td>
<td>2.5 Cl</td>
<td>10</td>
<td>EH (illus.)</td>
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10,000 H 27" 3" 21/4"

PRODUCTS OF MERIT

EY would like to go to higher power, but may say, "G7EA is on project No. 1PEA, 86N still is under the weather. LLA is chasing key clicks. M7K has a new steel tower and beam up. This time it is proved. MFZ is up to 90 postwar countries. TII is QRL business but gets on the air now and then. MVQ is getting out FB with low power. CDA is QRL. TT's lot looks like a broadcasting station with all the wires on a city lot. I claim working DX is not what it used to be! QJII puts out a mean signal. QXN is QRL net traffic: BUY is almost ready to get on the air. Traffic: [Member's Name] W6DR 609, W6RR 311, W6XN 191, W1RT 8 (Jan.) WBDQ 60, W6F8 27.

SAN FRANCISCO — SCM, Samuel C. Van Sloew, W6NL. — Phone 3-4457 F; SEC: BRS; ERC: YZD.

The 5th and 20th of each month the MT Net will have a regular period for handling traffic from mobile and emergency positions in the San Francisco Area. Control is Saturday nights each week (operator, JWF), who invites new members to check in. VEJ and 8P are doing some research into a one-frequency complete mobile ensemble, modulator, and all, the ideal mobile rig. Except for a receiver, IQQ is all set to get back on the air, ZOE soon will be heard as MEAR. ZJU is on trail. DLF is making good use of his new beam and 15/4 tubes. KBAI soon may be back at Hamilton Field. DXL still is plugging for DXCC Certificate. [Member's Name] W6JU is trying to get back on the air.

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YOUR DOLLAR IS WORTH MORE AT WRL!

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New 5.3 - 7 MC Arc 5 (BC458A) XMTR. .......... 6.95
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All TUBES Listed Below Brand New In Cartons
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1" O.D. — 3.90 ¼" O.D. — 3.57 ½" O.D. — 3.29
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receivers, MIW is now deep in Field Day Committees, Ex-W5J's new call is K4XXW and he is on 28-Mc. phone. MIWV has new Sonar f.m. unit on 28 Mc. CAS's 144-Mc. keyer is being used by an 80 Mc. keyer increased his keying to 6,000 w.b. OKJ is playing with lightweight grounded grid amplifiers on 144 Mc. NHA is showing off new transmitter with Variac feeding between each stage. CQK is rebuilding 28- and 50-Mc. mobile receiver. OKZ has new 3-Mc. centered all-band antenna and is putting 922 in his plane. PIV visited PQR at Santa Maria and scheduled his long nightly flight with traffic via ZP. KADE added 37Ts on 3.5-Mc. e.w. QDT has n.f.m. on his GP-11 emergency rig. WRD is back on 28 Ws on 24-Tone Traffic (Feb. 21) WQRE 1500, ZF 22, ZD 13, BYT 11, WTLY 11, (Jan.) W6WTL &.

PHILIPPINES — SCM, M. Set,less. J. C. Gil, KALAI On Feb. 25, a meeting was held at Clark Field for the purpose of organizing an amateur radio club, KALAK was chairman. At the meeting, the sample constitution was read, corrected and approved. All the members of the Clark Air Force Radio Club were formed. Officers are W5FI, ex-KAIABX, DUS0H, pres.; WBCQ, ex-KA-DU1U, vice-pres.; Maj. N. O. E. LaFargue, secy.; KAI set, Capt. U. L. Henderson, trea.; Capt. J. A. Trewee, net. mgr. About twenty members were present at the meeting, mostly non-licensed men. The group was urged to join the club. Let's keep the idea alive to take up this subject at a later meeting. Your SCM will be on the air again as W7KJ sometime in April or May and may be reached by mail at his home QTH, Phoenix, Oregon.

SAN JOAQUIN VALLEY — SCM, Ted R. Soura, W5FXL — SCM, James K. Wadsworth, KJQ; J. P. C., ECF, ECF, KUT, PHIL, WBB, OHT is now OBS for Tulare. OHT and PHIL were in town recently shopping for new gear. LDG is the proud possessor of a new 'scope and new wavemeter. JPP built a 'scope and JPMK has one in the making. PML is considering one. TV is now a permanent resident of Fresno, having moved down from the Bay Area. VKD and YGZ can be found on 50 Mc. DLE has a new jr. operator. CPT and WBB are going mobile. INF and PFP have rearranged the shack. RFN is doing all right.

Continued on page 81

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wirtze, W4CYB — Many thanks to JQO at State College and MR over Greenboro for the news this month. It is hoped that the blank space appearing here last month was noted. The month's accumulation was only a couple of traffic reports, hence no column. GBX, CG, ATT, JFT, and GG were on in a big way, working the DX. OSC, JON, GBI, and KIB operated Greensboro Club station, GNF, the first week end of the 'phone section. OQU complained that the pace was too fast and lost interest after the first week end. JFF and JRO are using the final amplifier at 50 Mc. JQO is active on NON and KVB on 7.1, no DX. AIIK is playing with a new receiver on 28 Mc. JQO is putting up a new 3.85-uk. antenna. TVG is doing some SXB activation. KF8 on 30 Mc. is the only DX that is, DTL is busy on the Mission Trail Net. SUV is putting up a new 3.85-uk. antenna. TVG is looking for some DX effort. TAC'ed in 50 Mc. DX. HCP and NDU are working out their schedules with KZ5FL, and VP5AS. VCQ is still using the club shack. BHI has been working some fine DX on 3.5 Mc. BHI is a regular on 5 Mc. in one night with no DX, no scram. The SARC has a fine demonstration by the four people at its last meeting. The wheels of the SARC are grinding with plans for the annual hamfest. KAI has had a new rig, works for Aea Bell. RAI is making a big noise on 3.85 Mc. with a new rig, TOS, PNY, and JQO are on the air.

Continued on page 81

SOUTH CAROLINA — Ted Ferguson, WA4DQ/ANG — BSS reports of the week done well for the P. N. Rwy. During the severe storm last week part in this working for KBW, KMR, A2T, CVQ, and BSS. We welcome to our midst OFW, who works 7-Mc. a.e. and KXK is busy with TL-7C and the NC Club QSO was a success. National Club President and ANK secretary and treasurer, MRJ is re-building, OSP is now located in Charleston. BJE reports activity in the Net as usual. NEA is a new name in the section and NDU is putting in a new receiver. We are indebted for the fine report from Greenville. KED keeps regular schedules with KZ2CD, KZ2FL, and VPSAS.

(Continued on page 88)
**Harvey Has the Most Complete Stock of Mobile Gear**

**Gonset's Latest**

The new converter which covers all bands from 3 to 30 mc.

- **Model 3-30** $39.95
- **MT15X for 20 meters** $87.50
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**BRAND NEW**

- **30 watts power, class A** $87.50
- **Dynamic microphone**...

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- **Complete unit with tubes and accessories** $99.95
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**Collins' New Mobile XMTTR**

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- **Solid cast bronze machined to fit RG-8/U, 11/7 and other coaxial cables of same diameter. Available in four types:**
  - 4-way
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- **Power requirement:** 600 volts 60 watts
- **Price:** $42.00

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- **Includes all major components and sockets mounted, etc., all RCA tubes including kines, complete manual with service notes, all RCA.**
- **New, simplified instructions. (Free circuit and parts list on request.)**
- **Shp. Wt. 85 lbs.** $198.50

**GE FM Tuner**

- **Only a few left at this unusual buy.**
- **Covers 88-108 mc range, uses guillofine tuning.**
- **Shp. Wt. 30 lbs.** $49.50

**Special Announcement**

- **New Product from Labs of James Millen**
- **On or about May 10 we will have in stock the first shipment of Grid Dip Meters made by Millen. This is a completely designed unit along lines of Bill Scherer’s W7AEP grid dip oscillator as described in Feb. CQ and the CQ-TVI manual. Frequency range of this completely calibrated unit is 3 to 250 mc. It will sell for approximately $49.50 with complete built-in AC power supply which will use complete AC line isolation. This unit has many uses around shack and shop. Invaluable in design and construction of new equipment, tuning antennas, chasing TVI harmonics, etc. Send your order in now as shipment will be made in rotation of orders as received. Be first in your neighborhood to own one of these fine instruments.**
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These are the publications which every amateur needs. They form a complete reference library for the amateur radio field; are authoritative, accurate and up to date.

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82

KEC also has schedules with KG6DI, KZQCD, and DL4AX. DHT operates 7-Mc., c.w. and has a number of schedules. FNS works 14-Mc., "phone and c.w. NVQ says, "How about some 50- and 144-Mc. work in South Carolina?" RKM works 80-Mc., "phone and is active in South Carolina Phone Net. BSS reports that they are organizing a club in Greenwood. AUT reports activity in the 145-Mc. c.w. net. Thanks, DAW, for the traffic through HMC.

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RADIO SHACK SPECIAL!

COMPLETE HALLICRAFTERS HAM STATION at a RECORD LOW PRICE!

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S-38 ........ $49.95
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HT-17 ACCESSORY KIT FOR IMMEDIATE OPERATION
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A RARE BUY IN VHF GEAR

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COLLINS HEADQUARTERS: The Radio Shack carries a complete stock of Collins receivers, transmitters and other Ham gear.
'ST. SEC: UTM. RM: KFZ. LQE will schedule and QSL ideas and increase of power will justify delay. NCO, a new KOZ reports slow progress in rebuilding program, but new appointment, men? We need more reports of activities, area. UTH, our SEC, says that there are plenty of newcomers from Oakland, Calif., is on 28-Mc. 'phone. LKM is regular Farm Net participant, LUV is new EC for Casper area. UTH, our SEC, says that there is plenty of assigned areas available. How about some requests for EC appointment, men? We need more reports of activities, fellow. It's hard to dream this stuff up and may be heard anytime or any place. LRR has almost foreseen amateur radio for t.v. UOM still is giving the boys a blast on 1. Mc. 'phone and e. w. not servicing t.v. and auto radio. DTB is making friends with the DX lands, NPU is on the air again with limited operating time. JVA is back on the air following move to new QTH. MFQ has been on an extended business tour. Traffice: W7UTM 352, BED 149, LKM 11, FJE 2, JVA 2.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Dr. Arthur W. Woods, W4GJW — DXB has a new 40-watt portable rig and a new Jr. operator! WXU consistently leads the section in traffic and he meets more nets and trunks than any other two members. KIX schedules AENB, TWC, and SOXO. EDD and DD squeezed 3.85 Mc to refute their standing as a smart e. w. hounds. GJW is making preparations to QSY to the high frequencies for summertime operations. So far only Anniston and Tuscaloosa have reported plans for Field Day. What about the Sheffield, Phenix, Montgomery, and Dothan groups? AENP is a smoothly functioning net and it is conceded it does well. AENB needs the support of more e. w. operators in order to increase coverage and stimulate traffic. New-comers are particularly welcome. Also, watch for the opening of AENB on 7 Mc. this summer. Your section now has 112 AEC members. Please, each of you, send me the name of a non-member of the Emergency Corps so I can send him an application. Club secretaries: Please send information and news for publication in this column. Traffic: W4MXU 241, KIX 54, GJW 44.

EASTERN FLORIDA — SCM, John W. Bollater, Jr., W4PFW 2 — With the passing of LJS, amateur radio has lost a friend. Seriously incapacitated physically, Bob operated under tremendous difficulties. The Tampa Club associates chalked up another traffic mark at the recent Florida State Fair. Traffic was channeled via PI, 2RTZ/4, HJS, AYV, IQV, CFL, DQW, NJN, JJS, IQV, HJD, JPY, and 5LSN. Operators at DUG included 1WX, BIF, HAD, DEB, JFH, OZ, BNI, NTV, GJW, ALP, MNT, APJ, GLZ, KM, CRA, JPR, FYI, IF, KRY, Moses, Magnon, Dansey, and Winlow. ALP did the organizational work. 3675 Net: AYV, who has done a great job as RM, has reluctantly resigned. His successor is HP. The Tampa Club put on an enjoyable hamfest. Brooksville: MNT took time out from his new Clapp VFO to help pound brass for the Fair at Ocala. Cortez: 11's BPL for 1DQW. Gainesville: RBG is back with a KJS call. JO offers him a nickel to go back to the Island so he can QSO on 3910 kc. (But JQ and WS did wire Japan on 3.85 Mc.) At the University the Gator Club elected the following new officers: LIE, NWI, NWC, EED, and HRB. Lake City: IQV made BPL. IQV reports SUN and RBS schedules with BU and RBS of Jacksonville on 144 Mc. Lake Placid: BYR reports ISR tied in to ridge-section emergency net. A complete wx station is located at BYR. Miami: GHP schedules DlAKY. JLT has 11 countries with 7 watts on 14-Mc. e. w., Tampa: 9NBR/4 and 7Q0G/4 were operators at DUG during the Fair. AXY is selling out a new bulletin on 11 K. of Kc. activities. West Palm Beach: It's BPL for 2RTZ and continued amalgamation at the FB conditions down here on 3.85-Mc. e. w. 1HJ has a new 40-watt portable rig and a new Jr. operator! MNT is new Pensacola call. FIR moved to 3.85-Mc. 'phone and 3.85 Mc. "EGN works 14-Mc. DX during the wee small hours of the morning. DAO moved to Pine Forest. The Tallahassee gang want 144-Mc. schedules with Pensacola. BGI was transferred to Guantanamo Bay, Cuba. UNK built 14-Mc. converter, OWN is new Pensacola call. FIIH moved to 3.85-Mc. 'phone. HQ built a new rig for 28-Mc. phone. 2RTZ is back with a JPL. IQV is back with a KJS call and BFD plays pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. Ohj schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ schedules his brother, 5NGN, and BFD play pinball by radio. OHS worked Wake Island on 7 Mc. using 20 watts. OHJ.
Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of all Collins amateur equipment for immediate delivery. Also complete stocks of all other amateur receivers, transmitters, and parts. I promise you that you can find nowhere else lower prices, more complete stocks, quicker delivery, easier terms or more generous trade-ins. I give you 10-day free trial and 90-day free service. I promise that you will be satisfied on every detail. Write, wire, phone or visit either store today.

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- RME HF-10-20: $77.00
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- Telvar T60-2: $130.00
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TL works DX exclusively. UW built QR. Traffic: W4AXP 93, NGS 5.

GEORGIA — SCM, Clay Griffin, W4DXI — GGD is new RM. BOL will take over EC duties for Cochran. The Atlanta Club will have a hamfest this summer. Details to be announced. New KHG and GTA are now 14-Mc. hams in Atlanta. AQL, the Tech Radio Club station, has been having good success with new 14-Mc. beam and 3.85-Mc. doubler. All 86 3.85- Mc. antennas were in one night on 3.85 Mc. WA-
nah: CK and FEH have new 75A receivers. EWF and FEH have new Collins exciters. The Savannah Club has started a code class. KG sent an SSB note. AM has his Subnora back on 28 Mc. and his 25-watt rig on 14 Mc. BE added OK3iD on 28-Mc. phone to his DX list. HJ gave the SSB back to the OJS and is up with 4-watt 'phone, 5-watt s.w., and worked G and KZ5 on 'phone and G on s.w. on 28 Mc. DV is active between building and installation periods, HJ keeps the HRB7 on 28-Mc. phone with traffic and DX such as YY, VI, TK, CX, and O4. EZ sent HRO7 back to the factory and is using HRO5. DJ is working five bands, 'phone and s.w., besides handling the C.W. ABC Net and handled traffic. JA schedules Cuba regularly on 14-Mc. phone with FB results. KG and CM got beams tuned up and working nicely. HU still is planning away on DX.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, Vincent J. Hargrety, W6IOX — ABC Activities: SEC ESR is stimulating ABC interest and forming new nets by visiting clubs in the area. Revision of areas and new appointments show the following changes in the Emergency Coordinator list: BYA, La Croft-Los Angeles areas; PMO, San Gabriel Valley; ZC, Ventura County; TWF, Santa Barbara area; TSN, Venice-Culver City area; RTF, North Centinella Valley; ZCV, San Clementina Valley; HXD, San Bernardino area; ZCV, Riverside area. The addition of Venice-Culver City and Ventura County areas gives complete coverage coastwise from Long Beach to Santa Barbara. AEC received W4BY endorsement. AM has been operating mobiles on Long Beach Emergency Net. ANT worked PMs in February and found their latest QSO was 19 years previous when PM was made. BHG sends code practice on 147.5 Mc. Sat. and Sun. (1000-1100 PST) and Mon. through Fri. (1900-2000 PST). BUD has a new rig on 14 Mc. with a three-element beam. CE again BPLed to lead the section in traffic and received RM appointment. Traffic reports were received by radio from CNMI, CZF, DPT, KEX, and ZNZ; CFZ and DM on mode. The VHF Net, with WKO and DPM in the lead, had a simulated emergency drill to familiarize members with AEC message handling. MYO gave a talk and demonstration on 144 Mc. direct-oscillating crystals to
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2 band, crystal controlled phone xmitter for 114-148 and 225-260 mc. 5 watts @ 240, 8 watts @ 144 mc. BAQ5, 6CM, HMK. Modulator uses 6-AQ5 in PP. Requires 6.3 V @ 3.5 amps AC or DC and 30 V @ 200 ma. Less tubes, power supply, crystal, mike. Big value! No. S-2056, less xial and meter... $39.50

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**OKLAHOMA** - SCM, Frank E. Fisher, W4AT/AST.

SEC: HGC. Oklahoma amateurs in particular phone net operators were lauded for emergency work in a fifteen-minute broadcast by EVOO. KDL and GWX, built-in ORS appointments, KIEF has completed new rig with 300 watts to 513 all bands. NDN, PBB, and PCL are also new-comers to OLZ. This net has 31 stations active. New ham has 24 stations active. New ham has 24 stations active.

The Espey 51J Tuner employs 10 tubes plus tuning indicator in a superheterodyne circuit and features a drift compensated circuit or new and embodies the latest engineering refinements for lastinig high quality at a price that defies competition.

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Triplet 2nd Square 0-40 D.C.-V. 2.97
Sun 2nd Round 0-3000 D.C.-V. 2.97
GE 3rd Square 0-150 A.C.-V. 3.49

TERMS
All items F.O.B., Washington, D. C. All orders $30.00 or less, cash with order, Above $30.00, 25 cents per order, balance C.O.D., Foreign orders cash with order, plus exchange rate.
Simple Gear for 420 Mc.
(Continued from page 14)

...tapped r.f. choke, RFC1, should be checked by the same method as recommended for the transmitter. The nodal point is that at which little or no change in the receiver’s operation is noticed as the line is touched. As with the transmitter, this point will be near the middle of the line. This test should be made with the receiver set near the middle of the band.

**Results**

Just as with simple lower-frequency gear, it should not be expected that this one-watt transmitter and three-tube receiver will set the 420-Mc. world on fire. They are presented as examples of just about the simplest sort of gear with which practical communication can be carried on on this or any other band. The beginner in this field will find the good enough to provide a lot of fun, particularly if there are several other amateurs within a radius of a few miles with whom to work. Not much beyond line of sight can be expected from such a low-powered transmitter, but even line of sight may include some pretty good distances if the rig is used for portable operation from high locations.

The receiver does surprisingly well, for such a simple layout. To be sure, it has all the disadvantages of the superregen—radiation of an interfering signal, somewhat critical tuning, and the characteristic superregen hiss—but the discrepancy between its performance and that of most superhets for 420 is not so great as is experienced on lower frequencies. The shortcomings of the superregen are somewhat alleviated by the inherent characteristics of the 420-Mc. band, and the advantages of this old stand-by of the v.h.f. experimenter show up well in this design. It is fully selective enough for present conditions on the band; its simplicity and low cost are a welcome change from present trends in receiving equipment; and its performance, in a tube-for-tube comparison, is hard to beat.

Linear R.F. Amplifiers
(Continued from page 20)

...that the system has been adjusted for optimum performance, and enjoy the fruits of his labor.

The design and adjustment techniques described in this article have been somewhat different from those which apply to the more common Class C amplifier. However, it is the author's sincere conviction that most difficulties which may arise in the design or handling of the Class B linear amplifier will be due to lack of familiarity with it, and that as the Class B linear amplifier comes into more common use, the amateur will soon handle it with the same ease as he does his other equipment. This has certainly been true of several amateur stations with which the author is familiar, and where linear amplifiers have been installed recently.
The present edition of the ARRL Antenna Book represents an accumulation of ten more years of the amateur's experience in both war and peace in making the all-important ever fascinating "sky wire" carry signals to the ends of the earth. The data contained in this book are the result of practical experience both of the authors and hundreds of amateurs who have contributed to the practical know-how that this book expresses.

The book has two principal divisions. Chapters 1 through 5 deal with the principles of antennas and transmission lines, wave propagation and its relationship to antenna design, and the performance characteristics of directive antenna systems. These five chapters might be called a textbook on antennas; they enable the reader to design a system of his own to fit his particular needs. Beginning with Chapter 6, there is a series of chapters in which complete data are given on specific designs for the various amateur bands. The amateur who has not studied the first section, or who wishes to avoid the necessity for making his own calculations, will find in these chapters the information necessary for putting up the system that appeals to him. The remaining chapters deal with the highly important mechanical features of construction and related subjects such as determining geographical directions.

This required twice as big a book as the previous edition but we are sure you will find it well worth more than the nominal cost.

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REX L. MUNGER COMPANY
4701 Sheridan Road, Chicago 40, Ill.

How’s DX?
(Continued from page 48)

CT3AV Reo Co Chao da Loba, 5, Funchal, Madeira Islands
EA2EE Esperanza 18, Barcelona, Spain
EP2B (via W4F1R)
F08AB Amateur Radio Station F08AB, Papeete, Tahiti
GD3UB Beach Cafe, Port Moor, Ramsey, Isle of Man, U. K.
HA1BG (via MRRE)
HB9EU Rudy Faessler, Rheinfelden 754, Switzerland
HC1KX Maurice M. Bernbaum, % American Embassy, Quito, Ecuador
HI2CP Wilfrid C. Plante, % Pan-American World Airways, Port-au-Prince, Haiti
HL1BQ (via W0CPT)
HZ1HZ Ahmed Zaridan, Mecca, Saudi Arabia
11VGF via Orivolo 13, Florence, Italy
IGAO (via MI3ZZ)
EC9EA Navy 3401, EPO, San Francisco, Calif.
ex-KH5LF W41MY, 412 Elisabeth Ave., Tarrant, Birmingham, Ala.
KH6OT/KJ6 APO 105, % PM, San Francisco, Calif.
KH6UK COLTS, French Frigate Shoals, via Box 4010, Honolulu, T. H.
KR6NE Navy 1175, EPO, San Francisco, Calif.
MI3AC APO 843, % PM, New York City
MT3Z P. O. Box 379, Asmara, Eritrea, East Africa
MT5E E. O. Box 400, Tripoli, Tripolitania, North Africa
PA9DOC Star Munanstraat 16, Groningen, Netherlands
PK4KQ Box 222, Soerabaja, N. E. I.
PY2JO P. O. Box 22, Sao Paulo, Brazil
SU1CR (via RSGB)
SV5UN (via W3KXS)
SY9WF Major J. M. Moss, APO 206, % PM, New York City
TD8BR % Puntarenas Brokerage Co., Puntarenas, Costa Rica
V8SOG Lorum Unit 5, Cambridge Bay, N.W.T., via RCAG Stn., Edmonton, Alta.
VO2HG Gander Airport, Gander, Newfoundland
VP2LX APO 867, % PM, Miami, Fla.
ex-VF4TAN Neter L. Felix, 654 Lincoln St., NE, Minneapolis 10, Minn.
VS7LA Box 907, Colombo, Ceylon
W1LBW/C1 (via ARRL)
ZA4F Box 654, Tirana, Albania
ZA5A (via ZA5AC)
ZA5AC Soldiers Staff Central, Police Office C. C., Tirana, Albania
ZM6AI Box 46, Apia, Western Samoa
ZS4TO (via SARRL, ex-VF4T0)
4X4Z L.A.R.C., Box 4079, Tel Aviv, Israel

If you birds can use any of the above you owe WIs APA, BOD, DF, EKU, FTJ, HX, IKE, JMY, KUF, QBD, QM3; W2s ADP, C3JX, EMW, EQS, KZE, LXL, TXB, WC, WDDW; W3s IYU, MZ; W4ALG, W5JL, ZBY, ZGY; W8TLL; W9s AND, DGA; W9s UOX, VIP; I1V8; KH6PM and KZ5AX all a large vote of thanks.

Note: The semiannual listing of QSL bureaus of the world will be published in June QST this year, instead of May. See the “I.A.R.U. News” section next month.

Tidbits:
With such exotic personages as RV2, EAXXX and M1A turning out to be as good as gold we might have known it was too good to last
(Continued on page 88)
PLATE TRANSFORMERS

For Small Transmitters, DC Voltage Ratings: 2000V RMS @ 5 Ma D.C. - 6.3V, @ 3 amps

- Type P-3170: $7.96
- Type P-3171: $7.66
- Type P-3172: $7.66

VERTICAL BLOCKING OSC. turns ratio prl. to sec.: 1.0.2

- Unshielded type A-3000: $1.18
- Shielded type: A-4000: $1.62

HORIZONTAL BLOCKING OSC. turns ratio prl. to sec.: 2.1.2

- Unshielded type A-3002: $1.32
- Shielded type: A-4002: $1.76

VERTICAL OUTPUT turns ratio prl. to sect.: 10.1.2

- Unshielded type A-3035: $3.09

SUPERIOR POWERSTATS

Smooth effect voltage control, 0 to 135V. Output from 115V. AC line.

- Type 20 (illustrated 3 amps): $12.50
- Type 50: for table rating 7.3 amps: $17.00

Also available for 230 volt input. Write for descriptive literature.

STEEL CHASSIS

- Black crochet: 5x10x3 10 Ga.: $5.97
- 15x17x3 16 Ga.: $2.23

CHOKES

- SMOOTHING SWINGING

- Type C-80: 10 C-87: 4-16 121.2 $3.82
- C-81: 10 C-88: 4-16 250 $3.92
- C-82: 10 C-89: 4-16 250 150.2 $5.29
- C-83: 8 C-90: 4-14 300 $3.99

All above 3000 Volts Insulation

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Positive Stabilization ±0.2%

- Input 95-130 volts, 60 cycles single phase; output 115 volts stabilized to ±0.2%. *Output 6.0 or 7.5 volts stabilized ±0.1%

- Output Net
  - No: 1600: 30 5 $17.00
  - VR-6110: 30 5 $17.00
  - VR-6111: 30 5 $17.00
  - VR-6112: 60 5 $24.00
  - VR-6113: 120 14 $34.00
  - VR-6114: 225 25 $48.00
  - VR-6115: 500 45 $75.00
  - VR-6116: 1000 90 $125.00

- Cap. wtg. wht. Price
  - No: 1600: 30 5 $17.00
  - VR-6110: 30 5 $17.00
  - VR-6111: 30 5 $17.00
  - VR-6112: 60 5 $24.00
  - VR-6113: 120 14 $34.00
  - VR-6114: 225 25 $48.00
  - VR-6115: 500 45 $75.00
  - VR-6116: 1000 90 $125.00

- Special All 600D.C. in following sizes: 0.5 Mf, 1 Mf, 2x1 large 7 pin tubing: $7.00

- 324 Tride Each 39c, 10 for $3.50

- All 117 Volts to 117 Volts 60 Cycles.
  - P-96, 40 watts: $3.60
  - P-98, 100 watts: $9.30
  - P-97, 80 watts: $5.10

- All: 19c Each $10.00 per 100.

- All 600D.C.: All in following sizes: 0.5 Mf, 1 Mf, 2x1 large 7 pin tubing: $7.00

- ISOLATION TRANSFORMERS

- All 117 Volts to 117 Volts 60 Cycles.
  - P-96, 40 watts: $3.60
  - P-98, 100 watts: $9.30
  - P-97, 80 watts: $5.10

- All: 19c Each $10.00 per 100.

- All 600D.C.: All in following sizes: 0.5 Mf, 1 Mf, 2x1 large 7 pin tubing: $7.00

- ISOLATION TRANSFORMERS

- All 117 Volts to 117 Volts 60 Cycles.
  - P-96, 40 watts: $3.60
  - P-98, 100 watts: $9.30
  - P-97, 80 watts: $5.10
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For Transformers, I.F.'s, Plugs, Binding Post Strips, Sockets, Etc.

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

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$2.95 $3.50 $1.95 $2.15 $2.30 $2.65

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... Organizations specializing in the accumulation of DX laurels have a new source of competition in the Ohio Valley Amateur Radio Association. The long membership list of crack DX men includes W4FU, W8s BIIW, BTI, BOJ, RSP and J JW. Officers are W8s FQK, FGX, CVK and PBU, ranking in the order named. Ralph Bird, W5KWX, is heading again for Swan Island where he intends to crank up KS4AI as of old. Plenty of activity on all skip bands, 'phone and c.w., is anticipated. If you kept an eye on WIAW then you probably got first crack at Heard Island's VK1FE/VK1IVU. An 80-watt bandswitching rig is currently used on 7, 14 and 28 Mc. plus an Eddystone receiver and (get this, Tilton) gear is available for 50 and 144 Mc. Operators VK4FE and VK3VU are scheduled to keep Heard on the propagation maps until around March of 1950. [The boss's blooper hasn't heard hide nor hair of Heard yet, either! — Jeeves] Ex-VQ5EDD, now G5YM, is gadding about Piedmont and vicinity operating mobile, of all things. Perhaps not only the local gang is having sky-hook trouble. TAZAA is still functioning more or less under cover and QSLs are desired only via ARRL. Jules has been looking for his buddy W1DX "on 14,000 kc." and wonders what's happened to him. He should know by now that since By got the single-sideband bug he's been misplacing his carrier like his collar buttons. Last we saw of it was somewhere around his fifth doubler stage. According to W2TVE, KB6AG is leaving Canton for Midway. VR6AB came through with a stack of wallpaper from his Sussex QTH and remarks that VR6AC had been intending to become active about the time Gil left the premises. MT2E dishes out a little Tripolitanian trivia: Active 28-Mc. stations there include MT2E (28.4-28.9), MT2D (28.1-28.6), MT2FU who is ex-ST2FU (28.3), and tentatively, MD2B. MT2E runs 50 watts to an S07 and an air force model receiver is in use. Quote W4CYY, a letter to CPIAQ will fix you up with a Bolivian sked if you're located in North Dakota.

QSO. ZCSPM cards are now getting around, and W2NYC of ZC6OUTI believes he has finally cleaned up his backlog in this category, via QSL managers. If yours hasn't shown try a plea direct to W2NYC. W1LIKE, who keeps things rolling at the Hq. bureau, has a load of pasteboards for IIL stations now QR tors are somewhere Stateside. He'd appreciate hearing peeps from you ex-Koreans. HP1PL requests through W2TXXZ that we keep our shirts on regarding his cards. He intends to QSL first upon his return to the U. S. Not to lunge at conclusions, reports from various sources indicate pirate activity involving these calls: OK1QD, VO6BL, FP8N, LX2PN, ZA5AC, PX1C, YA3B and HV2B. Data come from troubleshooters W1JEL, W1NL, W4CYY, W4MR and 11PL.
POWER CONVERSION UNITS...

for any Voltage and Amperage Rating

R.P.S. Power Conversion Units specially designed to convert any d-c Receiver, Transmitter, etc., into a-c use. No rewiring necessary; simple, easy, quick installation. No Tubes! Instant Warm-up! Cool Operation! No Maintenance! Low Cost!

Installation Diagram with each unit.

When ordering—be sure the input rating of your dynamotor does not exceed the d-c output rating of the rectifier. For example, 12 V. 2 amp. dynamotors require Rectifier No. S-295A and Transformer RPS-8883.

Weights listed—contact freight agent for cheapest means of shipment and include charge with remittance.


### THERMADOR TRANSFORMER

### ALL NEW—FULL WAVE VICKERS SELENIUM RECTIFIERS

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### ALL NEW—THERMADOR TRANSFORMERS 50/60 Cyc---117 Volt Primary Rating (For Taps, see Note A)

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**Note A:** All transformers have 3 extra taps—for example: 20, 19, 18, 17 volts and 38, 37, 36, 35 volts.

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ATTRACTION—NO GUYS WIRES!
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Now you can assemble the famous stancor
ST-203—A mobile X-mitter. It functions
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"Press-to-talk" operation, two-channel
crystal switching, self-contained antenna changeover relay.
Amplifier plate input with 500 volt supply — 21.3 watts.
All components complete in kit, including lead wires already
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V.H.F. QSO Party
(Continued from page 48)

5) The band your transmitter is on determines whether a
QSO counts 1 or 5 points. Cross-band work shall not count.
6) A "contestant" is a single operator working without
the help of any other person. Results may be presented with
names of all participating persons, for listing, but only single-operator scores will be considered for certificates.
7) Scoring: 1 point for completed two-way section ex-
changes on 20 or 44 Mc.; 3 points for completed two-way
section exchanges on the higher v.h.f. bands. The sum of
these points will be multiplied by the number of different
ARRL sections worked, i.e., those with which at least one
point has been earned. Reworking sections on additional
bands for extra section credits is permitted.
8) A contact per band may be counted for each different
station worked. Example: W13JSM (E. Mass.) works
W1MEP (Vt.) on 50, 144 and 220 Mc. for complete ex-
changes. This gives W13JSM 7 points (1 + 1 + 5 = 7) and
also 3 section-multiplier credits. (If more Vt. stations are
subsequently contacted on these bands they do not add to
the multiplier but they do pay off in additional contact
points.)
9) Each section multiplier requires actual completed ex-
changes with at least one station. The same section can
provide another multiplier point only when contacted on a
new v.h.f. band.
10) Award Committee decisions shall be accepted as
final.
11) All reports must be postmarked no later than June
14, 1949, to be entered for awards. See p. 56 of May, 1948,
QST, for form.

Reporting

Submit contest logs to Headquarters immediately,
even if your score is small, to help in cross-
checking the claims of others. ARRL will sup-
ply convenient reporting forms upon request.—F.E.H.

Filters for TVI

(Continued from page 48)

Besides reducing amateur interference, high-
pass filters will frequently improve television
reception generally. This is because many current
receiver models have rather poor i.f. rejection,
and a filter having a cut-off above 30 Mc. will
prevent many signals, such as i.f. broadcasting in the
21-Mc. region and industrial heating in the
27-Mc. band, from riding through the front end
to the receivers i.f. It is a good hint to stress,
when dealing with a set owner, particularly when
you find yourself being blamed for all sorts of
interference that doesn't originate with your
station.—G.G.

World Above 50 Mc.

(Continued from page 48)

another, and we would have been glad to put
whatever weight we swing to the side which
won out on that point alone.

But the picture has changed in recent times.
TVI, not long ago the sole concern of a few
amateurs in the New York area, now threatens a
considerable portion of the amateur body, and
more are having to live with it every day. It has
reached the point, in many metropolitan regions,
where it is the most serious problem amateur
radio has ever faced. In New York, New Jersey
and Eastern Pennsylvania, we saw at first hand
how TVI is changing the amateur picture. We
found hundreds of hams ready for any move

(Continued on page 108)
The original E-I Model 2606 "HAMPAK", delivers full 30 watts output (300 volts at 100 ma.) complete hum filtering and RF noise suppression, 6 volt DC 8 amp, input, 413/4" x 51/2" x 5", weight 6½ lbs. Regular amateur net $15.00, special buy.

$9.95

Aerovox Type 2509 2 Mfd. 2500 VDC oil filled transmitting filter condenser; ceramic pillars fitted with locknuts and soldering lugs, mounting bracket, regular list $19.75.

$2.95

Grid bias control
2500 ohm, 25 watt Clarostat potentiometer, perfect grid bias control for average final, worth $4.95, brand new, boxed.

$0.49

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SUPER SPECIALS
EVERY ITEM IS BRAND NEW!

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STEINBERG MOBILE POWER SUPPLY HALLICRAFTERS 150 DC MA.

The original E-I Model 2606 "HAMPAK", delivers full 30 watts output (300 volts at 100 ma.) complete hum filtering and RF noise suppression, 6 volt DC 8 amp, input, 413/4" x 51/2" x 5", weight 6½ lbs. Regular amateur net $15.00, special buy.

$9.95

Hallcrafters 150 DC MA.
Originally designed for HT-17 transmitter. Bakelite case, 2" round, hole face cover. Clear, sharp black markings on light green face, zero adjustment, no mounting ring. A fine meter at a price that will clean them out fast.

$1.45

HEAVY-DUTY CASTERS
Make your own dolly with these sturdy all-metal casters, Wheel diameter 2½", 6" overall, a sensational buy at

SET OF 4 $1.80

DON'T MISS THESE SCOOPS!

Ohmite 75,000 ohm, 200 watt bleeder........ $1.00
R-300-2.5 MH, 300 Ma. RF Choke...... 10 for $1.00
1N34 Germanium Crystal............. 2 for $0.50
Cordwell ceramic 3/4" shaft couplers, 1" dia........... 5 for $0.50
Amphenol 4 prg. ceramic sockets with plates... 8 for $0.50
Johnson 70F20, 70 mmf, 2000 v. spacing 100 mmf............. 2 for $0.50
Bud double-bearing 100 mmf............. 2 for $0.50
2 mfd 1000 v. oil filled, single mtg. hole........ 2 for $0.50

$39.

GRID BIAS CONTROL
2500 ohm, 25 watt Clarostat potentiometer, perfect grid bias control for average final, worth $4.95, brand new, boxed.

$0.49

Minimum order $2.00.
Send 20% deposit with COD orders. Please include sufficient postage or instruct us to ship by Express Collect. Overpayments will be refunded by check.

Steinbergs
633 WALNUT STREET - CINCINNATI 2, OHIO

MICRO SWITCH
Type YZ-R2, SPST normally open, with leaf and roller, very sensitive. Rated at 10A 125V, soldering terminals. Fine inter-lock switch.

$0.39

STRUTHERS-DUNN RELAY
110 VOLT AC
Control all of your equipment with this one relay, 110 VAC coil, 4-pole, 2 double throw, 2 single throw, 6 Amp. contacts, screw terminals, insulated base, 3½" x 3½", a terrific bargain at

$2.00

Your order will receive my personal attention and will be shipped the same day order is received. We distribute all top-flight amateur lines. Let us know what you need.

73, Jule Burnett, W8WHE
Use a large 9-inch C.R.T.

9GP7 only $3.95

Electromagnetic Deflection
Long Persistence - Bright Fluorescence

CHARACTERISTICS
Heater .......... 6.3 Volts 0.6 Amps
Anode #2 .......... 4000 Volts
Grid #1 Cutoff .......... 110 Volts
Peak-to-peak Signal Swing .......... 25 Volts

Standard Octal Base
Tube is securely packed in a light plywood crate. Shipping weight 22 lb. Shipment by Express Collect only.

TERMS: Cash with order, or 25% deposit, balance C.O.D.

RADIO COURSES
- RADIO OPERATING
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Y. M. C. A. TRADE & TECHNICAL SCHOOLS
229 W. 66th St. (West of P'way) New York City

This is the 5th issue of QST for 1949. Can you readily find your first four issues? You can if they are kept in a QST BINDER PRICED AT $2.50 POSTPAID
(Not available outside of the United States and Possessions.)
One set of yearly labels provided with each binder.
American Radio Relay League, West Hartford, Connecticut

Building a New Scope?

The World Above 420 Mc.

Rye, N. Y. — Having equipped himself with an APT-5 and a 32-element array, W2BAV decided that the receiver was next in line for improvement. Experimentation with various types of tubes indicated that lighthouses offered about the only hope of building up the receiver gain and sensitivity. At present Bill has three stages of lighthouse r.f., using trough circuits of simple design. The trough lines are made of flashing copper, the working of which requires no complicated or expensive tools, and the performance is quite impressive. To one accustomed to the lethargy of the various war-surplus superhets the antenna noise which is in evidence when these circuits are tuned to resonance is something to behold. They feed into a 955 mixer which converts to 55 Mc., where three stages are employed before converting to 15 Mc. Two types of i.f. are used, one having a bandwidth similar to that of the radar surplus jobs, and the other having a passband of about 500 kc. The former is used for strong modulated-oscillator signals and the narrower one for the weaker or more stable signals. Experience has shown that the narrower band is far superior in weak-signal work. Bill works W2JND, Syosset, L. I., 12 miles across the Sound, W1PBB, Stratford, Conn., 30 miles up the coast, and W2NPJ and W2BLF, in Elizabeth and Newark, N. J., about the same distance in the opposite direction, regularly. He will be working on 420 from his 800-foot elevation in Bedford, N. Y., this spring. Polarization in this area is largely vertical.

(Continued on page 104)
ANOTHER
WALTER ASHE
EXCLUSIVE!

LAST CALL!

PE 103-A DYNAMOTOR

JUST RECEIVED! BRAND NEW in original overseas shipping crates!
While the quantity lasts, Walter Ashe offers this big value PE-103A Dynamotor. This may be your final opportunity to obtain one of these brand new power units. So don't delay. Wire, write or phone today!
6 or 12 VDC input. 500 VDC output at 160 M. A. Complete with overload relays, filter and connecting cables. Shpg. Wt. 81 lbs. A once-in-a-lifetime bargain at ONLY $14.95 each.
F.O.B. 1125 Pine St. St. Louis 1, Mo.

GOING FAST!

HARVEY WELLS
VERSATILE ATR-3
TRANSMITTER/RECEIVER

A combination unit originally designed for Aircraft, consisting of 6 tube superhet Receiver and 3 tube Transmitter. Receiver covers 195 to 405 Kc and 550 to 1500 Kc in 2 bands. Fixed frequency position at 276 Kc and 1020 Cy filter for range voice reception. Transmitter utilizes xtal osc and 1 stage R. F. amp, for 3105 Kc operation. Delivers 10-12 watts R. P. output. Built-in 6 DVC vibrator power supply that may be detached as a unit for other applications.
Tube line up: 7A7 R.F., 7Q7 conv. & osc., 787 L.F. Det., 7F7 1st Audio, PP 7C5's A.F. output & class B modulator, 7A7 xtal osc., and 7C5 R.F. output. Xmitter may be modified for use on 15, 20 or 10 meter phone and receiver utilized with converter or modified to provide a complete self contained mobile, portable or emergency station. Complete with tubes, 3105 Kc xtal, self-contained 6 VDC power supply, connecting cable and instruction manual. Stock number 4F2. Model ATR-3. Shpg. Wt. 17 lbs.
In order to clear our shelves for stocks of additional bargain merchandise, these FB Transceivers must go! And at this sensationally low price our limited supply won't last. So play safe—order yours today!

P. S.—Just the thing for that 75 meter mobile installation!

CHESTNUT 1125
The House of "Surprise"
Trade-In Allowances
1125 Pine St.
St. Louis 1, Mo.

Walter Ashe Radio Co.
Walter Ashe Radio Co.
Bill DuBord W@QDF, Mgr., Amateur Div.
1125 Pine St., St. Louis 1, Mo.

P. S.—Just the thing for that 75 meter mobile installation!
COMMERCIAL RADIO INSTITUTE

A RADIO TRAINING CENTER FOR 28 YEARS

Resident Courses Only
• Broadcast, Service, Aeronautical, Television, UHF, Preparatory Mathematics, Frequency Modulation and Marine telegraphy.

Classes now forming for summer term June 1st.
Entrance examination May 16th.

Literature upon request. Veteran training.

Dept. B, 38 West Biddle Street, Baltimore 1, Maryland

CARTER SUPER CONVERTER—Change DC to AC.

Weighs only 13 lbs. Ideally suited for radio equipment, PA systems, wire and tape recorders, etc. For 85 to 100% power factor, noninductive loads only.

Ball-bearing equipped. Models from 40 to 250 watts AC output, 12, 24, 32, and 115 volt DC input. 110 volt input models, from 40 to 150 watt AC output.

Write for new Bulletin No. 447 and name of authorized Carter distributor.

CARTER MOTOR CO., 2649 N. Maplewood Ave., Chicago 47, Ill.

LEARN CODE!

SPEED UP your RECEIVING with G-C Automatic Sender.

$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 50c per roll.

GARDNER & COMPANY

NEW JERSEY

Bristol, Conn. — Improved receiver performance, and the first contacts out of town, resulted when WIPNB built a 420-Mc. converter using a lighthouse mixer with a coaxial circuit. This works into a Howard f.m. tuner on 90 Mc. Contrary to the general belief, the bandwidth of such an arrangement is not too narrow for satisfactory reception of modulated-oscillator signals, if the swing of the latter is held within reason. The f.m. detection provides noiseless reception and exceptional audio quality. WIPNB now works both WHDF and the writer regularly with S9 signals, but it was a matter of some three months of trying before anything was heard over either path. The next objective for all three is a contact with WIAEP, Springfield, Mass., who has a pair of 8025s at 60 watts, a triple-conversion superhet, and a 16-element array. Polarization in the Connecticut Valley is horizontal, but since vertical is generally used in the territory on either side it may be necessary to change to extend our sphere of operation.

Denver, Colo. — Nightly contacts on 420 Mc. are made by W5SNN, W5LAQ and W5PIN at 8 p.m. Though the distance between SNH and the other two is only about four miles, it is far from a direct line-of-sight proposition, and signal strengths vary considerably from night to night. LAQ uses a 2C-90 oscillator, while SNH and IPH have push-pull 8012s at about 25 watts. Vertical polarization is used. W5SNN has a crystal rig in the works. W5s A YY, FYY and OLL are getting equipment in shape, and television experiments are contemplated when enough stations are on the air.

Correspondence

(Continued from page 50)

Jamming stations was terrific. But despite it, I could read the faint signals in cipher my radio op was copying.

The exciting news was that the preceding wings met a "reception committee." This was passed on to the other planes in the flight which immediately assumed defensive formation and were thereby prepared for the greetings from Jerry, which soon followed.

How readily could this have been copied on 'phone? If copied on 'phone, how much longer (please remember that seconds were a matter of life or death) would the transmission have required when delivered in cipher?

Lt. Beverly O. Bush, W5MAD

714 Pierpont St., Rahway, N. J.

Editor, QST:

Why allow 'phone operation on any band for say the first year? Why not make it as easy as possible (minimum code ability) to get on c.w. but not the choice bands. A log of hundreds of contacts plus good code speed would then obtain license for choice c.w. and 'phone hands. Those still poor on code could elect to take a good theory test and go to above 400 or 1200 Mc. for experimenting using either c.w. or 'phone.

This might attract much more younger blood and such an apprenticeship at c.w. would insure better code ability of all new amateurs. This would also tend to populate more of the slightly-assorted hands.

D. E. Roberts

Atkinson, Nebr.

Editor, QST:

Here is my solution to the 'phone-c.w. situation:

Run a poll at once and have all hams vote which they prefer — 'phone or c.w. Have the votes counted fairly and then

(Continued on page 106)
ASTATIC MICROPHONES with CERAMIC ELEMENTS
GIVE "MORE NATURAL" VOICE REPRODUCTION

Not affected by Extremes of Temperature and Humidity

... and you can select from all these models now that most Astatic Crystal Microphones have been made available in Ceramic Units.

Astatic Crystal Devices Manufactured
Under Brush Development Co. Patents

LAMINATED PLASTIC CALL PLATES

White engraved letters on polished black surface. Holes drilled. Brass screws furnished. Size 1" x 3" gives set that new look. Size 2" x 5 1/2" with 1/8 wide line letters, for "Ham" shack door or wall. Two weeks delivery. Small size, $0.50 postpaid; large size, $1.75 postpaid.

TURNER PRODUCTS, 115-A Verlynn Avenue, Hamilton, Ohio

New! Pioneer Chassis Punch
For KEYPED 1 1/4" SOCKETS
Screw Action — Self Aligning
fits Amphenol "5", Mellen, etc. sockets and plugs.

At Your Favorite Distributors
PIioneer BROACH Co.
Los Angeles 15
California

Jobs in Television
Young Men 16 to 60

There is a job opening for every qualified trained television technician.

WE CAN TRAIN YOU
FREE TRAINING TO VETERANS
OF WORLD WAR 2

Visit our modern laboratories and class rooms
Approved under G. I. Bill of Rights

AMERICAN RADIO INSTITUTE
New York  Buffalo, N. Y.  Syracuse, N. Y.
101 W 63rd St.  640 Main St.  131 Shonnard St.
"TEACHING RADIO SINCE 1935"
Now you can house the equipment you build in attractive cabinets that match your National receiver! Cabinets are made of heavy-gauge steel, phosphate-sprayed, zinc-chromate-primed and finished in National grey enamel for handsome durability. $7.50 to $15. Matching speaker cabinets with grill cloth and all hardware for mounting 8" or 10" speakers. $6.60 and $7.50.

Cadmium plated chassis of cold rolled, high carbon steel with spot welded corners to fit above cabinets $2.10 to $3.30 at your National dealer's.
HAM-ADS

(1) Advertising shall pertain to radio and shall be of
nature of interest to radio amateurs or experimenters
in the field and be submitted in writing.

(2) No display of any character will be accepted, nor
any advertisement which is not typewritten in
black ink on all parts of the advertisement.

(3) The Ham-Ad rate is 30¢ per word, except as noted
in paragraph 5, below.

(4) Remittance in full must accompany copy.
No cash or check discount or agency commission
will be allowed.

(5) Closing date for Ham-Ads is the 25th of the
month preceding publication date.

(6) A special rate of 7¢ per word will apply to
advertising which is obviously non-commercial in
nature and is placed and signed by a member of the
American Radio Relay League. Thus, advertising of home
made equipment, educational materials, or ads for
a used item or apparatus offered for exchange or advertising
inquiring for special equipment, if by a member of the
American Radio Relay League takes the 7¢ rate. An attempt
to deal in apparatus in quantity for profit, even if by an
individual, is commercial and all advertising by him takes the 30¢
rate. Provision of paragraphs (1), (3), and (5), apply to all
advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested
signature and address be printed plainly.

(8) No advertising may use more than 100 words in
any one issue nor more than one ad in one issue.

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

QUANTUM 

Quartz-Direct importers from Brazil of best quality pure
quartz suitable for reading photo-electric crystals. Diamond Drill

O. S. L. 

O. S. L., Sun Mark for samples. Grifith, GFSW, 1042
Pine Heights Ave., Baltimore 29, Md.

AMATEUR radio licenses. Complete theory preparation for
passing exams. Reasonable rates. High marks. American
Radio Institute, 101 West 63rd Street, New York City.

OSLS. SWLs. For distinctive cards, write to McEchon, 1408
Borough Ave., Atlantic City, N. J.

OSLS! Krome cards at a fair price. DauphinP, W1NMP, Box
389, Wilkes-Barre, Pa.

OSLs. SWLS. Finest stock. Finest price. Fastest service. Dossert,
W2BHV. QSL Factory, 857 Burlington, Frankford, Ind.

BEAM...plan your ham call cards engraved in white on black plastic.
14¢ per card, white border, 3¢ each, posted. O. L. Lane,
W2WQ, 34 Union Ave., Belleville, N. J.

BEAM control cables, new material. Two 10¢: six $20 rubber
insulated, coded, tinned conductors. Weatherproof rubber jacket. Heavy
Transco, 2763 Broadway, New York.

CATALOG: Wireless equipment and literature prior to 1925; late
ARRL Member Stations. Flex Sheet Supplement. "Ban off"

PERSONALIZED book matches. Call letters or name and address.
Samples with prices. Miss Amanda Martin, Box 1123, Rochester, N. Y.

WANTED: Teletype 1/40TH hp synchronous motor. Weth, Morris.

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

DON'T QSL's. "The finest". Samples. 2106 South Sixteenth Avenue,
Maywood, Illinois.

CRYSTALS. Precision low drift units. Type 100A in 80, 40, and 20
meter bands. Two units plug in one octal socket. Plus or minus 3
KHz, one dollar each, Exact frequency. 1.98 ex. Res kassett, Inc.,
St. Lauderdale, Fla.

O-METER Beams. $10.50. Send for free information. Riverside Tool
Co., Box 87, Riverside, Illinois.

QSL quality cards priced right. Samples. Ferris, WOUTL, 1708
Frederick, Indianapolis, Ind.

SURPLUS: Deluxe crystal finishing kits containing holders, quartz
blanks, abrasive, etching fluid, complete instructions, $2.00 each postpaid.
Valin, 1517 North Halsted, Chicago, Ill.

BEAUTIFUL, inexpensive QSLs. Samples for atump. Timmers
Printing, 2503 Gretam Road, Appleton, Wis.

xformer, $20.00. Thordarson 500 mil smoothinl{ choke, hardly used,

FOR SALE! Practically new Thordarson 1750 and 2000 volt 500 mil
former, $200.00. Thordarson 500 mil smoothing choke, hardly used.
$100.00. F. B. B. Millis, Mass., Hammond, W1GCD, Plain St.,
Millis, Mass.

WBCU in QRT. Complete Coilng station equipment at almost half
price. Complete set, $75. W1FR. 224 Exchange Place, New York City.

WANTED: Latest radio receiver with 20" record player for
SWAP. New Philco 1405 table radio with 45 min. record player for
Price $80.00. W1NMP, Box 749, New York, N. Y.

FOR SALE: Radio receiver with coils plus broadcast band,
speaker, power supply, $250. These are both in perfect condition and
including receiver, broadcast band, and AC power supply, $250. Cash only. Shipped F.O.B. Alexandria,

FOR SALE: Practically new Thordarson 1750 and 2000 volt. 500 mil
former, $200.00. Thordarson 500 mil smoothing choke, hardly used.
$100.00. F. B. B. Millis, Mass., Hammond, W1GCD, Plain St.,
Millis, Mass.

WBCU in QRT. Complete Coilng station equipment at almost half
price. Complete set, $75. W1FR. 224 Exchange Place, New York City.

Selling out: HRO-7 complete with broadcast coils and NBPM
adapter, $275.00; JYF-1800, $75; UHF Resonator 3-element
matches, $59.50. J. F. Pack, 357 Broad St., New Britain, Conn.

FOR SALE! One BC610-D, complete, $500.00. F. O. B. Steepleev, Mo.
Also Wanted: Any Collins 1-13 transmitter with complete power supply,
30 tubes, $150.00. F. O. B. Steepleev, Mo.

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Also Wanted: Any Collins 1-13 transmitter with complete power supply,
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QSL'd G. L. Taylor, Sunniall, Mississippi.

TRANSMITTING tubes 100TH, $7.95, pair, $15.50; 7STL, $3.25,
pair, $6.50; 18ST, $8.50; 30ST, $15.50, pair. 

FOR SALE: Rickles.

TRANSMITTING tubes 100TH, $7.95, pair, $15.50; 7STL, $3.25,
pair, $6.50; 18ST, $8.50; 30ST, $15.50, pair.

FOR SALE: Practically new Thordarson 1750 and 2000 volt. 500 mil
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pair, $6.50; 18ST, $8.50; 30ST, $15.50, pair.

FOR SALE: Rickles.
COUNSELOR wanted for boys' camp in Maine for summer. License required to operate ham radio station. 20 years minimum age. Healy. $35 to $45. Reply c/o President. Boy's State Camp, 7252 S. Chicago Heights, Calif.

SELL: BC510E in perfect condition, factory modified all bands, complete with speech amplifier, spare 250TH and others. Sell or swap. $45. 1429 South Crescent Ave., Park Ridge, Ill.

SELL: New and reconditioned Collins, National, Hallcrafters, Hammarlund, BMI, Milken, Sonar, Melson, etc. Reconditioned $32, 90TH; $280, 490H; $300, 490B; $375, 490X; $410, 490X; $450, 500X; $500, 550X; $900, NC-113; $1490; NC-193; $1990; VHP 125; $590; JVC.$25. 1690 State Rd., Millbrae, Calif.


SULL: New National NC-183 receiver, NC-183TS speaker and narrow band FM adapter NFM-3 for above. Originally cost $209.55; cost with board $125.00. Will sell for $125.00. WJYCR, 4113 Paseo Alto, San Diego, Calif.

SELL: SWLS. Samples free! (stamp appreciated) Cushing, W1HJ1.

FOR SALE: 80-10, mike and two spare 2E22's. Gon-Set 80-10, mike and case, $25.00. HABOM, 622 8th Street, San Francisco 21, Calif.

SELL: Complete station, including nearly new HQ-129X, 300-watt output, Brand new unused condenser, reconditioned condenser, parts included. $200. WEPFX, 33 Pine Ridge Rd., Arlington 74, Mass. AR-3458M.

CUMBERLACE, single lens reflex, Trade for either top-notch receiver, Korelle II coated F2.9 Schneider, 124" square; Graflex 2 x 4 F4.5. $20.00.


DO NOT FLIP! C.W. transmitter for use on all amateur bands 10--80 meters; pair 25 amp., $5.25. J04TL sockets, $1.20. Atronic Corporation, 1253 Loyola Ave., Chicago 26, Ill.

WANTED: 1 kHzwait, TVI, BCl, proof transmitter final 100TH mod. 900's power supply. Value controlled. 40 volts. 500 miles separate power supply for each unit. 75 ft. rail relay. VFO. Remote control line amplifier. Reason: USAF, subject for overseas. Guy Milano, 308, 6500 N. Sheridan, Chicago, Ill.

WANTED: Transmitter, Brand new condition, factory modified all bands, spare 250TH and others. Sell for $10.00 each. B. O. B. West Hartford. WHKE, J8 LaSalle Rd., West Hartford, Conn.

SELL: BC696, BC499. Both new on shock-mounted rack; 100-watt power supply with 4VR tubes and key input; excellent beginners' trans­mitter. On shock-mounted rack with power supply. Take it for $40.00. On shock-mounted rack with power supply. Take it for $40.00. W6YCA, E. H. Willingham, J821 Chestnut St., DePau, Calif.


Announcing
THE NEW TURNER
MODEL 25X-25D
Crystal or Dynamic

New... all new from its precision engineered crystal and dynamic circuits to its specially designed case. The Turner 25X-25D combines quality performance, convenience, and style with world famous Turner dependability. Features include Alnico V magnets, high quality moisture sealed crystals, smooth, wide range response to voice and music pickups, 90° tilting head, 20-ft. removable quick-change cable set, mechanical-shock proof interior mounting, and high quality construction throughout. Finished in two-tone umber gray with chrome plated grill.

25X CRYSTAL—Level: 52
db below 1 volt/dyne/sq. cm.
Response: 50-9000 c.p.s.

25D DYNAMIC—Level: 54
db below 1 volt/dyne/sq. cm. at high impedance.
Response: 50-10,000 c.p.s.

ASK YOUR DEALER
IN CANADA—Canadian Marconi Co., Ltd., Montreal, P. Q.
EXPORT—Ad. Aurelia, Inc., 89 Broad Street, New York 4, N. Y.

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917 17th Street, N. E.
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Offers Training Courses for Radio Technician (Pre-Television) and Licensed Radio Operator (All Types) including maintenance and operation of General Electronic Equipment. Over 20,000 Alumni and 30 years radio training EXPERIENCE. Courses approved for G.I. Training for Veterans.

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CALL LETTER PLATES

Type A-10 - For Your Car
$2.95 POSTPAID
a black baked enamel background. Red, green, blue and gray = 90¢ extra. Size - 2½" x 8½" with 1½" letters.

LAPEL BUTTONS
An attractive metal button with highly polished raised letters against a black background. Other colors 90¢ extra.

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IN SPRING
IT'S SUBRACO FOR YOUR
COMPLETE MOBILE ENJOYMENT

SIMPLE TO INSTALL
COMPACT - EFFICIENT

30 WATTS
INPUT - PHONE
CLASS "B" MOD.

SUBURBAN RADIO COMPANY
158 CENTRAL AVE.
ROCHELLE PARK NEW JERSEY

MT-15X
AVAILABLE IN 75 MTR. PH.
AS WELL AS THE 10-11 MTR. UNIT

WRITE DEPT Q-5

$79.95 LESS TUBES

$59.95 COMPLETE

109
The No. 69040 Series of Permeability Tuned Ceramic Forms

In addition to the popular shielded plug-in permeability tuned forms, 74000 series, the 69040 series of ceramic permeability tuned unshielded forms are available as standard stock items. Winding diameters and lengths of winding space are 1/8 x 1/32, 1/4 x 1/16, and 1/8 x 1/16, for the 69041, 69043 and 69045 respectively. Nos. 69043 and 69046 have powdered iron slugs while Nos. 69041 and 69045 have copper slugs.
Now, for the first time, you can select a plate choke for a particular frequency and know that it will give excellent performance at this frequency. The Ohmite line of plate chokes are "frequency-rated"—their frequency characteristics have been accurately predetermined. The chart below gives the operating frequency range for each of the seven sizes.

Ohmite single-layer wound, r.f. plate chokes cover the entire frequency range of 3 to 520 megacycles. These chokes are wound on low power factor plastic or steatite cores, and are insulated and protected by a moistureproof coating. All chokes are rated 1000 ma except the Z-14 and Z-28, which are rated at 600 ma. Further information will be supplied upon request.

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4864 Flournoy St., Chicago 44, Ill.
Which Do You Want?

Get Your FCC Ticket

Jobs worth

Better Pay

Greater Security

Happy Vacations

and Travel

$3,000 to $7,500 are opening up right now for FCC Licensed Radiomen.

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Get your license easily and quickly and be ready for the $3000 to $7500 jobs that are open to ticket holders. CIRE training is the only planned course of coaching and training that leads directly to an FCC license.

YOUR FCC TICKET IS RECOGNIZED IN ALL RADIO FIELDS AS PROOF OF YOUR TECHNICAL ABILITY

CIRE Graduates Find FCC License Pays Off

"I now hold ticket P-10-3787, and holding the license has helped me to obtain the type of job I've always dreamed of having. Yes, thanks to CIRE, I am now working for CAA as Radio Maintenance Technician, at a far better salary than I've ever had before. I am deeply grateful." — Student No. 3319N12

"I was issued License P-2-11188 on November 4. The next day I was signed on board a tanker as Radio Operator-Purser. Besides radio operating, I handle the payrolls, etc., which is all overtime and brings my monthly pay up to between $500 and $650." — Student No. 2355N12

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2. TELLS HOW YOU WILL BENEFIT BY HOLDING AN FCC COMMERCIAL LICENSE.
3. TELLS HOW YOU CAN GET YOUR FCC COMMERCIAL RADIO OPERATOR LICENSE IN A FEW SHORT WEEKS—EASILY AND QUICKLY, BY USING CIRE SIMPLIFIED TRAINING AND COACHING AT HOME IN YOUR SPARE TIME.
4. TELLS OF HUNDREDS OF OUR SUCCESSFUL STUDENTS WHO NOW HAVE LICENSES AND NEW, BETTER—PAYING JOBS.
5. TELLS HOW WE PREPARE YOU TO PASS THE NEW FCC COMMERCIAL LICENSE EXAMINATIONS, WHICH NOW INCLUDE FM AND TELEVISION.
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7. TELLS HOW WE HELP YOU TO GET A BETTER—PAYING, LICENSED JOB, WITH OUR FREE AND EXCLUSIVE SERVICE, WHICH PREPARES YOUR EMPLOYMENT APPLICATION FOR MAILING TO HUNDREDS OF EMPLOYERS, INCLUDING FM, AM AND TELEVISION BROADCAST STATIONS, RADIO MANUFACTURERS, POLICE RADIO STATIONS, AND RADIO-EQUIPPED TAXI, BUS AND PUBLIC UTILITY COMPANIES.

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Want to know how I can get my FCC ticket in a few short weeks by training at home in spare time, send me your FREE booklet, "Money Making FCC License Information," as well as a sample FCC-type exam and free booklet, "How to Pass FCC License Examination" (does not cover exams for Amateur License)

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